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Effect of Personal and Situational Variables on Noise Annoyance: With Special Reference to Implications for En Route Noise

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Final Report

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16. Abstract

Over 680 publications from 282 social surveys of residents' reactions to environmental noise have been examined to locate 495 published findings on 26 topics concerning non-noise explanations for residents' reactions to environmental noise. This report (1) tabulates the evidence on the 26 response topics, (2) identifies the 495 findings, and (3) discusses the implications for en route noise assessment. After controlling for noise level, over half of the social survey evidence indicates that noise annoyance is not strongly affected by any of the nine demographic variables examined (age, sex, social status, income, education, homeownership, type of dwelling, length of residence, or receipt of benefits from the noise source), but is positively associated with each of the five attitudinal variables examined (a fear of danger from the noise source, a sensitivity towards noise generally, the belief that the authorities can control the noise, the awareness of non-noise impacts of the source, and the belief that the noise source is not important).

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LIST OF ABBREVIATIONS AND SYMBOLS

More detailed information about noise indices and scales for acoustical measurement can be found in general noise references (e.g., Bennett and Pearsons, 1981).

CNEL Community Noise Equivalent Level, dB

CNR Composite Noise Rating, dB

dB Decibel

L_{dn} Day-night Average Sound Level (DNL), dB

L_{eq} Equivalent Continuous Noise Level, dB

L_x Statistical Sound Level, dB (The noise level which is exceeded x percent of the time.)

NEF Noise Exposure Forecast, dB

NNI Noise and Number Index, dB

PNdB Perceived Noise Level, dB

r_{ax} Pearson product moment correlation between annoyance ("a") and a non-noise variable ("x")

$r_{ax.n}$ Partial correlation coefficient between annoyance ("a") and a non-noise variable ("x") controlled for noise ("n")

$R_{a.nx}$ Multiple regression coefficient for the regression of annoyance on noise and a non-noise variable

ω^2 Measure of proportion of variance associated with an explanatory variable (usually a nominal level variable)

WECPNL Weighted Equivalent Continuous Perceived Noise Level, dB

Symbols appearing only in Appendix B

FB1 Aircraft Noise Rating Quantity 1 ("Fluglärmbewertungsmaß," a German aircraft noise index), dB (Deutsche Forschungsgemeinschaft, 1974: 137)

L_m Logarithmic average of sound levels of individual events, dB (Deutsche Forschungsgemeinschaft, 1974: 125)

N Number of respondents

n Number of responses (either interviews or questionnaires). This symbol is only used when some respondents provide more than one interview because of multiple contacts.

ns	Effect not significant, $p>.05$
sr	Effect reported as significant, $p<.05$ (based on simple random sampling assumptions which almost always will overestimate the significance levels)
S	Effect significant, $p<.05$ (based on techniques which account for the complex sample design)
X_{dB}	Evidence based on the decibel equivalent of a difference in annoyance
$X_{\%}$	Evidence based on the difference in percentages annoyed
X_r	Evidence based on squared correlation coefficients or other measures of the percentage of the variance associated with an explanatory variable
X_o	Evidence based on "other" quantitative measures (usually either significance tests or differences based on multipoint annoyance scores)
X_{Vb}	Evidence based on a verbal statement in a publication without a quantitative measure of the size of an effect
?	Evidence is subject to a major weakness which could affect the direction of the finding

EXECUTIVE SUMMARY

Social surveys in residential areas find that measured physical noise levels only partially explain residents' reactions to environmental noise. This report examines 26 topics concerning other explanations for residents' reactions to noise. Twenty-one of these topics concern personal and situational explanations for residents' reactions to environmental noise, two topics concern annoyance at low noise levels, and three concern the relationships between noise sensitivity, noise level, and moving. The report provides a comprehensive evaluation of the evidence on these topics by tabulating 495 findings which were identified after examining over 680 publications based on 282 noise reaction surveys.

The report has three objectives: (1) to provide conclusions and synopses of the evidence on 26 response topics, (2) to provide a comprehensive guide to the location of previously published evidence on each response topic, and (3) to identify evidence which is relevant for en route noise assessment.

To evaluate the 21 hypotheses about the effects of moderating variables on noise reactions, each survey finding has been classified as supporting or not supporting an "important" effect for each moderating variable. A finding is tabulated as providing a "standard" level of evidence for an "important" effect if the moderating variable either affects annoyance as much as does a 3-decibel difference in noise level, creates a 5 percent difference in the percentage of annoyed respondents, or explains 1 percent of the variance in annoyance scores. A finding provides a weaker level of evidence for an "important" effect if a publication only contains a significance test or only reports a researcher's subjective evaluation of the "importance" of a finding. After classifying the findings from all the surveys on a single topic, a hypothesis is judged to be supported if an "important" effect is found in more than 50 percent of the surveys.

The balance of the social survey data do not support any of the nine hypotheses about the effects of demographic variables. Less than 50 percent of the surveys found that, after controlling for noise level, noise annoyance is increased to an important extent by age, sex, social status, income, education, homeownership, type of dwelling, length of residence, or the receipt of benefits from the noise source.

The data support all five of the hypothesized relationships between attitudes and noise annoyance. Over 50 percent of the surveys found that, after controlling for noise level, noise annoyance increases with a fear of danger from the noise source, a sensitivity towards noise generally, the belief that the authorities can control the noise, the awareness of non-noise impacts of the source, and the belief that the noise source is not important.

Only some of the remaining hypotheses about situational factors were supported. The data do not support the hypothesis that ambient noise levels affect reactions to environmental noise. There is no evidence that the type of interviewing mode (telephone or face-to-face) affects annoyance. The data support the hypothesis that the amount of insulation from environmental noise in a residence (e.g. sound proofing) reduces annoyance, but the existing, rather weak, data do not support the hypothesis that the number of hours of exposure (i.e. amount of time at home) affects annoyance.

For two other situational variables the findings are inconsistent or drawn from too few studies to offer useful evidence. Only three studies provide the inconsistent evidence about whether or not noise annoyance is increased by the presence of non-noise intrusions from the noise source. Although it is often noted that new noise sources can provoke strong public actions against noise, the findings are very mixed on whether residents' private annoyance is any different to a new noise than it is to a pre-existing noise of the same noise level.

The evidence at low noise levels (below a Day-Night Average Sound Level of 55 dB) consistently shows that a small percentage of the population is highly annoyed and that the degree of annoyance continues to decrease with reductions in noise levels below a Day-Night Average Sound Level (DNL) of 55 dB. The balance of the evidence suggests that there is no important difference between the general sensitivity to noise of residents of noisy and quiet areas.

The evidence from the above analyses are relevant for predicting whether reactions to noise from high altitude, en route aircraft would differ from reactions to comparable noise levels around existing airports. On the basis of the existing evidence three hypothesized differences between the en route and airport environments do not appear to be important: the extent to which residents benefit from the noise source, the general noise sensitivity of the populations, and the levels of ambient noise. Two other factors suggest that reactions to en route noise might be less than those predicted from data collected around airports: people exposed to en route noise will probably be less fearful of danger from the aircraft and may be less likely to be sensitized to aircraft noise by other non-noise impacts. It is not clear whether the introduction of new en route noise would generate any greater annoyance than would have been expected from studies of reactions to equally noisy, pre-existing noise environments. The data do, however, reveal two reasons why the en route noise issue cannot be simply dismissed on the grounds that en route noise levels would often be below DNL 55: (1) some residents are annoyed below DNL 55 and (2) incremental reductions in noise levels below DNL 55 do result in corresponding incremental reductions in annoyance.

1. INTRODUCTION

The objectively measured noise environment has been consistently found to explain part, but not all, of the variation in people's reactions to noise. The individual variation in reactions arises partly from errors in measurement processes and partly from persistent differences in how individuals react to the same noise environments (Hall, Taylor: 1982). The causes of these individual differences have been a secondary topic for many surveys since the 1940's when the first systematic social survey of residents' noise reactions was conducted (Chapman, 1948). The results from these surveys have not always been consistent. No previous publication has attempted to systematically accumulate all of the evidence from the surveys to assess the balance of the evidence. This report evaluates that evidence by applying principles from meta-analysis which have been developed to provide concise quantitative summaries of the results from large numbers of studies.

Twenty-six topics are examined. Twenty-one topics concern the effects of demographic, attitudinal and situational variables on annoyance with environmental noise. Two topics concern annoyance at low noise levels. Three concern the relationship between sensitivity and moving at high noise levels. While the primary purpose of this review is to draw conclusions from existing evidence, the review also provides a comprehensive index to existing publications on each topic.

The research reviewed in this report concerns people's personal, subjective reactions to environmental noise in their residential environments. These reactions are measured in social surveys in which respondents are directly asked about their feelings about the environmental noise (usually aircraft or road traffic) they hear when at home. It is important to note that these are not the public, political actions which practicing acousticians and public officials face in the public arena. Past research has provided some evidence that different moderating variables affect such public actions (McKennell, 1963).

After this introduction, Chapter 2 describes the methodology. This description is supplemented by the evidence coding protocol which is reproduced in Appendix A. The listing of the detailed evidence appears in Appendix B and is condensed into 26 synopses in Appendix C. The results of the analysis are presented in Chapter 3. Chapter 4 includes conclusions and a summary of some of the limitations of the present data. The implications of these analyses for en route noise issues are discussed in Chapter 5. The relationship between this publication and two previous publications which drew on much of the same data is described in Appendix D.

2. METHODOLOGY

This study summarizes findings on 26 topics with an approach which is consistent with the principles of meta-analysis, a methodology for combining the results from studies by using quantitative methods. Limitations in the available published data mean that the primary meta-analytic statistical techniques could not be used. However, this study follows many of the principles of meta-analysis by examining a comprehensive inventory of studies, categorizing findings using standardized objective techniques, controlling for differences by examining within-study differences, and quantifying the findings with a suitable statistic (Rosenthal, 1984; Wolf, 1986; Wachter and Straf, 1990).

While this report represents a departure from conventional literature reviews, most elements of the approach are shared with any high-quality, quantitative inquiry and do not require explanation. The few principles which might appear to represent departures from standard statistical practice will be highlighted below.

The methodology for this study can be conveniently divided into the eight sequential stages which are outlined in Figure 1. This chapter describes each of these stages, provides a guide to the appendices which support the methodology, and then describes an evaluation of the accuracy of the study procedures. Additional information about the methodology appears in Appendix A and in the footnotes to the tables in Chapter 3.

2.1. Data identification and classification stages

Stage I At Stage I the universe of surveys was defined to be all surveys which were accessible in English language publications or translations by 1987. About half of the social surveys were conducted in English. To locate these surveys nine English language acoustical journals were examined, all references cited in those journals were obtained, and personal correspondence was conducted with noise survey professionals. The 282 identified surveys are the first 282 surveys listed in a catalog of social surveys of noise annoyance (Fields, 1991).

Stage II At Stage II, the approximately 680 publications associated with these 282 surveys were read to identify discussions on the 26 topics reviewed in this study and on 8 additional topics for which too little information was accumulated to justify publication.
Stage III At Stage III, each of the discussions was screened to identify a total of 495 findings which meet the types of eligibility criteria outlined under Stage III in Figure 1. The basic annoyance question criteria are described in this section. The explanatory variable criteria appear in footnotes to tables. Additional details are presented in Appendix A.

To meet the annoyance question criteria, the question in the social survey must appear in the context of questions about noise experienced around the home and must specifically ask for the respondent's overall, current feelings about the noise from the specified source. A large number of different question formats are acceptable. The most frequently used noise annoyance question is the following:

"Q#. Does the noise of the aircraft (...road traffic) bother or annoy you:

1 very much
2 moderately
3 a little, or
4 not at all?"

Data Identification and Classification Stages

I. Identify universe of social surveys based on type, date and language of the publication
II. Review publications for discussions of topics
III. Screen discussions for eligibility based on:
  A. Wording of annoyance questions**
  B. Measurement of explanatory variables*
IV. Identify and rate the highest quality evidence from each survey on each topic by considering:
  A. Statistic used to measure effect**
  B. Annoyance question wording**
  C. Annoyance data analysis technique**
  D. Variables controlled in analysis*
  E. Other major weaknesses in finding**
V. Classify study finding by direction of conclusion considering:**
  A. Criterion for "important" size of effect
  B. Definition of contrast groups
  C. Non-linear relationships

Recording and Reporting Stages

VI. Record findings in a data base and list evidence
VII. Condense findings in synopses for each topic
VIII. Display results in tables by quality of data

* Additional information in table footnotes
** Additional information in Appendix A

Figure 1: Stages in the survey review process

For convenience the term "annoyance" will be used to describe this subjective reaction to noise. Most surveys ask about "annoyance" or "disturbance" but some ask for other judgements or evaluations of the noise environment.

Use of the annoyance question criteria excludes some discussions about annoyance at a single time of day or about annoyance in the workplace or about annoyance under previous conditions. Use of the explanatory variable criteria exclude some discussions which appear to confound the effects of the explanatory variables with the effects of other variables or with the effects of variations in measurement methodologies.

While the various eligibility criteria described here and in Appendix A do exclude some discussions of the 26 topics, the general approach is not highly selective. Findings are accumulated from a large number of surveys, including some with known methodological weaknesses, rather than from a small number of well-known, unusually sophisticated surveys. Including many surveys has the advantage of averaging the results over the widest possible range of community noise conditions and of avoiding biases due to the tendency for only studies with positive findings to be published or become well known. This later tendency is labeled the "file drawer" problem in the meta-analysis literature because negative findings tend to be confined to the "file drawer" or to lesser known publications.

Stage IV At Stage IV the single highest quality evidence on each topic from each survey was identified. This is not a trivial task when publications contain a range of evidence on a single topic. In such cases statistics may be reported separately for different subsamples, for several different annoyance measures, and for both controlled relationships and uncontrolled relationships. The basic principle followed in this review is to select a single finding on each topic by following a rigidly defined hierarchy of evidence without respect to the outcome for the hypothesis. In only 13 instances (noted in the footnotes to the tables) are multiple findings tabulated from a single survey on a single topic. In the remaining instances of multiple findings, a single finding was entered as evidence for this analysis, but the alternative findings were noted in the listing of the evidence in Appendix B. For complex reports the large number of criteria involved can only be fully understood by examining the study protocol in Appendix A.

The primary criteria for establishing the quality-of-evidence ranking can be understood from examining Figure 2 in which the 423 findings on 20 of the topics are classified by the quality of their evidence.[1] In the top half of the figure it can be seen that 46 percent of the findings (194) are classified as "Standard quality findings" because they; (1) measure the importance of a moderating variable by the "size" of its effect, (2) control for noise level in the analysis, and (3) are free of major problems.

The measure used for the importance of the moderating variable is the primary ranking criterion in Figure 2. For the standard quality findings in the top half of Figure 2, the highest priority evidence ("dB") is available for 85 findings. For these 85 findings, the publications measured the annoyance in each subgroup and then expressed the annoyance differences between subgroups in terms of the number of decibels which would create an equivalent difference in annoyance. This is commonly thought of as the displacement (measured in decibels) of dose/response curves for subgroups. The next level of evidence ($\Delta\%$) comes from 36 findings which measured the difference in the percentage annoyed in subgroups. The last type of "standard-quality" evidence (r^2) is available for 73 findings which measured the proportion of the variance associated with the explanatory variable. Most publications, but not all, only reported on linear relationships.

[1] Of the other 72 findings, the 26 findings on the three high-noise-area-sensitivity topics and the 41 findings for the two low-noise topics are not included because some of the criteria are not applicable. The 5 findings on the non-noise impact topic (Topic 15) are also not included.

STANDARD QUALITY FINDINGS [All standard findings; (1) measure size of effect, (2) control for noise, and (3) avoid major problems]				
Importance is measured by:				
Size-dB	Decibel equivalent of difference in annoyance	20%	(85)	
Size-Δ%	Difference in % annoyed	9%	(36)	
Size-r^2	Proportion of variance	17%	(73)	
	Standard subtotal			46% (194)
NON-STANDARD QUALITY FINDINGS				
Importance is measured by:				
Size (dB, Δ%, r^2) but...				
	No control for noise level	17%	(74)	
	Other major problem	2%	(8)	
Significance test or other objective measure (NOT a dB, Δ% or r^2 measure)		19%	(80)	
Verbal description - Vb (No quantitative descriptor in publication)		16%	(67)	
	Non-standard subtotal			54% (229)
	TOTAL	100%	(423)	

Figure 2: Quality of evidence for 423 findings on 20 topics

Of the 229 non-standard findings in Figure 2, 82 measured importance by measuring the size of an effect but 74 did not control for noise level and an additional 8 were classified as "non-standard" because of a major problem. The importance of most of the remaining findings in Figure 2 was not measured in terms of the size of the relationship. For 80 findings importance was indicated only by the results from significance tests (77 findings) or by some other statistical criteria not included within the three standard size criteria (3 findings used

differences in average annoyance index scores). Lastly, 67 findings (Vb) could only be classified on the basis of a verbal, non-statistical statement about the strength of an explanatory variable's effect.

It must be noted that the "non-standard quality" label is not a judgement on the overall quality of a survey or on the sophistication of the analyses. It only concerns the type of information which is presented on a specific topic.

One counter-intuitive aspect of the hierarchy of evidence in Figure 2 is the preference for effect-size over significance test measures and the subsequent exclusion of significance test results from the standard quality findings. Previous studies on meta-analysis methods have firmly established the fact that simple counts of significance test results can bias the conclusions from literature reviews (Hedges and Olkin, 1985). For example, if there were a 5% difference between subgroups in a population and every one of a large number of small surveys correctly found a 5% difference between subgroups, none of the individual surveys would be counted as finding a difference if the confidence interval for each of the small surveys was a non-significant $\pm$ 10%. For the types of laboratory studies which have been the subject of some of the classic meta-analyses, it is possible to transform measures of significance levels into measures of the size of an effect. That transformation would not have been useful for most data from these surveys because most publications only report dichotomous results for a single, $p<.05$, level of significance.

Stage V At Stage V the evidence is finally classified according to whether or not it supports one of the 20 hypotheses. Figure 3 presents the criterion which define an "important" effect for each measure of importance. An "important" effect is equivalent to a 3 decibel difference in target noise (3dB), a 5% difference in the percent annoyed (Δ5%), explaining 1% of the variance in annoyance scores ($.01r^2$), meeting a .05 statistical significance criterion ($p<.05$), finding a consistent difference within 3/4 of the subgroups studied $(3/4g)^2$ or an unqualified, published verbal assertion that there is a relationship (Vb). These criteria result in some smaller effects being tabulated as not showing an effect. For example, a 1973 road traffic survey in Sendai, Japan controlled for noise level and found that the noise/annoyance relationship for women was separated from that for men by the equivalent of about 2 decibels (LA_{eq}). Since this did not meet the 3dB criterion, the survey finding was classified as not supporting the hypothesis that sex affects annoyance.

The choice of these specific values for the criteria is to somewhat arbitrary. The choice of the word "important" to verbally characterize these values is also somewhat arbitrary. Readers may substitute any other adjective (for example "minimally interesting") to label this collection of criteria. If all the published data could have been expressed in decibel equivalent values then such choices could have been avoided. Given the diversity of the data, some choices were required to facilitate the clear communication of the results. It is hoped

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[2] The "3/4g" criterion is met if the differences between subgroups defined by the moderating variable support the hypothesis in 3/4's of the units (eg. study areas) examined. The criterion was applied in three instances when there was no other method for judging the importance of differences in annoyance scores.

that these criteria are similar to the criteria that most readers will find useful.

In this author's judgement the criteria which are used in this report are the minimum size criteria that would be of interest to most researchers studying noise annoyance. A 3-decibel difference in environmental noise level is about the smallest which is relevant for environmental noise regulations which are often defined in 5-decibel increments. A 3-decibel difference is equivalent to about a doubling in sound energy and is within the range in which otherwise identical complex sounds begin to be perceived to differ under normal listening conditions. The two remaining standard criterion are roughly consistent with the 3-decibel criterion. The $\Delta 5\%$ criterion is the equivalent of about a 3-decibel difference in noise levels in the 60 to 70 decibel (L_{dn}) range on one well-known high annoyance curve (Schultz, 1978). The third criterion, $.01r^2$, is more arbitrary. Most professionals would ignore less than a 1% effect. A 3-decibel effect is not totally inconsistent with a 1% of variance explained criterion. For five variables examined from one survey, a 3-decibel change was equivalent to a 0.7% to 2.1% variance explained measure (Fields and Walker, 1982).

Symbol	Criteria for "important" (in order of precedence)
3dB	The difference in annoyance scores of the subgroups formed by the moderating variable is the equivalent of a 3 dB difference in noise exposure
$\Delta 5\%$	At least a 5% difference between the percent annoyed in the subgroups of the moderating variable
$.01r^2$	The moderating variable explains at least 1 percent of the variance in annoyance scores
$p<.05$	Difference between the annoyance scores of subgroups is statistically significant at $p<.05$.
3/4g	3/4 of sample groups support hypothesis
Vb	Unqualified verbal assertion of a relation between annoyance and the moderating variable (i.e. no qualification such as "small" or "slight")

Figure 3: Criterion for "important" effect of moderating variable

The non-standard criteria also have some justification. The $p<.05$ criterion has become the standard indicator of whether a finding is significant enough to be reported in social science publications. The verbal criterion is no more than an acceptance of the published researcher's judgement that an effect has been discovered which does not need to be qualified as small or unimportant. The 3/4g criterion is admittedly more arbitrary, but, since it was only used for three findings, does not have an important effect on this report's conclusions.

The sensitivity of the study findings to the exact values of these criteria is not known. Although it is obvious that a much more strict criterion (e.g. 20 decibels) would have

increased the number of "no effect" findings, it is the author's impression that a small change (e.g. from 3 to 5 decibels) would not have strongly affected the results. Of course a more liberal criterion (e.g. 1 decibel) would have decreased the number of "no-effect" findings and increased the number of findings in both the same and/or opposite direction to that stated by a hypothesis.

While the exact value of the selected criteria are to some extent arbitrary, these simple criteria for evaluating hypotheses have the advantages of being unbiased, relatively easy to apply and readily transparent to readers. More powerful statistical methods for combining results from studies are available, but most noise surveys do not provide the necessary statistical data. The broad scope of this less powerful review serves to identify major findings and provide an extensive listing of sources of information about major noise annoyance hypotheses.

2.2. Recording and reporting stages

Stage VI At Stage VI each of the 495 findings which was identified and classified in the first five stages was entered into a data base. The entire data base is listed in Appendix B. It serves as an index to the location of the evidence on each of the 26 topics.

Figure 4 is the first page of this listing for the age topic. The first column for the first survey in Figure 4 indicates that this is evidence from the 1976-77 Dulles Concorde survey (survey identification number USA-127 in Fields, 1991). The last column shows that the evidence was drawn from pages 19 and 20 of a 1976 publication by Kirschner Associates (the full bibliographic entry for each publication appears in Fields, 1991). The "X_{Vb}" in the "same ... finding" column indicates that this "verbal" evidence (quoted in the "Comments" column) supports the assertion that reactions are the same in different age groups. The "{4}" which appears under "X_{Vb}" is a redundant indicator of the classification of the finding which is explained in Appendix A. The entry of "None" under "Variables controlled" shows that neither noise level nor any other variable was controlled in the analysis.

The listing also displays information about the results from significance tests (when available), the quality of the significance tests, the definitions of moderator variables, the number of respondents ("N=" within square brackets, "[]"), the number of interviews ("n=" within square brackets if some respondents are interviewed more than once), and other important aspects of the finding or survey. A more detailed guide to the listing is provided at the beginning of Appendix B. All symbols in the listing are defined under "LIST OF ABBREVIATIONS AND SYMBOLS" at the beginning of this report.

Stage VII At Stage VII a computer program sums the findings on each topic from Appendix B to produce a quantitative tabulation of the results which appears in the 26 topic synopses in Appendix C. The abridged version of the age topic synopsis in Figure 5 summarizes the evidence on the age topic, part of which was contained in Figure 4. These topic synopses provide a verbal description of the definitions, hypotheses and findings on each topic as well as a quantitative tabulation.

Table 01 — Issue 2.k: Age of respondent

Hypothesis: Older people are more annoyed

Study (Catalog ID number)	Finding: If older then annoyance is: Lower	Same	Higher	Methodology: Measure of age	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1976-77 Dulles Concorde (USA-127)		X_{vD} {4}		Years	None	Annoyance "..is not related to.." age. Analysis of reactions to subsonic aircraft before Concorde operations. [N≅1700]	Kirschner Associates, 1976:19,20
USA Airport [2 Cities] (USA-044)	X_r ? {1}			Years (10-year groups)	None	r_{ax}=-0.14. With noise and 9 attitudinal variables (not necessarily causally prior), b=.09 and R^2 increase ≅.005, not significant. [N≅1950]	Connor, Patterson, 1972:43,46
1969 Mixed Road and Aircraft (UKD-033)		X_{vD} {4}		Not reported	Not reported	Relationship is "consistent" with "not very significant" relationships. [N≅315]	Bottom, Waters, 1972:18
1982 British Helicopter Disturbance (UKD-225)		X_{o} ns {3}		Age groups	Noise (study area)	Age not significantly related to annoyance within areas. [N≅480]	Atkins, Brooker, Critchley, 1983:25
1965 Regional French Sonic Boom (FRA-017)			X_{vD} {4}	Years	None	Annoyance with the sonic boom ".. increases with age.." [N≅2290]	de Brisson, 1966:24
1961 Heathrow (UKD-008)	X_r sr {1}			Years	Noise (Average peak, PNdB)	$r_{ax.n}$=-0.11 [N≅1730]	McKennell, 1963: Apndx. D

Figure 4: Example of list of evidence from data base in Appendix B

The relationship between Figures 4 and 5 can be readily understood with an example. The "11" at the upper left of the tabulation in Figure 5 shows that 11 findings in the data base measured the importance with "objective" "standard" evidence (i.e. 3dB, Δ5%, .01r^2) with significance test evidence which either supported or did not contradict the finding. Two of these 11 come from Figure 4. The second and last entries in Figure 4, must be among the 11 because the position of the "X" in the "Finding-Lower" column indicates that these two findings support the assertion that older people are less annoyed, the "r" indicates that the findings met the standard .01r^2 criterion and the "sr" (for the last entry) or the absence of a "ns" (for the second entry) indicates that there was no evidence that the relationship was not statistically significant.

The data are summarized in the synopsis under the "Tabulations" heading. The initial statement to the right of the "Tabulations" heading in Figure 5 indicates that there were estimated to be a total of 77,122 respondents in the analyses from the 63 surveys which presented evidence on this topic. Each of the 63 surveys provided one finding on this topic.

The table is divided horizontally into three blocks. The upper block consists of headings for the columns while the other two blocks tabulate the evidence. The middle block tabulates the findings for all of the evidence. The bottom block provides the subtotal for only the "standard" quality evidence.

The "Finding" columns for the table are grouped into three major sections according to the primary finding on the hypothesis. The left third of the table presents the evidence opposing the hypothesis (older people are less annoyed by noise). The middle third presents evidence that the variable has no effect on annoyance. The right third presents the evidence supporting the hypothesis (older people are more annoyed). This division is the same as the three-way classification of the findings in the "Finding" column in Figure 4 and in the Appendix B listings.

The individual columns serve to more finely classify the studies by the type of evidence (information) which provided the basis for determining whether or not a finding supported the hypothesis. Most of these classifications are directly derived from the subscripts attached to the "X" symbols presented within the "findings" columns in Appendix B. (These subscripted symbols appear in brackets "[]" in the remainder of this section.) The evidence is first classified by whether it is objective (quantitative evidence) or subjective (based on only a verbal description [Vb]). Studies with objective evidence are further subdivided by whether the evidence is "standard" (i.e. 3dB, Δ5%, .01r^2) or "other" (based solely on significance tests or other numerical measures[o]).

The "standard" evidence is further subdivided if there is significance test evidence which is contrary to the classification. This subdivision also is based on information presented in the "Finding" column in Appendix B. For the "less annoyed" third of Figure 5, for example the one study under "sig. test evidence - ns" is one with evidence of an "important" sized effect

Synopsis for Topic 01: Age of respondent

Moderating variable: Age of respondent

Concepts excluded: None

Hypothesis: Older people are more annoyed.

Explanation: As people age they may become generally less tolerant of environmental problems. People who have difficulty hearing ....

Heading notes: None

Tabulations: 63 Findings, 63 Surveys, 77,122 Respondents

HEADINGS	Finding: Older people are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			-Sig	OK/ns	Sig-					ns	OK/S
Number of Findings F=63	11	1	1	1	1	14	1	12	13	2			6
	14				41					8			
100%	22				65					13			
Number of Respondents N=77,122	18824	800	750	510	1150	17994	180	13954	11011	2890			9059
	20,884				44,289					11,949			
100%	27				57					16			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=19	6				10					3			
100%	31				53					16			
Respondents N=26,206	7520				13576					5110			
100%	29				52					19			

Conclusion: The data do not support a direct relationship between age and annoyance. Less than 20% of the evidence supports ....

En route noise issue: Issue 2.k: Community differences—age of population
Would en route reactions be more severe in communities with older residents.?

Further research: .... Little more can be learned from existing publications, but reanalyses of data sets with information about age ....

Figure 5: Example of synopsis from Appendix C

for older people to be less annoyed, but because of a small sample size the effect was not statistically significant. Any finding which appears in this column was marked with a "ns" in the findings column of Appendix B. The other 11 standard findings in the adjacent cell ("OK/S") either did not report significance tests or reported significance tests which indicated that older people were less annoyed ("S" or "sr" in the findings column of Appendix B).

For the significance tests under the "No important difference" heading (center columns) the same logic is followed but with slightly different headings. The 14 findings under "OK/ns" are consistent with the "no difference" judgement because they do not support an effect. The two indicators for significant effects indicate that though there was a small effect which did not meet the "important effect" criterion, a significance test indicated that the small effect was significant in either opposing (←Sig) or supporting (Sig→) the hypothesis.

The tabulation thus sums the numbers of studies and numbers of interviews associated with these studies. The resulting percentages are therefore weighted either by the number of studies or the number of interviews. The "standard" findings subtotals include only the "objective-standard" evidence findings which also met the two other criteria which were enumerated in Figure 2: noise level was controlled in the analysis and no other "major problem" was noted.

The "En route noise issue" heading which follows the "Tabulations" heading describes the relationship between the topic and en route noise issues. The final "Further research" heading evaluates the relative value of different research programs for the specific topic.

Stage VIII At Stage VIII much of the evidence from the synopses in Figure 5 is transferred to Tables 1 to 7. These tables are described in Chapter 3.

2.3. Accuracy of the classification procedure

The conclusions in this report are dependent upon the accuracy with which the evidence from the studies has been classified. Part of the confidence in the accuracy of that classification derives from the thoroughness of the methodology which was outlined and is described in more detail in Appendix A. Additional confidence in the accuracy of the classification emerged when a test was conducted on the classifications for 42 studies.

The accuracy of the classifications was tested by having separate coders independently read and accumulate evidence from 42 studies' publications. The results of their classifications were then compared to the original classifications. Where there were discrepancies, the original classifications were reassessed. The accuracy of the classifications in the original data set is measured as the number of times the original classifications were changed. The remainder of this chapter describes the procedures and results of this test.

Procedure The five checkcoders conducted the evaluations of the 42 studies. Four of the checkcoders were community noise researchers who were given their own studies to classify.

One checkcoder was a research assistant who was given shorter studies which were described in no more than two publications. Each of the five checkcoders was provided with simplified coding instructions and a form for recording their classifications (reproduced in Appendix E). The checkcoders were asked to search for evidence on 19 of the 26 topics which are described in this report. These 19 topics, the first 19 in the list in Appendix D, are the ones which can be simply conceptualized as moderating the influence of noise on annoyance. The checkcoders had access to all of the listed study publications but had no information about the outcome of the original classification. As part of the classification process the checkcoders indicated the location of the published evidence which supported their classification.

The checkcoders' questionnaires were then returned for comparison with the original classifications. A discrepancy was noted when there was disagreement on the direction of the finding, on whether or not the evidence was of "standard" quality, and on whether or not a study provided any evidence on a topic. When a discrepancy was identified the original coder reread the relevant parts of the publications, consulted the more detailed classification rules (see Appendix A) and determined the correct code. When there was any doubt about the reason for the discrepancy the check-coder was contacted and the discrepancy was discussed and mutually resolved.

Results of test With 42 studies and 19 topics per study there were a total of 798 possible classifications which were being tested. Originally it was judged that there was study evidence on 68 of these and no study evidence on 730 classifications. As a result of the test, eight of the 798 (0.1%) of the classifications in the original data set were judged to have been incorrect.

Three of the originally identified 68 findings were incorrect (4 percent error rate). One error involved the misapplication of a coding rule which could be corrected in all the findings. Any other errors of this type were thus eliminated from the complete data set. The second involved the identification of a higher level of evidence in a second publication. The third derived from the misapplication of another rule; one which could not easily be traced, if present, in other studies.

Five of the original 730 "no-available-evidence" judgements were incorrect (0.7 percent error rate). In all five instances the evidence which was missed was non-standard, verbal evidence. These types of errors would not therefore affect conclusions based on only standard quality evidence.

There is no particular criteria for judging the number of errors which are acceptable. The numbers of errors found in the test should not affect the primary conclusions from the study. Two patterns in the errors tend to support this view. First, seven of the eight errors were found on topics for which a relatively large number of studies (17 to 42) also provided evidence on the topic. This later pattern is consistent with the fact that the original codings had been especially closely scrutinized on topics which were addressed by only a small number of studies. Secondly, the sole remaining error involved missing a finding on a topic

in which all 12 studies' evidence was unanimous in supporting the topic hypothesis (including the new finding).

Observations on the checking methodology This checking methodology attempted to provide a general check on the accuracy of the original coder's work. The methodology is not a conventional reliability check on the coding procedure because the checkcoders were not trained to use the same complex rules that the original coder used. Though the 42 selected studies were diverse, they were not drawn with probability selection methods.

This test gave some additional insight into the diversity of interpretations of published survey findings in the absence of a strictly defined methodology. The checkcoders performed their task with a minimum of training using simplified rules which did not deal with many of the complex situations found in actual publications. As a result there was not high agreement between the checkcoders first codes and the primary coder's codes. Although there were 659 codes which were agreed to be "no-available-evidence" codes, there were only 40 other codes where there was agreement on the other coding. This left an additional 99 codes where there was disagreement. As noted above, the original code was incorrect in only 8 cases. Checkcoders were thus incorrect on 91 codes. The coding rules and the strict application of those rules is thus essential in order to consistently classify studies.

3. RESULTS

The findings for the 26 hypotheses are summarized in this chapter under seven broad headings. The format for the seven tables in this chapter is described under the first heading, demographic characteristics.

3.1. Demographic characteristics

Nine hypotheses about demographic variables' impacts on noise annoyance are evaluated in Table 1. The distribution of the evidence on each hypothesis is expressed in percentages in the three central columns. The four percentages in the first of these columns are alternative measures of the percentage of evidence supporting the stated hypothesis. The next two columns show the division of the remaining evidence between support for "Neither hypothesis" and support for an important effect which is in the "Opposite" direction to the stated hypothesis.

Each of the four percentages in each cell indicates the degree of support but each differs in the base on which it is calculated. The base for each of the percentages is described in the left column and enumerated in the last column. See "Age of residents and length of residence" below for an illustrative example.

Although the remainder of this section discusses each of the nine demographic hypotheses individually, the central, uniform conclusion about all demographic variables is apparent from the low values of the percentages under the "Stated hypothesis" and "Opposite hypothesis" columns in Table 1. Less than 50 percent of the evidence supports any hypothesis. Thus the uniform conclusion from this review is that none of these nine demographic variables affects annoyance to an important extent where "important" is defined using the six criteria from Figure 3 (3dB, Δ5%, .01r^2, $p<.05$, 3/4g, Vb).

Age of respondent and length of residence The evidence on the age of residents in the first section of Table 1 is illustrative of the detailed information which is available in Tables 1 to 7. All of this evidence is derived from the data base which was illustrated in Figure 4 and summarized in Figure 5. The first hypothesis in Table 1 is that older people are more annoyed by noise than are younger people. The "Total" column of Table 1 shows that 63 survey finding based on a total of 77,122 respondents provide this evidence. These totals are thus supported by 63 entries of the types displayed in Figure 4. On the basis of all of these data the first line in Table 1 shows that 13 percent (8 surveys in Figure 5) of the 63 surveys reported that older people are more annoyed. The second line in Table 1 shows that these 8 surveys represent 16 percent (11,949 respondents in Figure 5) of the 77,122 respondents. When the criteria for "standard quality" evidence from Figure 2 are applied, however, the "Total" column of Table 1 shows that only the subset of 19 surveys, containing 26,206

Table 1: Evidence on nine demographic variables by type of evidence

Type of evidence and basis for percentages	% of Findings (Interviews) supporting: Stated hypothesis	Neither hypothesis	Opposite hypothesis	TOTAL-Findings[F] -Interviewees[I] %	Number
Hypothesis: Older people are more annoyed (Topic 1)[a]					
All.....Findings	13%	65%	22%	100%	63[F]
(Interviews)	(16%)	(57%)	(27%)	(100%)	77,122[I]
Standard..Findings	16%	53%	31%	100%	19[F]
(Interviews)	(19%)	(52%)	(29%)	(100%)	26,206[I]
Hypothesis: Women are more annoyed (Topic 2)					
All.....Findings	6%	94%	0	100%	47[F]
(Interviews)	(9%)	(91%)	(0)	(100%)	62,479[I]
Standard..Findings	0	100%	0	100%	15[F]
(Interviews)	(0)	(100%)	(0)	(100%)	24,725[I]
Hypothesis: High status residents are more annoyed (Topic 3)[b]					
All.....Findings	23%	73%	4%	100%	22[F]
(Interviews)	(7%)	(91%)	(2%)	(100%)	33,701[I]
Standard..Findings	33%	67%	0	100%	12[F]
(Interviews)	(9%)	(91%)	(0)	(100%)	23,039[I]
Hypothesis: High income residents are more annoyed (Topic 4)[b]					
All.....Findings	30%	70%	0%	100%	10[F]
(Interviews)	(9%)	(91%)	(0)	(100%)	15,846[I]
Standard..Findings	38%	62%	0	100%	8[F]
(Interviews)	(12%)	(88%)	(0)	(100%)	12,616[I]
Hypothesis: High education residents are more annoyed (Topic 5)[b]					
All.....Findings	22%	78%	0	100%	18[F]
(Interviews)	(12%)	(88%)	(0)	(100%)	23,983[I]
Standard..Findings	23%	77%	0	100%	13[F]
(Interviews)	(11%)	(89%)	(0)	(100%)	20,274[I]
Hypothesis: Home owners are more annoyed (Topic 6)					
All.....Findings	35%	56%	9%	100%	23[F]
(Interviews)	(39%)	(59%)	(2%)	(100%)	25,327[I]
Standard..Findings	29%	42%	29%	100%	7[F]
(Interviews)	(33%)	(61%)	(6%)	(100%)	8,157[I]
Hypothesis: Residents of single unit dwellings are more annoyed (Topic 7)					
All.....Findings	29%	57%	14%	100%	14[F]
(Interviews)	(30%)	(65%)	(5%)	(100%)	18,463[I]
Standard..Findings	17%	50%	33%	100%	6[F]
(Interviews)	(7%)	(84%)	(9%)	(100%)	10,246[I]
Hypothesis: Longer residents are less annoyed (Topic 8)[c]					
All.....Findings	18%	57%	25%	100%	44[F]
(Interviews)	(15%)	(64%)	(21%)	(100%)	61,322[I]
Standard..Findings	25%	50%	25%	100%	16[F]
(Interviews)	(24%)	(59%)	(17%)	(100%)	23,798[I]
Hypothesis: Employees and users of noise source are less annoyed (Topic 9)					
All.....Findings	22%	78%	0	100%	18[F]
(Interviews)	(17%)	(83%)	(0)	(100%)	28,453[I]
Standard..Findings	11%	89%	0	100%	9[F]
(Interviews)	(19%)	(81%)	(0)	(100%)	12,485[I]

[a] The findings for 6 of the 63 studies come from analyses which controlled for length of residence.
[b] All findings (not only the "standard" findings) must include controls for noise level for the status, income and education variables.
[c] The findings from 5 of the 44 studies come from analyses which had been controlled for the age of the respondent.

respondents met the standard quality criteria. This lesser number of standard quality findings shows the same general pattern; most of the evidence supports neither the hypothesis that older people are more annoyed nor the opposite hypothesis that older people are less annoyed.

The length of residence evidence (Topic 8) in Table 1 shows the same general pattern: there is not a relationship between noise annoyance and the length of time that people have been residents. This lack of a relationship is also evident for the more tightly screened "standard" surveys.

The evidence for Topic 1 in Table 1 thus shows that there is not an "important" relationship between age and reactions to noise. The evidence for Topic 8 shows that there is not a simple adaptation to noise with increasing years of residence. While these conclusions are probably sufficiently specific to meet most administrative needs, they do not preclude the possibility of other more subtle relationships. For example, though older people are not more annoyed by noise in general, data from some of these same surveys shows that older people are more annoyed by noise when trying to sleep (Fields, 1986).

Some of the other relevant qualifications to these and other findings are listed in the last column of Table 8. Since the social survey samples generally include very few members from relatively rare population subgroups, there is very little information about whether annoyance might be different for only teenagers, those over 70 or residents of less than a few months. The conclusions in this report do not, therefore, preclude the possibility that there might, for example, be a reduction in annoyance during the first few months of residence. Additionally, though some findings have been included which simultaneously controlled for age and length of residence, most findings have only been controlled for noise level. Age and length of residence are related to each other and probably also to experiencing a gradual increase in traffic and other noise exposure at a residence. Some steps were taken to record evidence of any such more complex relationships. If for example a publication reported reduced annoyance for both the youngest and oldest age groups this would have been recorded in the "Comments" section of the data base (see "Comments" column of Figure 4). However, such non-linear relationships were not systematically assessed in most publications. In sum, though the evidence assessed here does not support simple relationships, there might be more subtle, complex nonlinear or multivariate relationships.

Sex of respondent Over 90 percent of the evidence indicates that men and women have the same annoyance with noise in the residential environment. If women are any more sensitive to noise or have higher exposures because they are at home more hours, the effects are too small to be detected in the residential setting.

Status, income, education None of these social or economic position variables has an important effect on annoyance, despite the fact that they are all correlated and would, presumably, mutually reinforce their individual effects. The fact that a minority of the studies report an important effect in the hypothesized direction, but almost no studies find an important effect in the opposing direction suggests that there may be some weak effect of

increasing socio-economic position but that it does not meet the "importance" criterion (3dB, Δ5%, or .01r^2).

Nothing in this analysis contradicts practicing acousticians' and administrators' common observation that socio-economic status variables are strongly correlated with public action and complaints against noise. In fact, at least four surveys have found that high socio-economic status leads to more public action (Graf, Meier, Müller, 1974; Goodman and Clary, 1976; McKennell, 1965; Taylor and Hall, 1977). The evidence thus suggests that these socio-economic status variables do not increase residents' annoyance with a noise, but do increase the likelihood that residents will use their verbal and organizational skills to take action against noise.

These data do not test a related hypothesis that more expensive residences will be located in quieter areas. In fact the possible disturbance which could be introduced by such a relationship has been guarded against by applying a more severe screening eligibility rule for these three hypotheses. Eligibility rules required that all of the findings, non-standard as well as standard, include controls for noise level.

Homeownership and type of dwelling Homeowners and residents of single unit dwellings are not more annoyed to an important extent despite the fact that ownership and type of dwelling are positively correlated (at least in the United States) and would thus be expected to reinforce each other's effects. The findings do not therefore support the assumption that residents of multiple unit dwellings might be exposed to more interior noise and be less affected by exterior noise. The findings also do not support the theory that financial investment increases annoyance with noise. As indicated in Table 8 it is still possible that this investment would increase the likelihood of taking public action against noise.

Benefit from noise source The last hypothesis considered in Table 1 contrasts the annoyance of most residents with those residents who are users of the noise source (e.g. frequent aircraft users) or are employees or dependents of employees of the noise source. Less than 25 percent of the evidence supports this hypothesis. Perhaps any favorable feelings engendered by the benefits from the source are counterbalanced by other unfavorable experiences people have as employees or users of the source. Benefiting from the noise source might well, on the other hand, have a strong effect on public action against the noise source. People might be less likely to favor action, however distasteful the noise, if the result is a reduction in the benefits they receive from the noise source.

3.2. Attitudes

Each of the five attitudinal hypotheses in Table 2 is supported by over 70 percent of the evidence. Three of the hypotheses are evaluated with at least 11 surveys. There is therefore firm evidence that noise annoyance is associated with: (1) the fear of an aircraft crashing or of danger from nearby surface transportation; (2) the belief that aircraft noise could be prevented or reduced by designers, pilots or authorities related to airlines; and (3) an

Table 2: Distribution of evidence on five attitudinal variables by quality of evidence

Type of evidence and basis for percentages	% of Findings (Interviews) supporting: Stated hypothesis	Neither hypothesis	Opposite hypothesis	TOTAL-Findings[F] -Interviewees[I] %	Number[a]
Hypothesis: Fear of noise source increases annoyance (Topic 10)					
All.....Findings	100%	0	0	100%	21[F]
(Interviews)	(100%)	(0)	(0)	(100%)	44,713[I]
Standard..Findings	100%	0	0	100%	14[F]
(Interviews)	(100%)	(0)	(0)	(100%)	22,899[I]
Hypothesis: Belief that could prevent noise increases annoyance (Topic 11)					
All.....Findings	100%	0	0	100%	11[F]
(Interviews)	(100%)	(0)	(0)	(100%)	19,462[I]
Standard..Findings	100%	0	0	100%	6[F]
(Interviews)	(100%)	(0)	(0)	(100%)	9,779[I]
Hypothesis: Awareness of non-noise problems increases annoyance (Topic 12)					
All.....Findings	100%	0	0	100%	2[F]
(Interviews)	(100%)	(0)	(0)	(100%)	1,903[I]
Standard..Findings	100%	0	0	100%	2[F]
(Interviews)	(100%)	(0)	(0)	(100%)	1,903[I]
Hypothesis: General sensitivity with noise increases annoyance (Topic 13)[b]					
All.....Findings	96%	4%	0	100%	24[F]s=23
(Interviews)	(96%)	(4%)	(0)	(100%)	36,435[I]
Standard..Findings	100%	0	0	100%	14[F]s=13
(Interviews)	(100%)	(0)	(0)	(100%)	22,633[I]
Hypothesis: Belief noise source important decreases annoyance (Topic 14)					
All.....Findings	75%	25%	0	100%	4[F]
(Interviews)	(71%)	(29%)	(0)	(100%)	5,882[I]
Standard..Findings	75%	25%	0	100%	4[F]
(Interviews)	(71%)	(29%)	(0)	(100%)	5,882[I]

[a] The notation "s=" gives the number of surveys when some surveys provide multiple findings.

[b] One standard quality study provided two findings for the sensitivity issue because it included two very different definitions of sensitivity. As a result the 24 findings come from 23 studies and the 14 standard findings come from 13 studies. The totals of 36,435 and 22,633 interviewees presented in the last column are the actual number of respondents and thus do not double count the respondents from the study which supplied two findings.

expressed sensitivity to noise generally (not only local environmental noise). The evidence is weaker for the two remaining hypotheses. Only two surveys provide the evidence that residents who are more annoyed associate the noise source with such non-noise nuisances as air quality or dirt or fumes. Three of only four surveys support the hypothesis that noise annoyance is less for people who believe that the noise source (e.g. aircraft activity) is economically or otherwise important for the local area or some broader community.

Only these five attitudinal hypotheses have been systematically examined. In the course of the review, however, it was noted that one additional variable has often been studied: the attitude toward other aspects of the neighborhood. Langdon (1976) is one of several research-

ers who finds that a generally positive attitude toward other aspects of the neighborhood is associated with reduced noise annoyance.

The associations between these attitudes and annoyance should be interpreted cautiously. As Alexandre has argued (1976) such results do not prove that the attitudes cause noise annoyance. Noise annoyance might partially cause such attitudes. Some residents may be so annoyed by the noise from a source that they begin to assume that there must be other problems from the source (for example, danger or non-noise nuisances). Others may feel that "if the noise is this bad, there must be something that the authorities could do about it." The correlational evidence in these analyses only show that the attitudes are associated with noise annoyance, not that they cause noise annoyance.

The general sensitivity to noise is usually measured with self-ratings of sensitivity to "noise generally" or by annoyance with noise sources for which noise levels would not vary greatly between respondents (i.e. dripping water, barking dogs). Ratings of environmental noise in the respondent's area are excluded because they could include a rating of the target noise source.

3.3. Non-noise impacts

In Table 2, Topic 12 considered whether residents' perceptions of non-noise problems affected annoyance with noise. In Table 3, Topic 15 considers whether the actual, objectively measured non-noise conditions directly affect residents' annoyance with noise. The evidence about these direct effects such as visibility of the source and distance to the flight path is weak and not consistent. Only five findings are available and these came from only three surveys. The conclusions differ for different quality findings and different methods of weighting the survey findings. The non-noise impacts appear to affect annoyance in about half of the surveys, but not if only the two standard surveys are weighted by the number of interviews. The evidence is thus not sufficient to determine whether noise annoyance is affected by non-noise environmental problems (Topic 15) or only by residents' perceptions of those problems (Topic 12).

3.4. Individualized noise exposure

Two of the hypotheses examined in Table 3 address the question of whether residents adjust their annoyance for their individual exposure at their dwelling or whether they base their annoyance on the noise exposure at, for example, the exterior of the dwelling.

The results for the first test of this hypothesis in Table 3 suggest that noise annoyance is not affected by the number of hours residents are at home in the residential noise environment each day. There may be several reasons for the lack of a relationship. Annoyance may be governed by feelings during the time at home and thus not be adjusted for the amount of time away from home. Even if differences in exposure have an influence, the differences in

Table 3: Distribution of evidence on five situational and methodological variables by quality of evidence

Type of evidence and basis for percentages	% of Findings (Interviews) supporting: Stated hypothesis	Neither hypothesis	Opposite hypothesis	TOTAL-Findings[F] -Interviewees[I] %	Number[a]
Hypothesis: Non-noise impacts of intrusion increases annoyance (Topic 15)[b]					
All.....Findings	60%	40%	0	100%	5[F]s=3
(Interviews)	(54%)	(46%)	(0)	(100%)	4,380[I]
Standard..Findings	50%	50%	0	100%	2[F]
(Interviews)	(18%)	(82%)	(0)	(100%)	3,060[I]
Hypothesis: Those at home more are more annoyed (Topic 16)					
All.....Findings	12%	76%	12%	100%	17[F]
(Interviews)	(26%)	(65%)	(9%)	(100%)	19,765[I]
Standard..Findings	20%	40%	40%	100%	5[F]
(Interviews)	(40%)	(41%)	(19%)	(100%)	9,341[I]
Hypothesis: Those relatively isolated from sound around their home are less annoyed (Topic 17)[c]					
All.....Findings	61%	39%	0	100%	33[F]s=30
(Interviews)	(60%)	(40%)	(0)	(100%)	39,119[I]
Standard..Findings	82%	18%	0	100%	11[F]
(Interviews)	(72%)	(28%)	(0)	(100%)	7,511[I]
Hypothesis: Low ambient noise increases intrusive noise annoyance (Topic 18)[d]					
All.....Findings	18%	73%	9%	100%	22[F]s=17
(Interviews)	(24%)	(71%)	(5%)	(100%)	23,769[I]
Standard..Findings	23%	69%	8%	100%	13[F]s=9
(Interviews)	(16%)	(74%)	(10%)	(100%)	10,169[I]
Hypothesis: Those interviewed by telephone express more annoyance (Topic 19)					
All.....Findings	0	100%	0	100%	4[F]
(Interviews)	(0)	(100%)	(0)	(100%)	3,393[I]
Standard..Findings	0	100%	0	100%	1[F]
(Interviews)	(0)	(100%)	(0)	(100%)	1,603[I]

[a] The notation "s=" gives the number of surveys when some surveys provide multiple findings.
[b] The two standard findings come from two surveys which measured the relationship to flightpaths.
[c] Six non-standard findings were available from three studies which used several alternative indicators of isolation from sound.
[d] The eligibility screening criteria for this topic excluded open-ended questions which measure whether a noise source is volunteered as a problem. Such questions may measure only the relative salience of two noises.

energy-averaged exposures are probably small. Even a doubling in exposure time would create only a 3-decibel difference in noise exposure. The difference in exposure of homemakers and people employed outside the home would be considerably less.

The second hypothesis shows the opposite pattern. Those who are relatively well insulated from noise exposure while at home are less annoyed. Only a few surveys are available for any one of the following five types of isolation which have been studied: the sound insulation

of dwellings, the presence of air conditioning equipment, the orientation of important rooms towards the noise source, the extent to which residents spend time out-of-doors, and the extent to which climatic conditions encourage outside activity (each type of isolation is tabulated separately in Appendix C). Both surveys which measured annoyance and attenuation both before and after the installation of noise insulation support the hypothesis. However, the respondents' annoyance may have been affected by knowing that noise insulation had been installed. The 12 findings (3 of standard quality) based on comparisons of dwellings with expected differences in insulation (double glazing, construction type, etc.) provide mixed evidence. The most serious weakness in most of these surveys is the absence of an adequate indicator of the amount of acoustic insulation. This weakness is present in even the most recent publications on this topic (Fidell and Silvati, 1991). The overall results and the results from the two surveys with before/after designs both suggest that localized variations in exposure can affect annoyance.

3.5. Ambient noise

The evidence in Table 3 does not indicate that residents in low ambient noise areas are more annoyed by a specified noise source. Ambient noise levels do not appear to affect annoyance with other noises. The characteristics of ambient noise conditions found in residential areas may help to explain this finding. First it should be noted that intrusive noise levels which are high enough to be annoying are usually high enough so that they are not usually masked, even by high ambient noise levels, in the areas which are sampled in these surveys. In the absence of masking, the theoretical basis for an ambient noise effect must come from a more subtle perceptual or sensitization phenomenon. Second, it should be noted that noise annoyance has not been studied in the remote, largely uninhabited areas which are sometimes of concern for military training in the United States. Virtually all existing survey data come from areas which have some local road traffic. Even with those two caveats, however, the surveys still include information from a wide range of ambient noise levels conditions. Eight of the ten standard findings not supporting the hypothesis included respondents spread over at least a 20-decibel range of ambient noise conditions. While it is possible that even more extreme variations in ambient noise levels might have an effect, it is also possible that ambient noise levels have no effect. Perhaps residents compare intrusive noises with the more pervasive standard sound levels for speech than with the local environmental sound levels.

The absence of an impact of ambient noise levels on absolute levels of annoyance is consistent with previously reported findings about other types of ambient noise effects. Several surveys have found that the relative importance or salience of several noise sources is, of course, affected by the relative noise levels of the sources (Fields and Walker 1982: 198; Aubree, 1973). The 1971 3-City Swiss survey reported both types of findings (Fields, 1990a: 243). In this survey, respondents' direct, absolute ratings of aircraft noise using an 11-point thermometer scale were unaffected by the ambient road traffic noise. This finding was tabulated in the present report as showing that ambient noise does not affect target noise annoyance. The same survey included an open question in which the respondent volunteered

anything in the nearby environment which the respondent disliked. Respondents' answers to this open question were related to ambient noise levels. Since respondents typically volunteer only one or two responses on such questions, their answers to the open question only indicated the approximate rank order of the importance or relative salience of aircraft and road traffic noise. Respondents' answers to the open question did not provide evidence which could compare respondents' annoyance with aircraft noise in quiet ambient environments with respondents' annoyance with aircraft noise in high noise ambient environments. Several researchers have erroneously cited this Swiss survey as supporting an ambient noise effect because they ignored this distinction (Schultz, 1978).

As is indicated in Table 8, ambient noise might be expected to affect public action. An effect on public action is consistent with the finding in this report that ambient noise does not affect private expressed annoyance. It is quite possible that communities may focus their public action and complaints on only a single noise source, the most prominent noise source.

3.6. Interviewing method

All four surveys which compare face-to-face and telephone interviews concluded that the mode of administration does not have an important effect on annoyance. While the surveys did not fully report their analyses (only one provided a "standard" level of evidence) there seems to be little reason to doubt their conclusions. There is no particularly strong theoretical basis for expecting differences between these two modes of data collection for noise surveys. No attempt was made to determine whether or not the mail survey administration mode could affect annoyance measurements.

3.7. Change in noise environment

The evidence in Table 4 is mixed on whether people overreact to a change in the noise environment. The first three panels of Table 4 contrast residents whose noise environment has recently changed to a new noise level with residents at the same noise level where the noise environment has not changed. An "important" finding is recorded if those in the new noise environment over-reacted compared to those living in the unchanged noise environment. The first panel includes both increases in noise levels and decreases in noise levels. The second and third panels present the results separately for the subset of those surveys which distinguished between the findings in the increasing-noise and decreasing-noise situations. There is not a clear pattern in the findings. The results vary for different weightings and subsets of the surveys. The balance of the evidence does not reject the assumption that changes in noise annoyance closely follow changes in noise levels.

The final panel in Table 4 has mixed evidence on whether there is a tendency for residents' annoyance to decrease as the time since a change in noise level increases. This finding is subject to the caveat that annoyance has not often been studied in the days immediately following a change.

Table 4: Distribution of evidence for four noise change topics by quality of evidence

Type of evidence and basis for percentages	% of Findings (Interviews) supporting: Stated hypothesis	Neither hypothesis	Opposite hypothesis	TOTAL-Findings[F] -Interviewees[I] %	Number[a]
Hypothesis: People overreact to changes in noise levels (either increase or decrease) (Topic 20)[b]					
All.....Findings	42%	47%	11%	100%	19[F]s=14
(Interviews)	(32%)	(35%)	(34%)	(100%)	14,097[I]
Standard..Findings	61%	31%	8%	100%	13[F]s=10
(Interviews)	(60%)	(29%)	(11%)	(100%)	7,737[I]
Hypothesis: People overreact to an increase in noise levels (i.e.A newly introduced or increased noise is more annoying than an existing noise at the same noise level) (Topic 20a)[c]					
All.....Findings	50%	38%	12%	100%	8[F]s=7
(Interviews)	(13%)	(30%)	(57%)	(100%)	7,577[I]
Standard..Findings	80%	20%	0	100%	5[F]
(Interviews)	(43%)	(57%)	(0)	(100%)	2,467[I]
Hypothesis: People overreact to a reduction in noise levels (i.e. A reduction in noise levels leads to less annoyance than would be expected from an existing noise at the same noise level) (Topic 20b)[c]					
All.....Findings	40%	50%	10%	100%	10[F]s=9
(Interviews)	(56%)	(32%)	(12%)	(100%)	6,639[I]
Standard..Findings	50%	38%	12%	100%	8[F]
(Interviews)	(67%)	(18%)	(15%)	(100%)	6,189[I]
Hypothesis: With time, annoyance with a new noise source decreases (Topic 21)					
All.....Findings	43%	14%	43%	100%	7[F]
(Interviews)	(49%)	(38%)	(13%)	(100%)	1,581[I]
Standard..Findings	50%	17%	33%	100%	6[F]
(Interviews)	(53%)	(41%)	(6%)	(100%)	1,450[I]

[a] The notation "s=" gives the number of surveys when some surveys provide multiple findings.

[b] The 19 findings come from 14 surveys studying reactions to either decreases or increases in noise levels. Of these, 3 studied only increases, 6 only decreases, 1 both (where increasing and decreasing results could not be separated) and 3 both with separate findings being reported for the increasing and decreasing noise areas. One of the former studies' findings are tabulated twice because different researchers' publications on the same data came to different conclusions. Subsets of the 19 findings in this upper panel of this table provide the findings for the next two panels of the table.

[c] Both a standard and a non-standard finding are included from one survey in which different researchers published independent results.

The evidence presented here does not invalidate the observation that changes (or even expected changes) in noise environments can have strong effects on public action. A changed noise environment may be an important factor in mobilizing public action against noise.

3.8. Sensitivity of residents remaining in high noise areas

It is sometimes hypothesized that people in high noise areas may be abnormally tolerant of high noise because of a process of self selection, i.e. sensitive people would either leave high noise areas or not move into the areas initially. Table 5 presents three tests of this hypothesis.

Table 5: Distribution of evidence on three topics concerning noise sensitivity in high noise areas by quality of evidence

Type of evidence and basis for percentages	% of Findings (Interviews) supporting: Stated hypothesis	Neither hypothesis	Opposite hypothesis	TOTAL-Findings[F] -Interviewees[I] %	Number[a]
Hypothesis: Noise sensitivity is less at high noise levels (Topic 22)					
All.....Findings	12%	76%	12%	100%	17[F]s=16
(Interviews)	(18%)	(70%)	(12%)	(100%)	30,199[I]
Standard..Findings	17%	75%	8%	100%	12[F]s=11
(Interviews)	(29%)	(62%)	(9%)	(100%)	18,439[I]
Hypothesis: There is more moving at high noise levels (Topic 23)					
All.....Findings	25%	75%	0	100%	4[F]s=3
(Interviews)	(23%)	(77%)	(0)	(100%)	2,310[I]
Standard..Findings	33%	67%	0	100%	3[F]s=2
(Interviews)	(34%)	(66%)	(0)	(100%)	1,360[I]
Hypothesis: There is more moving by highly annoyed people (Topic 24)					
All.....Findings	40%	60%	0	100%	5[F]
(Interviews)	(69%)	(31%)	(0)	(100%)	4,227[I]
Standard..Findings	33%	67%	0	100%	3[F]
(Interviews)	(66%)	(34%)	(0)	(100%)	2,197[I]

a The notation "s=" gives the number of surveys when some surveys provide multiple findings.

The balance of the evidence does not support the sensitivity hypotheses. The general noise sensitivity of the population is not lower at high noise levels (Topic 22). There is not consistent evidence of more moving at high noise levels (Topic 23). There is mixed evidence about whether more highly annoyed people are more likely to move (Topic 24). However, it is not clear whether annoyance causes moving or whether the decision to move may permit some people to express previously repressed feelings about negative aspects of their neighborhoods.

3.9. Annoyance at low noise levels

Most of the noise survey evidence comes from residents at high noise levels. Only 16 surveys asked about high annoyance and included respondents at estimated noise levels of Day-Night Average Sound Level (DNL) of 55 dB or lower. These surveys' findings are presented in Table 6 for 5-decibel groups at DNL 30 to 55. The first three panels in Table 6 show that every one of the surveys which had interviews at DNL levels of DNL 40-44, 45-49

and 50-54 that some respondents reported high annoyance. Only two surveys provide evidence between DNL 30 and 39. The 1971 Three City Swiss Noise Survey (Graf, Meier and Müller, 1974) reported some high annoyance from DNL 30-39 while the British railway survey (Fields and Walker, 1982) reported no high annoyance.

Table 6: Percentage of surveys reporting specified incidences of a high degree of annoyance at low noise levels (below DNL 55 dB) (Topic 26)[a]

Noise environment	Percentage expressing a high degree of annoyance				TOTAL-Findings[F] -Interviewees[I]	
	0 %	1-4 %	5-9 %	≥ 10 %	%	Number
50-54 Ldn	0 (0)	53% (47%)	27% (38%)	20% (15%)	100% (100%)	15[F] (2,888)[I]
45-49 Ldn	0 (0)	60% (31%)	40% (69%)	0 (0)	100% (100%)	10[F] (2,536)[I]
40-44 Ldn	0 (0)	80% (95%)	20% (5%)	0 (0)	100% (100%)	5[F] (501)[I]
35-39 Ldn	50% (17%)	50% (83%)	0 (0)	0 (0)	100% (100%)	2[F] (270)[I]
30-34 Ldn	100% (100%)	0 (0)	0 (0)	0 (0)	100% (100%)	1[F] (48)[I]

[a] Most findings in this table come from verbal annoyance scales. Verbal scales are dichotomized at a word indicating a large amount of annoyance. Typical words are "very," "considerably," "strongly," or "extremely." Findings for other types of scales have only been included when the authors described some division of the scale as indicating a large amount of annoyance. The studies for which Schultz provided such a division are included (Schultz, 1978). When the authors of a study originally provided a different dichotomization than that recommended by Schultz, the author's judgement is accepted on the assumption that the primary researchers are more familiar with the survey data.

The data in Table 7 consider the slope of the noise/annoyance curve below DNL 55 dB. It is hypothesized that, as at higher noise levels, there is a positive slope relating annoyance to noise level. Kryter has speculated, however, that there is not such a positive slope and that about four to eight percent of the population below DNL 55 dB is supersensitive and annoyed regardless of noise level (Kryter, 1984). This speculation was based on extrapolations of annoyance data collected at higher noise levels, not on observations of annoyance at these low noise levels. Table 7 shows, however, that each of the eight surveys found a positive slope between annoyance and noise level over at least a 10 decibel range of noise levels below DNL 55 dB.

The evidence reviewed in Tables 6 and 7 shows that there is annoyance at noise exposures of less than DNL 55 dB and that this annoyance is sensitive to variations in noise levels below

Table 7: Distribution of evidence on slope of high degree of annoyance curve at low noise levels (below DNL 55 dB)

Type of evidence and basis for percentages	% of Findings (Interviews) supporting: Stated hypothesis	Neither hypothesis	Opposite hypothesis	TOTAL-Findings[F] -Interviewees[I] %	Number
Hypothesis: Annoyance increases with noise level below DNL 55 dB (Topic 25)					
All.....Findings	100%	0	0	100%	8[F]
(Interviews)	(100%)	(0)	(0)	(100%)	4,012[I]
Standard..Findings	100%	0	0	100%	5[F]
(Interviews)	(100%)	(0)	(0)	(100%)	1,746[I]

[a] To be eligible for this table a survey must include at least a 10 decibel range in noise level below DNL 55 dB and thus have included some respondents from noise environments at DNL 45 dB or less. If the slope is based on grouped data, the average noise levels of the groups used for calculating the slope below DNL 55 dB must be separated by at least 8 decibels. The five "standard" quality findings are all based on annoyance scales in which the respondents choose a verbal category to characterize a large amount of annoyance. Typical words are "very," "considerably," "strongly," or "extremely." The three "non-standard" findings are based on dichotomizations of numeric scales at unlabeled points where the researcher judged there was a high degree of annoyance.

DNL 55 dB. This evidence is thus consistent with the assumption that reductions of noise levels below DNL 55 dB yield benefits in reduced annoyance.

4. CONCLUSIONS AND DISCUSSION

Tables 1 to 7 summarize the evidence on 26 specific hypotheses about community reactions to noise. From examining this evidence six conclusions have been reached. In interpreting these conclusions it is important to be aware of the ways in which the weaknesses and strengths of the evidence and the methodology are related to specific hypotheses.

4.1. Conclusions

This study's methodology has been designed to answer the following question:

> What is the balance of the available social survey evidence about the existence of important effects of specified variables on residents' annoyance with environmental noise?

A conclusion is drawn about the "balance of the evidence" when at least 50 percent of the evidence (i.e. numbers of studies and interview-weighted studies) supports one hypothesis. Table 8 summarizes the findings and some of the qualifications which pertain to the following conclusions:

1. The balance of the available evidence fails to support the hypotheses that noise annoyance is affected to an important degree by: (1) any of the 9 demographic variables, (2) the number of hours residents are in their dwelling, (3) the mode of interviewing or (4) the ambient noise in which the rated noise is experienced.

2. The available evidence is so mixed that it does not indicate whether the recency of a change in noise levels affects reactions to the noise. It is thus unclear whether annoyance with similar noise levels is any greater in a recently changed noise environment than in a long established noise environment.

3. From the above negative findings it follows that if there are strong, readily-observed relationships between the preceding variables and anti-noise public actions, the public actions cannot be explained by differences in underlying personal annoyance. For example, the balance of the survey evidence suggests that it cannot be assumed that the annoyance in an outwardly complacent low status inner-city community is any less than in a publicly protesting high status suburban community.

4. The evidence strongly supports the hypotheses that: (1) there is noise annoyance below DNL 55 dB which is positively related to noise level and (2) noise annoyance is related to three attitudes (fear, preventability, sensitivity). The evidence cannot however determine whether the attitudes cause annoyance or whether noise annoyance

may, at least, partially cause the attitudes. For each of these hypotheses at least 96 percent of the evidence supports the hypothesis. In no case was the finding based on fewer than five studies or less than 1,746 interviews.

5. The balance of the evidence supports the hypotheses that: (1) noise annoyance is related to two attitudes (non-noise annoyance and importance), and (2) insulation from a noise source at home reduces annoyance.

6. The balance of the evidence suggests that populations at high noise levels are about as sensitive to noise generally as is the population at large. Neither the sensitivity evidence nor the rate-of-moving evidence suggests that there is a self-selected population of noise-insensitive residents at high noise levels.

4.2. Limitations

The above conclusions provide useful information. However, the conclusions about the strengths of relationships are disappointingly imprecise. Demographic variables, it is concluded, do not strongly effect annoyance, but this conclusion is not accompanied by estimates of statistical parameters or their standard errors and confidence intervals. The publications did not provide sufficient information to determine the probability that, for example, social status has the equivalent of less than a 3dB effect on noise annoyance. Although the balance of the evidence is against such an effect and although the surveys disagree, it is still possible that the 95 percent confidence interval for an estimated effect could include a 3dB effect. It is also possible that there may be diverse survey conditions such that the relationships are only found under certain conditions. It is not possible to simply determine the likelihood that the surveys' findings are statistically significantly different. The random sampling formulae which only require information about sample sizes are not sufficient because the social survey samples are clustered (Fields, 1983).

Table 8 highlights several additional limitations in the survey findings. The numbers of surveys presented in the third column of Table 8 show that the amount of data examined for the hypotheses varies. Though at least ten surveys could be evaluated for seventeen topics, less than five surveys were available for three topics. Statements in the last column for the attitudinal variables indicate that the existence of a correlation between annoyance and the attitudinal variables is not sufficient to establish causality.

Statements for other variables indicate that there has not been a systematic evaluation of more complex relationships between these variables and annoyance. The conclusions reached here concern the simplest type of relationship, a monotonic increase in noise annoyance with an increase in the value of a moderating variable. In the unusual instances in which researchers reported more complex relationships they were recorded as comments in the data base (see Figure 4). However, researchers have not systematically considered such relationships and this report's methodology has not systematically accumulated evidence about curvilinear relationships nor even moderately complex multivariate relationships.

Table 8: Limitations on the study conclusions

Type of variables (Table)	VARIABLE: and hypothesis	Conclusion from balance of existing evidence	Issues		
			Number of surveys (All/ Standard)	Expect to affect public action?	Other factors to consider
Demographic (Table 1)	AGE: Older people are more annoyed (Topic 1)	Reject	63/19		Age is correlated with length of residence. Teenagers and residents over 70 are not well represented in samples.
	SEX: Women are more annoyed (Topic 2)		47/15		Sex is correlated with amount of time at home.
	SOCIAL STATUS: High status residents are more annoyed (Topic 3)		22/12	YES	Social status, income, and education are correlated.
	INCOME: High income residents are more annoyed (Topic 4)		10/8		
	EDUCATION: High education residents are more annoyed (Topic 5)		18/13		
	HOME OWNERSHIP: Home owners are more annoyed (Topic 6)		23/7	YES	Home ownership and type of dwelling are usually correlated.
	DWELLING TYPE: Residents of single unit dwellings are more annoyed (Topic 7)		14/6		
	LENGTH OF RESIDENCE: Longer residents are less annoyed (Topic 8)		44/16		Length of residence is positively correlated with age and experiencing change. Very new residents (i.e. first few months) are not well represented.
	BENEFIT: Employees and users of noise source are less annoyed (Topic 9)		18/9	YES	
Attitudinal (Table 2)	FEAR: Fear of noise source increases annoyance (Topic 10)	Support	21/14		The direction of causation is uncertain.
	PREVENTABILITY: Belief that could prevent noise increases annoyance (Topic 11)		11/6	YES	
	NON-NOISE ANNOYANCE: Awareness of non-noise problems increases annoyance (Topic 12)		2/2		
	SENSITIVITY: General sensitivity with noise increases annoyance (Topic 13)		23/11		
	IMPORTANCE: Belief noise source important decreases annoyance (Topic 14)		4/4		

Type of variables (Table)	VARIABLE: and hypothesis	Conclusion from balance of existing evidence	Issues		
			Number of surveys (All/ Standard)	Expect to affect public action?	Other factors to consider
Situational (Table 3)	OTHER IMPACTS: Non-noise impacts of intrusion increase annoyance (Topic 15)	Mixed	3/2		Noise measurement errors may bias estimates. Many impacts are correlated.
	EXPOSURE TIME: Those at home more are more annoyed (Topic 16)	Reject	17/5		
	INSULATION: Those relatively isolated from sound around their home are less annoyed (Topic 17)	Support	30/11		Paying for insulation may bias judgement. Noise insulation not accurately measured.
	AMBIENT: Low ambient noise increases intrusive noise annoyance (Topic 18)	Reject	19/9	YES	Ambient noise affects the relative importance of difference sources. Ambient noise has not been studied in extremely remote locations.
Methods (Table 3)	INTERVIEW MODE: Those interviewed by telephone report more annoyance (Topic 19)	Reject	4/1		The effect of mail survey administration has not been examined.
Change in noise (Table 4)	CHANGE: People overreact to changes in noise (either increase or decrease) (Topic 20)	Mixed	14/10	YES	Annoyance with very recent changes (previous few days) have not been studied. The relationships could be complex.
	TIME SINCE CHANGE: With time, annoyance with a new noise source decreases (Topic 21)		7/6		
High noise area sensitivity (Table 5)	Noise sensitivity is less at high noise levels (Topic 22)	Reject	16/11		
	There is more moving at high noise levels (Topic 23)	Reject	3/2		
	There is more moving by highly annoyed people (Topic 24)	Support	5/3		The causal relationship between these two variables is especially unclear.
Low noise annoyance (Tables 6 & 7)	Even below DNL 55 there is a positive slope relating annoyance to noise level (Topic 25)	Support	8/5		Very little information is available below DNL 40 dB
	There is some high annoyance below DNL 55 dB (Topic 26)		16		

4.3. Productive directions for further research

In the face of the diversity of findings from different surveys on the same topic there is a tendency to first search for methodological weaknesses which might invalidate the findings. One or another of the physical or social science disciplines which is involved in noise

research could identify a weakness in almost every noise/annoyance survey's methodology which would be considered to be contrary to standard professional practices for that discipline. Acousticians could point to inaccuracies in estimates of long-term noise environments. Mathematicians could point to unrealistic assumptions in commonly used analysis techniques. Sampling statisticians could point to non-probability methods of selecting sites and household members. Survey statisticians could point to inferential statistics which are biased by the use of inappropriate simple random sampling assumptions. Sociologists could point to the absence of measures of community organization variables. Psychometricians could point to primitive single-item scales. Experimental psychologists could point to the large number of variables which are not controlled in study designs.

While all of these weaknesses introduce distortions in numerical estimates, it is not clear to this author that a more rigorous application of any discipline's methodology in new data gathering projects would substantially help to resolve any of the present issues. Instead a more systematic approach is needed which begins with existing data.

For most issues the chief impediments to forming strong conclusions in this report are not inherent differences in the data, but rather in the published presentations of the data. For most topics the most efficient next step is probably to conduct parallel, secondary analyses with as many of the original social survey data sets as are possible. For topics on which survey designs and measurement techniques are not critical, such analyses might provide relatively consistent estimates of the sizes and standard errors of any effects. Most of the demographic variables would appear to be of this type. For the socio-economic status variables, sex, and housing variables, such analyses might find simple, consistent relationships. The age and length-of-residence variables on the other hand may be related to annoyance in more complex ways. Perhaps secondary analyses of non-linear, complex multivariate relationships might uncover patterns which have previously been obscured.

For three situational topics (noise change, ambient noise and acoustical insulation) the survey sample designs and noise measurements can be of critical importance. Parallel secondary analyses could provide a starting point for future work on these topics but would be limited both by the numbers of data sets and the original designs. At the least, such analyses would help to clarify the analysis techniques and eliminate some explanations for inconsistencies between different surveys. In view of the importance of satisfactory noise data and carefully structured samples for these topics, it is likely that further, more methodologically sophisticated original research would be required to make substantial progress on these three topics.

5. IMPLICATIONS FOR EN ROUTE NOISE ISSUES

5.1. Introduction

A previous paper has shown that the small number of previous en route noise surveys do not provide good direct evidence about the differences between reactions in en route and airport noise environments (Fields, 1990a). Another strategy is thus needed for obtaining evidence about expected reactions to en route noise.

The strategy which is adopted here does not have the objective of estimating specific levels of annoyance with en route noise. Rather the strategy is to determine whether the types of characteristics which differentiate en route and airport noise environments are related to aircraft noise annoyance. Hypotheses about the effects of these characteristics can be tested with the evidence in the previous chapters.

Eight hypotheses have been identified which provide the bases for speculations that reactions to en route and airport noise environments will differ. The data which provide a test of these hypotheses were examined in the previous chapters of this report. This chapter reviews the implications of those tests from an en route noise perspective.

5.2. Results

Fear of crashes and non-noise impacts Annoyance is somewhat less for two types of attitudes which would appear to predominate in high altitude, en route noise situations. The evidence in Table 2 showed reduced annoyance is associated with a lack of fear of aircraft crashes and a lack of awareness of other non-noise impacts from the noise source. The best available evidence thus suggests that:

Hypothesis 1: Reactions to en-route noise may be less than experienced in airport settings if residents are less fearful of aircraft crashes.

Hypothesis 2: Reactions to en-route noise may be less than experienced in airport settings if residents are less impacted by non-noise impacts of the source.

The interpretation of these findings should be tempered by the evidence in the first panel of Table 3 which presents only very mixed evidence about whether the presence of non-noise impacts (including being under a flight path) affects annoyance. It should also be noted that both of these factors may be less important in low-noise than high-noise airport noise environments.

Reactions at low noise levels En route noise, at least for high altitude operations, is predominantly a low intensity noise exposure. The evidence in Tables 6 and 7 suggest that

reactions can be expected under such conditions. Table 6 showed that the studies consistently find that some, small percentage of the population expresses a high degree of annoyance at low noise levels. Table 7 showed that every survey found a tendency for further reductions below DNL 55 dB to be associated with reduced annoyance.

The evidence thus rejects the speculation that en route noise could be dismissed due to the low noise levels. Instead, the following counter hypotheses were supported:

Hypothesis 3: There can be expected to be some en route noise annoyance even below DNL 55 dB.

Hypothesis 4: En route noise annoyance could be expected to be directly related to variations in noise environment below DNL 55 dB.

Benefiting from the noise source Airport residents may be more likely to benefit from the presence of the noise source's activities than are en route residents. The evidence in Table 1, however, suggests that people who are directly employed by or use the noise source as a means of transportation are no less likely to be annoyed. Thus residents' occupational ties may not be important. The limited evidence available in Table 2, however, suggests that annoyance may be related to the importance which people attach to the noise source. Residents' feelings about the importance of military aircraft or commercial aviation could be positive in some areas whether or not there is a local airport.

The direct evidence rejects the original hypothesis and supports the hypothesis that:

Hypothesis 5: En route noise annoyance would not be moderated if residents do not economically benefit from an airport.

Noise sensitivity around airports at high noise levels It might be thought that the population around airports may be self selected so that it includes fewer noise sensitive people than are found in en route noise situations. However this was not supported by the evidence. The balance of the evidence in Table 5 did not find evidence of such self selection. People at high noise levels do not appear to be more sensitive to noise in general than do people at low noise levels. Rates of moving do not appear to be consistently higher in high noise areas. The evidence is mixed on whether more annoyed people are more likely to move.

The balance of the present evidence thus tends to reject the original hypothesis and to support the hypothesis that:

Hypothesis 6: The general noise sensitivity of residents in en route situations should not be expected to differ from that in airport noise situations.

Reactions to changes in noise levels A primary interest in en route noise has been in situations in which en route noise might be introduced as a new noise source. The primary

question in such situations is whether annoyance under such new noise situations could be predicted from annoyance reactions which are observed under the more typically surveyed long-term noise exposure conditions. The evidence in Table 4 is so mixed that there is not a current indication about whether changes in noise levels cause any more extreme annoyance reactions than those which are found at similar noise levels in more established noise environments. The evidence in the table relates, of course, only to private, annoyance reactions. It is quite consistent with the observation that publicly manifested, community actions are much stronger to a new noise source than to a long-standing noise source.

A related issue is adaptation to noise over time. The evidence does not indicate that new residents adapt over time, at least not after the first few days or weeks. In Table 1, longer residents do not appear to be any less annoyed. In Table 4, however, the evidence is mixed on whether noise annoyance with a new noise source decreases over time.

The balance of the evidence is thus too mixed to either reject or support the hypothesis that:

Hypothesis 7: The recency of introduction of en route noise into an environment heightens reactions beyond those predicted under more established conditions.

Ambient noise conditions En route noise, unlike many types of transportation noise, may be experienced in rural and other low ambient noise settings. The evidence in Table 3 indicates that annoyance does not tend to be greater in low ambient settings. It should be noted that the surveys do not directly measure the masking of different noise sources. While the surveys include some low ambient, rural settings, the surveys do not include the remote, largely uninhabited areas which are often of concern for military training in the United States.

The existing data do not support the assumption that low ambient noise conditions will heighten reactions to en route noise. The data thus support the hypothesis that:

Hypothesis 8: Low ambient noise conditions will not heighten reactions to en route noise.

5.3. Summary of implications for en route noise

Of the eight hypotheses examined in this section, two were confirmed which suggest that reactions to high altitude, en route noise might be less than would be expected in an airport environment, two were confirmed that suggested that there should be some annoyance with en route noise and four were not confirmed that suggested that en route noise reactions would differ from airport noise environment reactions. The balance of the existing evidence suggests that annoyance could be reduced in en route environments by less fear of aircraft crashes and less perception of non-noise aircraft impacts. However, the evidence indicates that some people are annoyed at low noise levels and that their annoyance is meaningfully related to the noise level. While these people represent only a small proportion of the population, their absolute numbers could be quite high if many more people are exposed to en route aircraft noise than to airport-related aircraft noise.

REFERENCES

Note: This section contains references for publications which are cited in the text of the report. References which are cited as sources of evidence in Appendix B can be found in the survey catalog by Fields (1991).

Alexandre, A.: 1976. An assessment of certain causal models used in surveys on aircraft noise annoyance. J. Sound Vib., vol. 44, pp. 119-125.

Aubree, D.: 1973. Enquête Acoustique et Sociologique Permettant de Définir une Echelle des la Gêne Eprouvée par l'Homme dans son Logement du Fait des Bruits de Train. Centre Scientifique et Technique du Bâtiment, Paris, June 1973. Translation Available as: Acoustical and Sociological Survey to Define a Scale of Annoyance Felt by People in Their Homes Due to the Noise of Railroad Trains. Technical Information Report No. 88. Bolt Beranek and Newman, Cambridge, Massachusetts.

Bennett, Ricarda L.: and Pearsons, Karl S.: 1981. Handbook of Aircraft Noise Metrics. CR-3406. National Aeronautics and Space Administration: Washington D.C.

Chapman, D.: 1948. A Survey of Noise in British Homes. National Building Studies, Tech Paper No. 2. HMSO, London.

Deutsche Forschungsgemeinschaft: 1974. DFG-Forschungsbericht Fluglärmwirkungen: Eine Interdisziplinäre Untersuchung über die Auswirkungen des Fluglärms auf den Menschen. (DFG-Research-Report Aircraft Noise: An Interdisciplinary Investigation of the Effect of Aircraft Noise on People). Harald Boldt Verlag KG, Boppard.

Fidell, S. and Silvati, L.: 1991. An assessment of the effect of residential insulation on prevalence of annoyance in an airport community. J. Acoust. Soc. Am., vol. 89, pp.244-247.

Fields, J.M.: 1981. A Catalog of Social Surveys of Residents' Reactions to Environmental Noise (1943-1980). NASA TM-83187. August 1981.

Fields, J.M.: 1983. Variability in individuals' responses to noise: community differences. Proceedings of Inter-Noise 83, pp. 965-968.

Fields, J.M.: 1986 (1989 revised printing). Cumulative Airport Noise Metrics: An Assessment of Evidence for Time-of-Day Weightings. DOT/FAA/EE-86/10. U.S. Dept. of Transportation, Federal Aviation Administration, Washington D.C.

Fields, J.M.: 1990a. Social survey finding on en route noise annoyance issues. In FAA/NASA En Route Noise Symposium, NASA Conference Publication 3067. Washington D.C.: National Aeronautics and Space Administration, pp. 227-252.

Fields, J. M.: 1990b. A quantitative summary of non-acoustical variables' effects on reactions to environmental noise. Proceedings of Noise-Con 90. pp. 303-308.

Fields, J.M.: 1991. An Updated Catalog of 318 Social Surveys of Residents' Reactions to Environmental Noise (1943-1989). NASA TM-187553. June 1991.

Fields, J.M., and Walker, J.G.: 1982. The response to railway noise in residential areas in Great Britain. J. Sound Vib., vol. 85, pp. 177-255.

Goodman, Robert F. and Clary, Bruce B.: 1976. Community attitudes and action in response to aircraft noise. Environment and Behavior, vol. 8, pp. 441-470.

Graf, P.; Meier, H.P.; and Müller, R.: 1974. Sozio-psychologische Fluglärmuntersuchung im Gebiet der drei Schweizer Flughäfen, Zürich, Genf, Basel. Bern, June, 1973. Translation available as: Sociopsychological Airplane Noise Investigation in the Districts of Three Swiss Airports: Zurich, Geneva, and Basel. NASA TM-75787, Sept., 1980.

Hall, F.L. and Taylor, S.M.: 1982. Reliability of social survey data on noise effects. J.Acoust. Soc. Am., vol. 72, pp. 1212-1221.

Hedges, L. and Olkin, I.: 1985. Statistical Methods for Meta-Analysis. Academic Press, Orlando, Fl.

Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, 1974. Report 550/9-74-004. United States Environmental Protection Agency, Washington D.C.

Kryter, K.D.: 1984. Physiological, Psychological and Social Effects of Noise. NASA Reference Publication 1115. NASA, Washington, D.C.

Langdon, F.J.: 1976. Noise nuisance caused by road traffic in residential areas. Parts I, II. J. Sound Vib., vol. 47, pp. 257, 271.

McKennell, A.C.: 1963. Aircraft Noise Annoyance Around London (Heathrow) Airport. S.S.337. The Government Social Survey, Central Office of Information, London.

McKennell, A.C.: 1965. Correlational analysis of survey data. Sociological Review, vol. 13, pp. 157-181.

Rosenthal, R.: 1984. Meta-analytic Procedures for Social Research. Sage Publications, Beverly Hills, CA.

Schultz, T.J.: 1978. Synthesis of social surveys on noise annoyance. J. Acoust. Soc. of America, vol. 64., pp.377-405.

Taylor, S.M.; and Hall, F.L.: 1977. Factors affecting response to road noise. Environment and Planning A, vol. 9, pp. 585-597.

Wachter, Kenneth W. and Straf, Miron L. (Eds.): 1990. The Future of Meta-analysis. Russell Sage Foundation, New York, NY.

Wolf, F.M.: 1986. Meta-analysis: Quantitative Methods for Research Synthesis. Sage Publications, Beverly Hills, CA.

APPENDIX A: PROTOCOL FOR SCREENING AND CLASSIFYING FINDINGS

The protocol in this appendix is the set of instructions which were followed in preparing the listings in Appendix B. These instructions are therefore the operational definition of the methodology which was used to accumulate the evidence for this report. The listing of tasks on the next page provides an outline of the protocol.

LISTING OF TASKS

OVERVIEW

Publications are to be screened using the following protocol to identify and classify findings which can be entered in the listing of evidence. Each of the following tasks must be completed before a finding can be entered as evidence in the listing. The tasks under Part A must be completed for all topics. The tasks under Part B are completed for only the moderator variables. The tasks under Part C are specific to other types of findings.

PART A: TASKS WHICH RELATE TO ALL TOPICS

Task 1. Examine publications Examine all of the publications for a particular survey which are listed in the catalog (Fields, 1991) before beginning to classify that survey's findings.

Task 2. Screen by relevance for topic hypothesis Determine whether any of the survey's publications address the specific hypothesis which is stated in the headings to the listing tables. In some cases this hypothesis is more narrowly defined than the topic title.

Task 3. Screen the object of the noise reaction question Identify the environmental noise which is being asked about in the reaction question. Screen the reaction question to be certain that it meets the following conditions:

1. Noise, not the presence of the source generally, is specified in the question or by the context as the object of the rating. For example, ratings of "road traffic" are not sufficient unless the "noise" from road traffic has been clearly established as the object being rated.
2. The rated noise is the primary noise source studied in the survey or another noise for which the rated noise's physical characteristics have been independently measured or estimated.
3. The noise is asked about in the context of the respondent's residence. For example, questions about reactions when respondents are not on their property are not acceptable.
4. The rated noise source is not the noise from neighbors.

Task 4. Screen for accessibility of the information to the respondent Reject a reaction question unless it asks for the respondent's direct experience. A satisfactory reaction question must fulfill two conditions:

1. The reaction question must require the respondent to describe a direct reaction, feeling, or rating toward the noise.
   Do not accept questions which request opinions about study hypotheses. For example an opinion about the noise-insulating properties of a window would not be tabulated, but a rating of an environmental noise

source which is on the other side of the window (i.e. traffic noise) would be acceptable.

2. The question must refer to the respondent's current or habitual reaction. Reject hypothetical questions about noise sources which are to be introduced in the future. Reject retrospective accounts of reactions to past conditions before a change in a noise environment.

Task 5. Enter identification information Enter an abbreviated survey title and the catalog Identification Number in the "Survey" column after identifying the survey in the noise survey catalog (Fields, 1991).

Task 6. Record ancillary information

1. If the noise source is not identified in the title of the survey enter the noise source in square brackets after the survey name.
2 Record any additional information in the "Comments" column which will aid in interpreting the findings.

PART B: TASKS FOR ALL MODERATOR VARIABLE TOPICS

Task 7. Classify and screen by type of reaction variable Reject reaction variables unless they summarize the respondent's reaction to the noise source.

Unacceptable reaction variables: Reject any of the following types of reaction variables:

1. An activity interference question about a single activity.
2. A dichotomized question about only whether or not a sound is heard.
3. A question about only evening or only nighttime noise.
4. A question which only rank orders different noise sources.
5. [For the Ambient noise topic only..] An open-ended question about noise in which the answers are classified by whether a particular noise source is mentioned.

Rank order of acceptable reaction variables: If several different reaction variables are reported, enter the finding for the first reaction variable from the following ranked list:

1. Index which combines several non-specific reaction questions about a single noise source.
2. A single, summary noise source reaction question (fully scored)
3. A single, summary noise source reaction question (high-annoyance dichotomy)
4. A single, summary noise source reaction question (moderate-annoyance dichotomy)

5. Index which combines answers on several activity interference questions (fully scored versions are preferred over dichotomies)
6. Open-ended question about noise in which answers are classified by whether a particular source is mentioned. [Not acceptable for assessments of reactions to ambient noise.]

Task 8. Classify the direction of finding using criteria for highest ranked level of evidence Determine the highest level of evidence (first in the rank order) which is available for a finding on the topic. Using the first available criterion from the "rank order of evidence" listed below, classify the finding as: (1) supporting the topic hypothesis, (2) supporting the opposing hypothesis (that annoyance is impacted but in the direction which is opposite to that expected) or (3) supporting neither hypothesis. Enter the symbol for the appropriate type of evidence under one of the three subheadings under the "Findings" heading in the evidence listing. Symbols, criteria, and type of evidence are presented below in the following preferred order:

Rank order of evidence for classifying findings:

Rank	Symb	Criterion	Evidence
1.	X_{dB}	$\geq$ 3dB	The variable is associated with a difference in annoyance scores which is the equivalent of at least a 3-decibel difference in noise level. The decibel equivalents of annoyance scores are measures of the displacement of the dose/response relationship for different subgroups on a variable. In multivariate analyses the decibel equivalent may be estimated by the ratio of the unstandardized regression coefficient for the explanatory variable to the regression coefficient for noise level.
2.	$X_{\%}$	$\geq$ 5%	The variable is associated with at least a 5% difference in the percentage annoyed.
3.	$X_{\%}$	$\geq$ 5%,-gp.	Occasionally percentages are only given within subgroups (usually study sites or noise level categories) and a single overall percentage difference cannot be calculated. In these cases at least 50 percent of the subgroups must meet the 5% criterion and no more than 10 percent of the subgroups must support the opposite hypothesis.

4.	X_r	$r_{ax \cdot n} \geq 0.1$	Partial correlation of annoyance and the modifying variable controlled for noise level. (See "Variables controlled" task below if there are additional control variables.)
5.	X_r	$R^2_{a.nx} - R^2_{a.n} > .01$	Increment in explained variance from the addition of the modifying variable to a linear regression equation which includes noise level. (Task 13: "Variables controlled" discusses some analyses controlling for other variables.)
6.	X_r	$r_{ax} > 0.10$ $r^2_x > 0.01$	Simple bivariate correlation between annoyance and the modifying variable (not controlled for noise level).
7.	X_r	$\omega^2 \geq 0.01$	Proportion of variance associated with the modifying variable which is analyzed as a nominal level measure.
8.	X_o	$p < .05$	Statistical significance test. In the few cases in which tests are reported in several subgroups then at least 3/4's of the subgroups must have a significant effect and no more than 10 percent of the subgroups must have a significant effect opposing the hypothesis.
9.	X_o	3/4 of comparisons	Subgroups in the sample are compared using some other statistic, for example, comparisons of mean annoyance scores of men and women within each study site. For such within subgroup comparisons the criteria for supporting the hypothesis is that the relationship must be supported for at least 3/4 of comparisons which are examined (e.g. in at least 3/4 of the study sites). The descriptive statistics must be described in the "Comments" finding of the listing.
10.	X_{Vb}	Unqualified verbal report of relationship	A variable is classified as having an effect if there is only a verbal claim that the variable has an effect. The variable is classified as not having an effect if the strength of the relationship is qualified with such words as "small," "slight," or "unimportant." If a neutral qualifier ("some") is used there is assumed to be an effect. Verbal evidence ranks ahead of significance test results for very small, imprecise ($N < 50$) surveys.

Definitions of contrast groups: One other decision must occasionally be made about the grouping on the moderating variable. Determining whether there is a 3 dB or 5% difference is relatively unambiguous when the moderating variable has been dichotomized. The effect of the moderating variable is simply determined by the difference between the annoyance scores in the two groups. If there are more than

two groups or the variable is continuously coded, then additional rules must be applied. To conclude that there is an effect, the required size effect must be observed either in the contrast between the two largest groups or between the two most distant moderating variable groups (i.e. for age, between the oldest and youngest age group). If the difference is measured between the two most distant moderating variable groups then at least 5% of the population must be in each group and the average annoyance for the intermediate groups must be between that of the most distant moderating groups. A similar rule applies for a continuously coded variable as in a linear regression. For example, if a regression equation predicted that there was a 0.1% rise in annoyance with each year of age and thus that 70 year old's should be 5% more annoyed than 20 year old's, this would only be reported as being an (important) effect if at least 5% of the sample was below 20 years old and at least 5% over 70 years old.

If a curvilinear relationship is reported in which the most extreme relationship is for a middle group, then this is recorded as no relationship. The curvilinear relationship is then described under "Comments."

Task 9. Record supporting evidence and source Record the supporting evidence (value of correlation coefficients, size of percentage differences) in the "Comments" column. If the classification was based on a verbal description (X_{Vb}) then the verbal statement is quoted verbatim. (English translations are enclosed in quotes without reproducing the foreign text.) Record the publication and page number for the evidence in the last column under "Reference."

Task 10. Identify major problems If some aspect of the methodology or analysis provides evidence that the direction of the finding is uncertain: (1) enter a question mark ("?") in the findings column and (2) explain the uncertainty in the "Comments" column. Usually the basis for judging a weakness should be one of the following: (1) the direction of an effect changes when a variable which does not appear to be causally prior is entered in an analysis, (2) an incomplete description of a variable indicates that the variable might not satisfy the screening criteria, (3) other statements in a publication appear to contradict the primary evidence in the publication, (4) a dichotomous measure of effect size differs from the present publication's (i.e. only report whether there is at least a 15 percent difference in reactions).

This code is not used for "uncertainty" which has been resolved in other rules or has been captured in the coding schemes. Do NOT use this code for the following situations: (1) different annoyance scales give different results (instead, describe the differences in the "Comments" column and record the results for the preferred scale), (2) results are not statistically significant (instead, code the statistical significance), (3) subsets of the sample have different results (instead use the rules under "Definition of Contrast Groups" (Task 8) or report each result separately).

Task 11. Record significance test results, if available If significance tests are reported, enter one of the symbols listed below. Unless otherwise noted, it is assumed that a standard criterion of $p<.05$ has been used. No symbol is entered if there is no test. If the publication discusses statistical tests, then the word "significant" is assumed to be a reference to the outcome of a statistical test and not a general statement about the perceived importance of a relationship. The relationship is not assumed to be significant in the unusual cases where the relationship varies within subgroups of the sample (i.e. at different study sites) and the significance tests in the subgroups are divided between supporting the hypothesis and supporting the opposite of the hypothesis.

Symbol	Type and result of significance test
S	Significant effect ($p<.05$) from a test which takes into account the structure (including any clustering) of the sample design.
sr	Significant effect ($p<.05$) from a test based on incorrect simple random sampling assumptions when a complex sample design has been used. Unless there is an explicit statement about the use of appropriate methods, it is assumed that simple random sample assumptions have not in fact been met.
ns	Non-significant effect ($p>.05$) from any significance test.

Task 12. Enter combination code Consider the evidence code, the direction of the finding and the significance test results to select the correct combination code for the finding. Enter the code under the finding code in the listing. (NOTE: This code is only used to simplify later tabulations.)

Combination code	Type of evidence	Direction of findings and significance test
{1}	X_{dB}, X_r, $X_{\%}$	No significance test performed or, if performed, the significance test does not contradict the finding about the direction of an effect: i.e. a. No significance test OR b. Direction criterion met and effect is statistically significant OR c. Direction criterion not met and effect is not statistically significant
{2}	X_{dB}, X_r, $X_{\%}$	Direction criterion met but effect is not statistically significant
{5}	X_{dB}, X_r, $X_{\%}$	Effect criterion not met but a relationship supporting the hypothesis is statistically significant
{6}	X_{dB}, X_r, $X_{\%}$	Effect criterion not met but a relationship supporting the opposing hypothesis is statistically significant
{3}	X_o	Any direction (always code "3")
{4}	X_{Vb}	Any direction (always code "4")

Task 13. Record and, if possible, select variables controlled in the analysis Record the variables, if any, which were controlled in the analysis reported above. If noise level is controlled, enter the term "Noise." The noise metric may also be entered. If ambient noise level is not known for the ambient noise analysis, enter the phrase "Not known" under "Range of ambient noise." If the publication describes a series of analyses which differ in the controlled variables, then choose the finding from the highest level of evidence (first in the rank order) from the following rank ordered list:

1. Control for noise level and study area
2. Control for only noise level
3. Report uncontrolled relationship between annoyance and the modifying variable. [Note: For social status, income, education and non-noise impacts (subjective and objective) the relationships are not reported unless they have been controlled for noise level.]
4. Control for noise level and additional variables if they may be causally prior. [Length of residence is considered to be causally prior to age.]
5. Control for noise level and additional variables which are not causally prior (for example a measure of some other impact of the noise from the same source). If such a controlled relationship is reported, the

finding should be marked with a "?" to indicate that there is an important weakness in the evidence.

[Note: Estimates of noise exposure using non-acoustical variables as predictors are considered to be noise exposure information as long as the estimated noise levels are reported. If only distance, vehicle flow or some other correlated variable is controlled in the analysis, then noise level is not considered to have been controlled for.

[Note: In a few cases one of the first five controls is reported and an additional analysis is also reported in which another variable is controlled which is likely to be causally prior (e.g. control for distance in an analysis of the effect of observed non-noise impacts). In this case the survey should be classified according to the one of the first four standard controls. If, however, the introduction of the additional controls reduces the strength of the finding so that it is no longer "important" then a "?" should be entered to indicate that the classification of the finding is uncertain.]

Task 14. Record best information about number of responses Enter the best information about the number of individual observations which support the finding in square brackets with the letter "N" in the "Comments" column. Provide the most specific information available according to the following ranked order:

1. [If repeated ratings by the same respondent] Record the total number of ratings proceeded by a lower case "n" and then report the number of respondents proceeded by an upper case "N."
2. Record the exact number of respondents preceded by "N=."
3. [If numbers of respondents used in the specific analysis are not reported] Round down the best estimate of the number of respondents to the nearest ten's digit and record this number preceded by "N≈" to indicate the approximation. This best estimate is often the total number of respondents in the survey.

NOTE: Reporting multiple findings: A single survey sometimes provides multiple findings on the same topic. More than one of a survey's findings on a single topic are entered in the unusual circumstance that they provide distinctly different types of information. Almost all such entries occur in one of the four following unusual circumstances: (1) the survey publication provides separate findings for distinctly separate subpopulations (e.g. different types of airports) (2) very different concepts for measuring the moderating variable are analyzed (3) separate investigators come to different conclusions using different analysis conditions, or (4) distinctly different subhypotheses are tested. Separate entries are made for decreases and increases in noise level under the change in noise level topic, for different sources of noise insulation under the noise insulation

topic, and for different combinations of ambient noise and source noise under the ambient noise effect topic.

PART C: TASK FOR DOSE/RESPONSE FINDINGS

Task 15. (For dose-response tabulations) Classify and screen by type of reaction variable

Only report dose/response relationships for dichotomizations of annoyance scales. If there are several possible dichotomizations then choose one "high" and one "moderate" dichotomization using the following preferential ordering.

Rank order of acceptable reaction variables

1. Use single-item, verbally-labeled category summary annoyance measures.
2. Use the "high" and "moderate" dichotomizations recommended by the authors in the publication.
3. [For surveys reviewed in the 1978 article by Schultz] If the author does not provide a definition, use the "high" dichotomizations used by Schultz for the particular survey.
4. Use single item, numerical scale summary annoyance measure.

Unacceptable reaction variables: Reject the following types of reaction variables:

1. Single activity interference question.
2. Dichotomized report of whether or not a sound is heard
3. Rating of only evening or only nighttime noise.
4. Open-ended question asking the respondent to list environmental noises.
5. Any fully scored reaction index or reaction scale.
6. Rank ordering of reactions to noise sources.

APPENDIX B: LISTING OF EVIDENCE

This appendix lists the evidence on each of the 26 topics which has been analyzed for this report. A brief guide to the listing was provided in the discussion which accompanied Figure 4 in the text. This appendix is prefaced by a more extensive guide.

List of Topics

Guide to listings

The listings on each of the 26 topics contain all of the data which have been used in this report. The listings are ordered by topic number and follow the order in which the tables are presented in the text. The "Issue" number identification which appears in each heading is keyed to en route noise issues.

This guide introduces the information in the listings. For the definition of specific symbols, the reader should consult the "SYMBOLS AND ABBREVIATIONS" section at the beginning of the report. For information about topic-specific headings, the reader should consult the "Heading notes" under the corresponding synopsis in Appendix C.

The information in the listings will be described by referring to the first page of evidence in this appendix (Topic 1: Age of respondent). The first column in the first block on that page shows that the data come from the "1976-77 Dulles Concorde survey". This survey is identified in the catalog of social surveys with the identification number of USA-127 (Fields, 1991). The "USA" indicates that the study was conducted in the United States while "127" is a serial number for the survey. The fact that the "Xvb" is located under the "same" heading indicates that this survey's evidence found that older and younger people had the "same" reaction. The "vb" subscript indicates that the evidence for this finding comes from a verbal statement because a quantitative descriptor was not published. The actual verbal statement is directly quoted in the next-to-the-last column, the "Comments" column.

The "{4}" which appears under "Xvb" in the second column is of no concern to most readers. It provides a redundant indicator of the classification of the finding. The meaning of the code is explained in Appendix A under "Task 12".

Under the "Methodology - Measure of Age" heading, the term "Years" indicates age is represented in the analysis by a respondent's actual age in years without any grouping into broad age groups. Under the "Variables controlled" heading the "None" entry indicates that the publication does not report that effects of noise level or any other variables were controlled in the analysis. The absence of a noise level control weakens the value of the evidence. For example the lack of an observed age effect in this survey could be an erroneous conclusion if the effect of increasing sensitivity with age were concealed by a tendency for older people to live at lower noise levels further from the airport.

The "Comments" section provides, as was noted above, the evidence on which the "Xvb" classification is based. The remaining sentence under "Comments" for this survey states that the evidence comes from only those interviews which were completed before the Concorde began flying. The "N≅1700" indicates that there were approximately 1,700 respondents included in the analysis. The "≅" sign indicates, in this case, that the sample size was reported but that the exact number of interviews which was included in this particular analysis was not reported.

Finally, the entry in the "Reference" column gives the location (page number) in the publication from which the evidence was extracted. The full citation for this publication can be found in a catalog of surveys (Fields, 1991).

Codes are used to indicate three different significance test outcomes ($p<.05$) in the "Finding" column. A "ns" (the fourth survey, "1982 British Helicopter..") indicates that the results are "not significant." A "S" indicates that a significant relationship was found. A "sr" (the last survey, "1961 Heathrow") indicates that the results were reported as being significant but that the actual significance is unknown

because inappropriate simple random sampling (sr) assumptions were made (Fields, 1983).

For the second survey in the table ("USA Airport [2 Cities]" survey) the "?" under the "X_r" indicates that there is a major problem in classifying this finding. The basis for such a classification is described under "Task 10" in Appendix A. This is a typical "?" marked finding in that the finding was already classified as non-standard on some other basis (no control for noise level in this instance).

Table 01 -- Issue 2.k: Age of respondent

Hypothesis: Older people are more annoyed

Study (Catalog ID number)	Finding: If older then annoyance is: Lower	Same	Higher	Methodology: Measure of age	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1976-77 Dulles Concorde (USA-127)		X_{vb} {4}		Years	None	Annoyance "..is not related to.." age. Analysis of reactions to subsonic aircraft before Concorde operations. [N≅1700]	Kirschner Associates, 1976:19,20
USA Airport [2 Cities] (USA-044)	X_r ? {1}			Years (10-year groups)	None	r_{ax}=-0.14. With noise and 9 attitudinal variables (not necessarily causally prior), b=.09 and R^2 increase ≅.005, not significant. [N≅1950]	Connor, Patterson, 1972:43,46
1969 Mixed Road and Aircraft (UKD-033)		X_{vb} {4}		Not reported	Not reported	Relationship is "consistent" with "not very significant" relationships. [N≅315]	Bottom, Waters, 1972:18
1982 British Helicopter Disturbance (UKD-225)		X_{o}^{ns} {3}		Age groups	Noise (study area)	Age not significantly related to annoyance within areas. [N≅480]	Atkins, Brooker, Critchley, 1983:25
1965 Regional French Sonic Boom (FRA-017)			X_{vb} {4}	Years	None	Annoyance with the sonic boom ".. increases with age.." [N≅2290]	de Brisson, 1966:24
1961 Heathrow (UKD-008)	X_r^{sr} {1}			Years	Noise (Average peak, PNdB)	$r_{ax.n}$=-0.11 [N≅1730]	McKennell, 1963: Apndx. D

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
1970 French Sonic Boom (FRA-045)		X_r ns {1}		Years	None	r_{ax}=0.08 Unclear if significant at p=.05 (p.28) or not significant at p=.05 (Apndx. XI). [N≅2000]	Centre ..., 1971: 28 Apndx.XI
1978 Canada 4-Airport [Toronto sample] (CAN-168)		X_r ns {1}		Years	Noise (24hr L_{eq})	$r_{ax.n}$= -0.03 [N≅670]	Taylor, 1984:250 253
1984 Glasgow Aircraft/ Road (UKD-238)			X_{vb} {4}	Years	Noise (24hr L_{eq})	"Older people are more likely to express annoyance.." [N≅600]	Diamond, et al., 1986:33, 34, 55
1980 Australian 5-Airport (AUL-210)	X_{dB} s {1}			Years (6 groups)	Noise (NEF)	Those over 70 are the equivalent of at least 5 dB less annoyed than the under 40 groups. [N=3250]	Hede, Bullen, 1982a: 80,112,114; Bullen, Hede, Kyriacos, 1986:214
Irish, CEC Impulse Noise (IRE-254)		X_o ns {3}		Under/ over 55 years	Children, Education Sex, Home owner	Age has no significant effect on impulse noise or road traffic noise annoyance in a regression equation. [N≅450]	Hayden, Whelan, Dillon, 1984:40
1967 Heathrow (UKD-024)		X_r {1}		Years (5 groups)	Noise (average peak PNDB)	$r_{ax.n}$=0.03 [N≅4690]	Direct ..., 1971:75
1965 French 4-Airport (FRA-016)		X_{vb} {4}		Years	None	Age does not "..influence.." annoyance. [N≅2000]	Centre ..., 1968:47
1971 3-City Swiss [AIRCRAFT] (SWI-053)		X_o ns {3}		Years	Noise level, length of residence	Age of under 2-year residents is not related to residual annoyance scores from a regression analysis. Slight relation for more than 2-year residents. Stronger relation if not control for length of residence. [N=3934]	Grandjean, et al., 1973:657; Graf, Meier, Müller, 1974:175

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
Scandinavian 9-Airport (SWE-035)			X_{dB} {1}	Years (3 groups)	Noise level	Tendency for those over 30 years old to be more annoyed (at least the equivalent of 3 dB) increases with noise level, but about 1/4 of sample shows no difference or opposite pattern. [N≅3740]	Sörensen, Berglund, Rylander, 1973:672; Rylander, Sörensen, Kajland, 1972:433
1975 Orly Aircraft (FRA-113)		$X_{\%}$ {1}		Years (3 groups)	Noise zone, length of residence	Oldest group is 5% less annoyed for more recent residents but is 19% more annoyed for longest residents. Over 10% difference if not control for length of residence. [N≅990]	Francois, 1975b:57,
1977 French Light Aircraft (FRA-146)	X_{r} ns {2}			Years	Noise (Psophic index)	$r_{ax.n}$=-0.14 Annoyance decreases with age. [N≅800]	La Gêne ..., 1978:68, 121
1975 German General Aviation (GER-114)		X_{r} ns {1}		Years	None	Older are more annoyed. r_{ax}=0.07 (Not significant) [N=398]	Rohrmann, 1975:65
1972 J.F.K. Airport (USA-059)		X_{r} ns {1}		Years	None	Correlation with age is less than r_{ax}=0.05 and not significant. [N≅1500]	Leonard, Borsky, 1973:697; Borsky, 1975:41
1961 St. Louis Sonic Boom (USA-007)	X% {1}			Years (5 groups)	Distance from flight path (2 groups)	Over age 65 are somewhat less annoyed in both distance groups. [N=1145]	Borsky, 1962:34, 35
1974 Warsaw Aircraft (POL-198)	X_{vb} ? {4}			Not reported	Sex	"..young people are more sensitive to noise than.." old. Findings are somewhat unclear. [N≅510]	Koszarny, Maziarka, 1975:7

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
1981 UK 5-General Aviation Airport (UKD-243)		X_r {1}		Years (5-year groups)	Noise level	For the within-site analysis at Leavesden $r_{ax.n}$=-0.03. (No consistent age difference for full sample of 399 when no control for age.) [N=89]	Directorate ..., 1982a: 18,59,79
Burbank Noise Change [AIRCRAFT] (USA-203)		X_o ns {3}		Years (3 groups)	Noise level, study area	No significant differences (Chi Square test) (n≅5000 interviews) [N≅1000 respondents]	Fidell, Horonjeff, Teffeteller, Pearsons, 1981:30
1983 Controlled Exposure Helicopter (USA-235)		X_{dB} ns {1}		Years	Noise (L_{eq})	Those over 60 are the equivalent of about 0.9 dB more annoyed than those under 30 (not significant). (n≅4000 daily ratings) [N=272 respondents]	Fields, Powell, 1987:488; Fields, Powell, 1985:41
1980 Aircraft Rating Diary (USA-217)		X_{vb} {4}		Years	None	"No clear relationship was exhibited between age and ... annoyance" (with individual aircraft) in a graphical inspection. (n=920 ratings) [N=18 respondents]	Stearns, Brown, Neiswander, 1983: 49
1980 Salt Lake City In-Home Rating [AIRCRAFT] (USA-219)	X_{dB} s {1}			Years	Noise (Peak noise level, dB(A)), length of residence	With each year of age, annoyance decreases by the equivalent of about 0.1 to 0.5 dB. (n≅1100 ratings of single flyovers) [N≅100 respondents]	Dempsey, Stephens, Fields, Shepherd, 1983:25, 38
USSR 22 Settlement [AIRCRAFT] (USR-042)			X_s {1}	Years (3 groups)	None	At least 17% more of the under 20 age are less disturbed than those over 40. [N≅2000]	Karagodina, Soldatkina, Vinokur, Klimukhin, 1969: 184

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
1957 USA Air Base (USA-006)		X_{s}^{ns} {1}		Years (4 groups)	Noise level	Age differences not consistent: no difference for 2 noise groups, and opposite patterns in other two groups (not significant). [N=2296]	Borsky, 1961b: 57, 58, 93
1969 Munich [AIRCRAFT] (GER-034)			X_{r}^{sr} {1}	Years	Noise (FBl)	Older people are more annoyed. $r_{ax.n}$=0.26. [N≅660]	Deutsche . ., 1974: 209, 215, Apndx.A,72; Rohrmann et al., 1973: 774
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1968 London Traffic (UKD-030)		X_{vb} {4}		Years	Not reported	"..internal tests showed that ..age.. made no difference.." in annoyance. [N≅1990]	Griffiths, Langdon, 1968:18)
1972 London Traffic Noise (UKD-071)		X_{o}^{ns} {3}		Years	Noise level	Age does not affect response (AID analysis of residuals from regression of annoyance on noise level). [N≅2930]	Langdon, 1976b:250
1975-76 S. Ontario Community Noise (CAN-121)		X_{o}^{ns} {3}		Years	Noise (5-dB L_{dn} groups)	"..very little relationship.." not significant within noise groups. [N≅300]	Taylor, Hall, 1977: 592
German part of CEC impulse noise (GER-253)		X_{vb} {4}		Years	Noise level	Age does not "appear to affect" reactions to either impulse or road traffic noise. [N≅490]	Kastka, Langdon, 1985:901
CEC Impulse Noise (FRA-252, GER-253, IRE-254, NET-255)		X_{vb} {4}		Years	Noise level	"Very slight, but present" effects show the young (18-25), but especially old (>65) are "somewhat less annoyed". [N≅1610]	Groeneveld, de Jong, 1985b:59

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
1978 Dutch homes for aged [ROAD TRAFFIC] (NET-196)		X_{vb} {4}		Compare residents of homes for aged to average population	Not known	"..the aged are not more susceptible to road traffic noise." Source of data for "average" age population is not reported. (Sample size is greater than 228.)[N≅228]	van Dongen, 1980b: C 2 - 6.1
Dutch Tram and Road (NET-276)		X_{o} ns {3}		Not reported	Noise level, type of tramway noise	Age does not add significantly to the total explained variance.[N≅790]	Miedema, van den Berg, 1988: 343
1979 Hornsby Rifle Range Study (AUL-209)	X_{r} sr {1}			Years	None	r_{ax}=-0.14. Age is also related to length of residence which is related to annoyance. [N≅190]	Hede, Bullen, 1982b:47; Hede, Bullen, 1981:54
1973 Vienna Traffic (AUS-093)		X_{s} {1}		Years	Noise level	Increased age slightly increases annoyance in 2 noise groups, decreases in 2 and has no effect in 1 group.[N≅2300]	Lang, 1975: 8, Fig. 7
1972 Copenhagen Traffic (DEN-075)		X_{o} {3}		Year of birth	Noise (2 groups: 51-63, above 68 24hr L_{eq})	"..no significant relation between age.." and annoyance. Middle aged most annoyed in high noise areas. [N≅950]	Relster, 1975:73, 77
1975 Western Ontario Traffic (CAN-120)		X_{r} sr {6}		Years (6 groups) (decades)	Noise (24hr L_{eq})	$r_{ax.n}$=-0.08 [N=1150]	Jonah, Bradley, Dawson, 1981:494, 495
Hong Kong SES-Area Road (HKG-187)		X% sr {5}		Years (6 groups)	Noise levels similar for all	About 4% more high annoyance for over 55 years age. Chi square shows significant age effect. [N=180]	Ko, Wong, 1980: 150, 151

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
1976 Canada Impulse Noise (CAN-136)		X_r $?^{ns}$ {1}		Years	Noise level, years exposed	Significant correlation with age (r_{an}=-0.10) but reduced when control for noise and years exposed ($r_{ax.nw}$=-0.085). [N≅600]	Seshagiri, 1981:56
1979 French Behavioral Effects [ROAD TRAFFIC] (FRA-197)		X_o ^{ns} {3}		Years	Noise level (2 groups)	No significant overall relationship; but in AID analysis at moderate noise levels those 35 and older are more annoyed. [N≅1480]	Lambert, Simonnet, 1980:23
1972 Paris-Area Railway (FRA-063)		X_{vb} {4}		Years	Not reported	"..no effect on annoyance." [N≅350]	Aubree, 1973: p.29 in English translation
1974 Sendai Regular Railway (JPN-101)			X_r {1}	Years (10-year groups)	Noise (L_{eq})	$r_{ax.n}$=0.13 [N≅710]	Kumagai, Kono, Sone, Nimura, 1975:431
1972 New Tokaido/ New Sanyo Railway (JPN-065)		X_o ^{ns} {3}		Years	Not reported	Older respondents are more annoyed, but the relation is not significant.[N≅420]	Nimura, Sone, Ebata, Matsumato, 1975:7; Sone et al., 1973: p. 12 in translation)
Philadelphia Community Noise (USA-058)		X_s ^{ns} {1}		Years (7 groups)	None	Less than 4% difference in reactions of under 30 and over 60. [N≅500]	Bragdon, 1969:21; Bragdon, 1971:170
USA Vehicle Noise Situation (USA-057)	X_s ^{sr} {1}			Not reported	None	About 18% fewer of the under age 30 are annoyed than the over 60. [N≅500]	Jones, 1971:86
Valencia City Single Site [ROAD TRAFFIC] (SPA-274)	X% {1}			Not reported	Noise level (all live on single road)	About 18% more of the under 20 age than over 60 age are "very much" annoyed.[N≅190]	Garcia, 1983:942

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
1972 Birmingham New Motorway (UKD-073)		Xvb {4}		Not reported	None	"..age.. uncorrelated.." with annoyance. [N≅360]	Lawson, Walters, 1973:9
1977 Zurich Pilot Traffic (SWI-158)			X% {1}	Years (3 groups) (<30,30-50, >50)	None	18% more in the over 50 age group are annoyed than in the under 30 group. [N=1285]	Wanner, Wehrli, Nemecek, Turrian, 1977:112
1978 Zurich Time-of-day [ROAD TRAFFIC] (SWI-173)		Xvb {4}		Years (5 groups)	Noise (Leq), study area	"..no recognizable systematic differences.." "Analysis..along individual streets...produced no significant evidence." [N≅1600]	Wehrli, Nemecek, Turrian, Hofmann, Wanner, 1978:146
1963 Welsh Village Impulse Noise (UKD-010)		Xvb {4}		Not reported	Noise, personal characteristics	"..nothing could convincingly be discerned." Middle age groups are most annoyed. (Multiple interviews) [N=220 respondents]	Webb, Warren, 1967:383
1972 English Road Traffic (UKD-072)	X* ? {1}			Years	Traffic flow (vehicles per hour)	Over 65 age at least 12% less likely to be bothered than those under 25 in one publication, but another reports not "vary to any notable extent." Age is not related to traffic flow. [N≅5800]	Sando, Batty, 1975:69; Morton-Williams, Hedges, Fernando, 1978:72, 73, 85
1972 London Construction Site (UKD-074)		Xo ns {3}		Years (4 groups)	Noise (L_{eq})	Age does not significantly increase the explained variance in a multiple regression analysis. [N≅530]	Large, Ludlow, 1976:64
1977 Hampshire Village (UKD-160)		X* ? {1}		Age groups	None	This study does not find a 15% response difference. [N≅750]	Hawkins, 1980:83

Study	Lower	Same	Higher	Meas. Age	Controls	Comments	Reference
1979 17-Site Electrical Line and Transformer (USA-216)		X_{vb} {4}		Years (10-year groups)	Not reported	No "discernable differences" between age groups. [N≅130]	Fidell, Teffetellier, Pearsons, 1979:11
1975 British Railway (UKD-116)	X_{dB} s {1}			Years	Noise (24hr L_{eq}), length of residence, age of house	50 years greater age is equivalent to 12 dB less annoyance after controlled for length of residence and house age. [N=1450]	Fields, Walker, 1982b:224-225, 232
1978 Spokane Community (USA-171)	X_{o} sr {3}			Years	None	Spearman's rho is r_s=-.08, p=.04. Annoyance slightly related to age. [N≅750]	Perdue, Coates, 1979:53
1973-74 Sendai Road Traffic (JPN-094)		X_{dB} {1}		Years (5 groups)	Noise (L_{eq}), length of residence, and 9 other variables	Oldest and youngest groups least annoyed, but less than equivalent of 3 dB difference from middle age (30-50 years). [N≅939]	Shibuya, Tanno, Sone, Nimura, 1975:427
1969 Paris Road Traffic (FRA-041)		X_{o} ns {3}		Years (5 groups	Noise level	Not statistically significant relation with annoyance. [N≅690]	Aubree, Auzou, Rapin, 1971:42
1972 BART Impact [NEIGHBORHOOD] (USA-066)	X_{r} sr {1}			Years (12 groups)	Sex, some neighborhood and personal characteristics	Activity disturbance and specific noise source annoyance decreases steadily with age. (r_{ax}=0.16) Significant at .001. [N=2519]	Carp, Carp, 1982a:179, 181,185; Carp, Carp, 1982b:301
1966 Stockholm, Gothenburg Road Traffic (SWE-021)			$X_{\%}$ {1}	Years (3 groups, <31,31-51, >52)	None	At least 8% more with high annoyance in over 50 age group. [N=664]	Fog, Jonsson, 1968:55

Table 02 -- Issue 2.i.ii: Sex of respondent

Hypothesis: Women are more annoyed than men (partly because they are home more).

Study (Catalog ID number)	Finding: Women's annoyance is: Lower	Same	Higher	Methodology: Claim that women home more?	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1965 Regional French Sonic Boom (FRA-017)			X_{vb} {4}	No	None	Sex "..affects.." annoyance. ".. women..are more.." annoyed. [N≅2290]	de Brisson, 1966:24
1970 French Sonic Boom (FRA-045)			$X_{r\ sr}$ {1}	No	None	Women are more annoyed. r_{ax}=0.20 (Very approximate estimate of sample size.) [N≅2000]	Centre ..., 1971: 28 Apndx. XI
1976-77 Dulles Concorde (USA-127)		$X_{o\ ns}$ {3}		No	None	Annoyance "..is not related to.." sex. Pre-Concorde interviews analyzed. Appears to not be significant. [N≅1700]	Kirschner Associates, 1976:19,20
1982 British Helicopter Disturbance (UKD-225)		$X_{o\ ns}$ {3}		No	Noise (study area)	Sex not significantly related to annoyance within study areas. [N≅480]	Atkins, Brooker, Critchley, 1983:24
1961 Heathrow (UKD-008)		$X_{r\ sr}$ {6}		No	Noise (Average peak, PNdB)	Women are slightly less annoyed, $r_{ax.n}$=-0.05 [N≅1730]	McKennell, 1963: Appendix D
1978 Canada 4-Airport [Toronto sample] (CAN-168)		$X_{r\ ns}$ {1}		No	Noise (24hr L_{eq})	$r_{ax.n}$=0.04 Does not report which sex is more annoyed. [N≅670]	Taylor, 1984:250 253

Study	Lower	Same	Higher	Claim home	Controls	Comments	Reference
Irish, CEC Impulse Noise (IRE-254)		X_o ns {3}		No	Children, Education Age, Home owner	Sex has no significant effect on either impulse or road noise annoyance in a regression equation. [N≅450]	Hayden, Whelan, Dillon, 1984:40
1980 Australian 5-Airport (AUL-210)		X_{dB} ns {1}		No	Noise (NEF)	Men are slightly, but not significantly, more annoyed. [N=3255]	Hede, Bullen, 1982a: 80,112,114; Bullen, Hede, Kyriacos, 1986:214
1965 French 4-Airport (FRA-016)		X_o ns {3}		No	None	Not "..find a significant difference.." in annoyance. [N≅2000]	Centre ..., 1968:47
1971 3-City Swiss [AIRCRAFT] (SWI-053)		X_r sr {6}		No	Noise level	w^2=.003 Though men are slightly more annoyed, this only explains 0.3% of the variance in the residuals from a regression analysis. [N=3939]	Grandjean, et al., 1973:659; Graf, Meier, Müller, 1974:171
Scandinavian 9-Airport (SWE-035)		X_o ns {3}		No	Noise level	The tendency for men to be more annoyed than women is not statistically significant. [N≅3740]	Sörensen, Berglund, Rylander, 1973:670-671
1953 USA 8-Airport (USA-004)		$X_{\%}$ ns {1}		Yes	Noise level	3% more of the women are greatly bothered (not significant). [N=3612]	Borsky, 1954:97
1977 French Light Aircraft (FRA-146)		X_r ns {1}		No	Noise (Psophic index)	$r_{ax.n}$=0.05 Does not report which sex is more annoyed. [N≅700]	La Gêne ..., 1978:68, 121
1975 German General Aviation (GER-114)		X_r ns {1}		No	None	r_{ax}=-0.02 Does not report which sex is more annoyed. [N=398]	Rohrmann, 1975:64

Study	Lower	Same	Higher	Claim home	Controls	Comments	Reference
1972 J.F.K. Airport (USA-059)		X_{r} sr {5}		Yes	Noise (CNR)	$r_{ax.n}$=-0.09 indicated men are slightly less annoyed. "Sex added little to an understanding" when the other variables were included. [N≅1500]	Leonard, Borsky, 1973: 698, 699
1974 Warsaw Aircraft (POL-198)		X_{o} ns {3}		No	None	Young males have "..greater sensitivity.." but no overall difference [N≅510]	Koszarny, Maziarka, 1975:6
1981 UK 5-General Aviation Airport (UKD-243)		X_{r} ns {1}		No	Noise	For the within-site analysis at Leavesden $r_{ax.n}$=-0.01. (At least 8% more women annoyed for full sample of 399, but no controls for noise.) [N=89]	Directorate ..., 1982a: 17,59,79
1976 Heathrow Concorde (UKD-130)		X_{r} ns {1}		No	Noise (Average peak, PNdB for Concorde)	Men are slightly more annoyed (r_{ax}=-0.01). In a graph the difference varies from the equivalent of about 2 to 5 dB depending on noise level. [N≅2600]	McKennell, 1977: 27
Burbank Noise Change [AIRCRAFT] (USA-203)		X_{o} ns {3}		No	Noise level, study area	No significant difference (Chi square tests). (n≅5000 interviews) [N≅1000 respondents]	Fidell, Horonjeff, Teffeteller, Pearsons, 1981:30
1984 Glasgow Aircraft/ Road (UKD-238)		X_{vb} {4}		No	Noise (24hr L_{eq})	Not a " major effect" [N≅600]	Diamond, et al., 1986:33, 34, 55
1980 Aircraft Rating Diary (USA-217)		X_{vb} {4}		No	None	Mean annoyance scores on a 7-point scale are "apparently not dependent on sex" (female=2.9, male=2.8). (May be multiple ratings) [N=18 respondents]	Stearns, Brown, Neiswander, 1983: 50

Study	Lower	Same	Higher	Claim home	Controls	Comments	Reference
1980 Salt Lake City In-Home Rating [AIRCRAFT] (USA-219)		X_{dB} ns {1}		No	Noise (Peak noise level, dB(A))	Women are the equivalent of 2 dB less annoyed (not significant). (n≅1100 ratings of single fly-overs) [N≅100 respondents]	Dempsey, Stephens, Fields, Shepherd, 1983:25, 38
1957 USA Air Base (USA-006)		X_s {1}		No	Noise level	Somewhat fewer than 5% of the women are more annoyed in 3 of 4 groups [N=2328]	Borsky, 1961b: 57, 58, 93
1961 St. Louis Sonic Boom (USA-007)			X_s {1}	No	Distance from flight path (2 groups)	Women about 6% more likely to be greatly annoyed within dist-ance groups. [N=1145]	Borsky, 1962:34, 35
1969 Munich [AIRCRAFT] (GER-034)		X_r ns {1}		No	Noise (FBl)	Males only slightly more annoyed $r_{ax.n}$=-0.02. [N≅660]	Deutsche . ., 1974: 209, Apndx.A,72; Rohrmann et al., 1973: 774
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975-76 S. Ontario Community Noise (CAN-121)		X_o ns {3}		No	Noise (5-dB, L_{dn} groups)	"..very little rela-tionship..". The same survey has a more direct measure of time spent at home. [N≅300]	Taylor, Hall, 1977:594
1968 London Traffic (UKD-030)		X_{vb} {4}		No	Not known	"..internal tests showed that ..sex.. made no difference.." in annoyance. [N≅1990]	Griffiths, Langdon, 1968:18
1972 London Traffic Noise (UKD-071)		X_o ns {3}		No	Noise level	Sex does not affect response (AID analysis of residuals from the regression of annoyance on noise level). [N≅2930]	Langdon, 1976b:250

Study	Lower	Same	Higher	Claim home	Controls	Comments	Reference
1979 Hornsby Rifle Range Study (AUL-209)		X_o ns {3}		No	None	Men are more annoyed (not significant). [N≅190]	Hede, Bullen, 1982b:47; Hede, Bullen, 1981:54
1975 Western Ontario Traffic (CAN-120)		X_r ns {1}		No	Noise (24hr L_{eq})	Females slightly more annoyed $r_{ax.n}$=0.03. [N=1150]	Jonah, Bradley, Dawson, 1981:494
Hong Kong SES-Area Road (HKG-187)		X_o ns {3}		No	Noise levels similar for all	No significant relation for sex. [N≅170]	Ko, Wong, 1980: 150
1972 Paris-Area Railway (FRA-063)		X_{vb} {4}		No	Not reported	"..no effect on annoyance." [N≅350]	Aubree, 1973: p.29 in English translation
Philadelphia Community Noise (USA-058)		X_o ns {3}		No	None	No "..statistically significant correlation with.." noise annoyance. [N≅500]	Bragdon, 1971:171
USA Vehicle Noise Situation (USA-057)		X_s ns {1}		No	None	Less than a 1% difference in annoyance. [N≅500]	Jones, 1971:85
Valencia City Single Site [ROAD TRAFFIC] (SPA-274)		X_o ns {3}		No	Noise level (all live on single road)	"..no significant difference.." for sex. [N≅190]	Garcia, 1983:942
1966 Stockholm, Gothenburg Road traffic (SWE-021)		X_s {1}		No	None	Less than 1% difference in annoyance. [N=664]	Fog, Jonsson, 1968:55
1972 Birmingham New Motorway (UKD-073)		X_{vb} {4}		No	None	"Sex...is uncorrelated.." with annoyance. [N≅360]	Lawson, Walters, 1973:9

Study	Lower	Same	Higher	Claim home	Controls	Comments	Reference
1978 Zurich Time-of-day [ROAD TRAFFIC] (SWI-173)		X_{vD} {4}		No	None reported	Sex is one of the variables which has "no recognizable influence". [N≅1600]	Wehrli, Nemecek, Turrian, Hofmann, Wanner, 1978:146
1972 English Road Traffic (UKD-072)		X_{vD} {4}		No	Traffic flow (vehicles per hour)	There are "no differences" by sex and sex does not show a "notable" association with traffic flow. [N≅5800]	Sando, Batty, 1975:69; Morton-Williams, Hedges, Fernando, 1978: 73
1977 Hampshire Village (UKD-160)		$X_{\%}$? {1}		No	None	This study does not find a 15% response difference. [N≅750]	Hawkins, 1980:83
1979 17-Site Electrical Line and Transformer (USA-216)		$X_{\%}$ ns {1}		No	Not reported	Less than a 1% difference in response. [N≅130]	Fidell, Teffeteller, Pearsons, 1979:10
1975 British Railway (UKD-116)		X_{dB} ns {1}		No	Noise (24hr L_{eq})	Women are the equivalent of 2 dB more annoyed. [N=1453]	Fields, Walker, 1982b:224-225
1978 Spokane Community (USA-171)		X_{o} ns {3}		No	None	Spearman's rho is r_s=-.01, p=.82 [N≅750]	Perdue, Coates, 1979:53
1981 Alabama Blast Noise (USA-206)		$X_{\%}$ ns {1}		No	None	3% more women than men with high annoyance [N≅1040]	Fidell, Horonjeff, et al., 1982: G-12
1973-74 Sendai Road Traffic (JPN-094)		X_{dB} {1}		No	Noise (L_{eq}), and 10 other variables	Slight tendency (equivalent of about 2 dB) for women to be more annoyed [N=939]	Shibuya, Tanno, Sone, Nimura, 1975:427
1969 Paris Road Traffic (FRA-041)		X_{o} ns {3}		No	Noise level	Not statistically significant relation with traffic noise annoyance. [N≅690]	Aubree, Auzou, Rapin, 1971:42, 43

Study	Lower	Same	Higher	Claim home	Controls	Comments	Reference
1972 BART Impact [NEIGHBOR-HOOD] (USA-066)		Xr ns {1}		No	Age, some neighbor-hood and personal charact-eristics	Relationships for activity disturbance and specific transportation noise sources are low. (r_{ax}=<.08) No noise data. [N=2519]	Carp, Carp, 1982a:179, 181,185; Carp, Carp, 1982b:301, 310

Table 03 -- Issue 2.1.i: Social status (social class or occupational status)

Hypothesis: High status residents are more annoyed

Study (Catalog ID number)	Finding: If higher status then annoyance is: Lower	Same	Higher	Methodology: Measure of socio-economic status	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1982 British Helicopter Disturbance (UKD-225)		$X_{\%}$ ns {2}		Occupation (3 groups)	Noise (study area)	In 3 of 5 areas, at least 8% more high occupation groups are annoyed. Significant at $p<.10$ but not at $p<.05$. [N≅480]	Atkins, Brooker, Critchley, 1983:25
1961 Heathrow (UKD-008)		X_r ns {1}		Occupation class	Noise (Average peak, PNdB)	$r_{ax.n}$=-0.04 [N≅1730]	McKennell, 1963:6-5, Apndx. D
1967 Heathrow (UKD-024)		X_r sr {5}		Social class	Noise (Average peak, PNdB)	$r_{ax.n}$=0.07. [N≅4690]	Direct ..., 1971:75
1963 Schiphol (NET-013)		X_o {3}		Social class	Noise level, study area	Middle and upper classes have higher average annoyance scores in 4 areas and lower annoyance in 4 other areas. [N=992]	Bitter, Schwager, 1964: Part V, Table IX
1984 Glasgow Aircraft/ Road (UKD-238)		X_{vb} {4}		Social class	Noise (24hr L_{eq})	Not a " major effect" [N≅600]	Diamond, et al., 1986:33, 34, 55
1980 Australian 5-Airport (AUL-210)		X_{dB} ns {1}		Occupation (4 groups)	Noise (NEF)	Less than 3 dB effect. [N≅3240]	Hede, Bullen, 1982a: 80,112,115; Bullen, Hede, Kyriacos, 1986:214

Study	Lower	Same	Higher	Meas. SES	Controls	Comments	Reference
1971 3-City Swiss [AIRCRAFT] (SWI-053)		X_{dB} ns {1}		Occupation	Noise level	Residual annoyance scores from noise/ annoyance regression show less than 3 dB equivalent more annoyance (not significant) for occupation groups. [N≅3490]	Grandjean, et al., 1973:657; Graf, Meier, Müller, 1974:180
1953 USA 8-Airport (USA-004)		$X_{\%}$ ns {1}		Occupation (4 broad groups)	Noise (5-10 dB SNL groups)	Less than 5% differences in 6 of the 8 comparisons of most extreme groups. [N≅3600]	Borsky, 1954:100
1977 French Light Aircraft (FRA-146)			X_r sr {1}	Socio-professional category	Noise (Psophic index)	$r_{ax.n}$=0.26 [N≅700]	La Gêne ..., 1978:68, 121
1957 USA Air Base (USA-006)		$X_{\%}$ ns {1}		Occupation (4 groups)	Noise level (4 groups)	Professionals are more annoyed in 1 group, same in 2 and less in 1. [N=2128]	Borsky, 1961b: 57, 59, 93
1969 Munich [AIRCRAFT] (GER-034)		X_r ns {1}		Occupation prestige	Noise (FB1)	Annoyance not strongly or significantly related to occupation prestige $r_{ax.n}$=0.05. [N≅660]	Deutsche . ., 1974:182 209, 215, Apndx. p.72 Table A.4-8.
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975-76 S. Ontario Community Noise (CAN-121)		X_o ns {3}		Occupation	Noise (5-dB L_{dn} groups)	Occupation effect not significant. [N≅300]	Taylor, Hall, 1977: 593
Hong Kong SES-Area Road (HKG-187)			$X_{\%}$ sr {1}	Occupation (4 groups)	Noise levels similar for all	At least 10% more annoyed in high occupation groups. Only two study areas: one high-SES and one low-SES. [N=180]	Ko, Wong, 1980: 150, 151

Study	Lower	Same	Higher	Meas. SES	Controls	Comments	Reference
1976 Canada Impulse Noise (CAN-136)		X_r $?^{ns}$ {1}		Occupation (skilled worker and manager compared to others)	Noise level, income, education	Skilled worker or higher status is significantly more annoyed (r_{ax}= 0.11) but not if control for noise, income, education ($r_{ax.nwz}$= 0.04) [N≅600]	Seshagiri, 1981:56, 57
1974 Sendai Regular Railway (JPN-101)			X_r {1}	Occupation	Noise (L_{eq})	$r_{ax.n}$=0.12 [N≅710]	Kumagai, Kono, Sone, Nimura, 1975:431
Los Angeles Freeway 5-Site (USA-043)			X_{vb} {4}	"most economically prosperous" area compared to others	Noise (Average for community)	Of the 5 communities, one with high annoyance was at the lowest noise level and had a high social status. [N≅300]	Galloway, Clark, Kerrick, 1969:8
1961 Central London Traffic (UKD-009)	X_s {1}			Social class	None but noise and class not related in a subsample	Non-manual about 12% more likely to be bothered for full sample of 1353. Social class noise levels similar for the 630 with noise data. [N=630]	McKennell, Hunt, 1966:V-2, V-4
1963 Welsh Village Impulse Noise (UKD-010)		X_{vb} {4}		Manual workers	Noise (repeated exposures)	"..nothing could convincingly be discerned." Manual laborers are least annoyed, housewives are most annoyed. (Multiple interviews) [N=220 respondents]	Webb, Warren, 1967:383
1972 English Road Traffic (UKD-072)		X_{vb} {4}		"Socio-economic group"	Traffic flow (vehicles per hour)	"No differences" between socio-economic groups. No "notable association" of SES with traffic flow. [N≅5800]	Sando, Batty, 1975:69; Morton-Williams, Hedges, Fernando, 1978: 72, 73, 85

Study	Lower	Same	Higher	Meas. SES	Controls	Comments	Reference
1972 London Construction Site (UKD-074)		X_o ns {3}		Occupation	Noise L_{eq}	Occupation does not significantly increase the explained variance in a multiple regression analysis. [N≅530]	Large, Ludlow, 1976:64
1975 British Railway (UKD-116)		X_{dB} ns {1}		Head's occupation professional/ manager or other	Noise (24hr L_{eq})	Professional, managers equivalent of less than 3 dB more annoyed. (not significant) [N=1431]	Fields, Walker, 1982b:224-225
1969 Paris Road Traffic (FRA-041)		X_o ns {3}		Profession	Noise level	Relation with annoyance not statistically significant. [N≅690]	Aubree, Auzou, Rapin, 1971:42

Table 04 -- Issue 2.1.ii: Income

Hypothesis: High income residents are more annoyed

Study (Catalog ID number)	Finding: If higher income then annoyance is: Lower	Same	Higher	Methodology: Measure of socio-economic status	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1971 3-City Swiss [AIRCRAFT] (SWI-053)		X_{dB}^{ns} {1}		Income	Noise level	Residual annoyance scores from noise/annoyance regression show less than 3 dB equivalent more annoyance (not significant) for higher income groups. [N≅3490]	Grandjean, et al., 1973:657; Graf, Meier, Müller, 1974:180
1953 USA 8-Airport (USA-004)		$X_{\%}^{ns}$ {1}		Income (4 broad groups)	Noise (5-10 dB SNL groups)	Less than 5% differences in 6 of the 8 comparisons of most extreme groups. [N≅3600]	Borsky, 1954:99
1977 French Light Aircraft (FRA-146)			$X_{r_{sr}}$ {1}	Income	Noise (Psophic index)	$r_{ax.n}$=0.28. [N≅700]	La Gêne ..., 1978:68, 121
1957 USA Air Base (USA-006)		$X_{\%}^{ns}$ {1}		Income (4 groups)	Noise level (4 groups)	4.8% more "much annoyance" for high income (weighted average over 4 noise groups) [N=2236]	Borsky, 1961b: 57, 59, 93
1969 Munich [AIRCRAFT] (GER-034)		X_r^{ns} {1}		Income	Noise (FBl)	Annoyance not strongly or significantly related to income $r_{ax.n}$=-0.07. [N≅660]	Deutsche . ., 1974:182 209, 215, Apndx. p.72 Table A.4-8.

Study	Lower	Same	Higher	Meas. SES	Controls	Comments	Reference
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1972 London Traffic Noise (UKD-071)		X_{o}^{sr} {3}		Income	Noise level	In an AID analysis of the residuals from a regression of annoyance on noise, income has a significant effect only for the less sensitive part of the sample. [N≅2930]	Langdon, 1976b:250, 252
1975-76 S. Ontario Community Noise (CAN-121)		X_{o}^{ns} {3}		Income	Noise (5-dB L_{dn} groups)	Significant income effect in only 2 of 3 noise groups. [N≅300]	Taylor, Hall, 1977: 593
1975 Western Ontario Traffic (CAN-120)		X_{r}^{sr} {5}		Income	Noise (24hr L_{eq})	$r_{ax.n}$=0.07. There may be an interaction effect for SES with appearance of housing in study area. [N=1150]	Jonah, Bradley, Dawson, 1981:494; Bradley, Jonah, 1979c:407
Hong Kong SES-Area Road (HKG-187)			$X_{\%}^{sr}$ {1}	Income (5 groups)	Noise levels similar for all	At least 5% more annoyed in high income groups. Only two study areas: one high-SES and one low-SES. [N=180]	Ko, Wong, 1980: 150, 151
1976 Canada Impulse Noise (CAN-136)			X_{r}^{sr} {1}	Income	Noise level	r_{ax}= 0.15. If control for education and occupation group, $r_{ax.nw2}$= 0.14. [N≅600]	Seshagiri, 1981:56, 57

Table 05 -- Issue 2.1.iii: Education

Hypothesis: High education residents are more annoyed

Study (Catalog ID number)	Finding: If higher education then annoyance is: Lower	Same	Higher	Methodology: Measure of socio-economic status	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1961 Heathrow (UKD-008)		X_{sr} {5}		Amount of education	Noise (Average peak, PNdB)	$r_{ax.n}$=0.07 [N≅1730]	McKennell, 1963:6-5, Apndx. D
1967 Heathrow (UKD-024)		X_{sr} {5}		Age completed education,	Noise (Average peak, PNdB)	$r_{ax.n}$=0.07. [N≅4690]	Direct ..., 1971:74
1978 Canada 4-Airport [Toronto sample] (CAN-168)		X_{sr} {5}		Education	Noise (24hr L_{eq})	$r_{ax.n}$=0.07. [N≅670]	Taylor, 1984:247, 250
1980 Australian 5-Airport (AUL-210)		$X_{dB\,ns}$ {1}		Education	Noise (NEF)	Less than 3 dB effect. [N≅3240]	Hede, Bullen, 1982a: 80,112,115; Bullen, Hede, Kyriacos, 1986:214
1984 Glasgow Aircraft/ Road (UKD-238)		X_{vb} {4}		Age completed education	Noise (24hr L_{eq})	Not a " major effect" [N≅600]	Diamond, et al., 1986:33, 34, 55
1971 3-City Swiss [AIRCRAFT] (SWI-053)		$X_{dB\,ns}$ {1}		Education	Noise level	Residual annoyance scores from noise/ annoyance regression show less than 3 dB equivalent more annoyance (not significant) for higher education groups. [N≅3490]	Grandjean, et al., 1973:657; Graf, Meier, Müller, 1974:180

Study	Lower	Same	Higher	Meas. SES	Controls	Comments	Reference
1983 Controlled Exposure Helicopter (USA-235)		X_{dB} ns {1}		Education (3 groups)	Noise (L_{eq})	College educated respondents are slightly (equivalent of 0.8 dB) but not significantly more annoyed. ($n \cong 4000$ daily ratings) [N=326 respondents]	Fields, Powell, 1985:41
1957 USA Air Base (USA-006)		$X_{\%}$ ns {1}		Education (3 groups)	Noise level (4 groups)	More educated are less annoyed by at least 5% in 2 noise groups, more annoyed in 1 and same in 1. [N=2128]	Borsky, 1961b: 57, 58,93
1969 Munich [AIRCRAFT] (GER-034)		X_r ns {1}		Education	Noise (FB1)	Annoyance not strongly or significantly related to education $r_{ax.n}=-0.07$. [N≅660]	Deutsche . ., 1974:182 209, Apndx. p.72 Table A.4-8.
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975-76 S. Ontario Community Noise (CAN-121)		X_o ns {3}		Education	Noise (5-dB L_{dn} groups)	Education effect not significant. [N≅300]	Taylor, Hall, 1977: 593
CEC Impulse Noise (FRA-252, GER-253, IRE-254, NET-255)		X_{vb} ? {4}		Education (2 groups) (left school at age $\geq$ 18 is high)	Noise	"Very slight, but present" effects include higher educated are "somewhat" more annoyed. [N≅1610]	Groeneveld, de Jong, 1985b: 15, 59
Hong Kong SES--Area Road (HKG-187)		$X_{\%}$ sr {5}		Education (4 groups)	Noise levels similar for all	Less than 5% more high annoyance in highest education group. Only two study areas: one high-SES and one low-SES. [N=180]	Ko, Wong, 1980: 150, 151
1976 Canada Impulse Noise (CAN-136)			X_r sr {1}	Education (post-secondary education)	Noise level	$r_{ax}= 0.18$. If control for income and occupation group(z), $r_{ax.nwz}= 0.14$. [N≅600]	Seshagiri, 1981:56, 57

Study	Lower	Same	Higher	Meas. SES	Controls	Comments	Reference
Valencia City Single Site [ROAD TRAFFIC] (SPA-274)			X% {1}	Education	Noise (all live on single road)	About 40% more of the university educated than the no education groups are "very much" annoyed. [N≅190]	Garcia, 1983:942
1972 London Construction Site (UKD-074)		Xo ns {3}		Education	Noise L_{eq}	Education does not significantly increase the explained variance in a multiple regression analysis. [N≅530]	Large, Ludlow, 1976:64
1977 Hampshire Village [Local Road Traffic] (UKD-160)			Xs ? {1}	Education (3 groups)	Noise (18hr L_{eq})	High education respondents are more than 15% more likely to be annoyed at a similar noise level in 2 groups but less than 15% difference in 1 group. [N=669]	Hawkins, 1980:83,84, 101,102
1975 British Railway (UKD-116)			XdB s {1}	Education (4 groups)	Noise (24hr L_{eq})	College-educated are the equivalent of 6 dB more annoyed. After control for age the effect is less than 3 dB (no longer significant). [N=1431]	Fields, Walker, 1982b:224-225, 231
1973-74 Sendai Road Traffic (JPN-094)		XdB {1}		Education (3 groups)	Noise (L_{eq}), and 10 other variables	High school educated respondents are the equivalent of about 1 dB less annoyed than middle school or university. [N=939]	Shibuya, Tamno, Sone, Nimura, 1975:427

Table 06 -- Issue 2.m: Home ownership

Hypothesis: Home owners are more annoyed

Study (Catalog ID number)	Finding: If owner then annoyance is: Lower	Same	Higher	Methodology: Measure of ownership	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1976-77 Dulles Concorde (USA-127)			X% sr {1}	Own/rent	Noise level (communities)	Pre-Concorde interviews analyzed. Owners more annoyed by 11%. [N=2004]	Kirschner Associates, 1976:20,21
1969 Munich [AIRCRAFT] (GER-034)			X% sr {1}	Ownership	None	20% more owners than renters say aircraft noise not tolerable. [N≅660]	Deutsche . ., 1974: 224
1970 French Sonic Boom (FRA-045)			X_o sr {3}	Own/rent	None	"..property owners.." are "..the most annoyed.." (Noise level or number of flights, might be higher in rural, home-owning areas.) [N≅2000]	Centre ..., 1971: 27, 28
SR-71 Supersonic (USA-023)			X% {1}	Ownership	None	About 5% more owners are annoyed. Author labels this "not a large difference". [N=3332]	Tracor Inc., 1970:xvii, A33
1984 Glasgow Aircraft/ Road (UKD-238)		X_{vb} {4}		Ownership	Noise (24hr L_{eq})	Not a " major effect" [N≅600]	Diamond, et al., 1986:33, 34, 55
1980 Australian 5-Airport (AUL-210)		X_{dB} ns {1}		Own, renting or buying	Noise (NEF)	Owners are the equivalent of about 1 dB more annoyed (not significant). [N=3223]	Bullen, Hede, Kyriacos, 1986:214; Hede, Bullen, 1982a: 80,112,115

Study	Lower	Same	Higher	Meas. Own	Controls	Comments	Reference
Irish, CEC Impulse Noise (IRE-254)		X_{o} ns {3}		Owners/ others	Children, Education Age, Sex	Home ownership has no significant effect on impulse noise or road traffic noise annoyance in a regression equation. [N≅450]	Hayden, Whelan, Dillon, 1984:40
1977 French Light Aircraft (FRA-146)			X_{r} sr {1}	Own/rent	Noise (Psophic index)	Owners are more annoyed. $r_{ax.n}$=0.14 [N≅700]	La Gêne ..., 1978:69, 121
1975 German General Aviation (GER-114)			X_{r} sr {1}	Own/rent	None	Owners are more annoyed. r_{ax}=0.15 [N=398]	Rohrmann, 1975:64
1972 J.F.K. Airport (USA-059)		X_{vb} {4}		Ownership	None	"Minimally" related to annoyance. [N≅1500]	Leonard, Borsky, 1973: 697
1980 John Wayne Airport (USA-207)			X_{vb} {4}	Own/rent	Noise (All are in 65 CNEL contour)	"..homeowners consider noise to be a more serious problem than do renters." [N≅300]	VTN Consolidated, 1980: X-34
1983 Controlled Exposure Helicopter (USA-235)		X_{dB} ns {1}		Own/rent	Noise (L_{eq})	Owners equivalent of 1.8 dB more annoyed, not significant. (n≅4000 daily ratings) [N=332 respondents]	Fields, Powell, 1985:41
1980 Salt Lake City In-Home Rating [AIRCRAFT] (USA-219)	X_{dB} ns {2}			Own/rent	Noise (Peak noise level, dB(A))	Owners are less annoyed (equivalent of 5 dB) (not significant). (n≅1100 ratings of individual flyovers) [N≅100 respondents]	Dempsey, Stephens, Fields, Shepherd, 1983:25, 37
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975-76 S. Ontario Community Noise (CAN-121)		X_{o} ns {3}		Ownership	Noise (L_{dn}), house type	No significant differences (t-tests). [N≅500]	Taylor, Birnie, Hall, 1978: 1381

Study	Lower	Same	Higher	Meas. Own	Controls	Comments	Reference
CEC Impulse Noise (FRA-252, GER-253, IRE-254, NET-255)		X vb {4}		Own house	Noise level	"Very slight, but present" effects include owners are "..a little more annoyed (at lower noise levels)". [N≅1610]	Groeneveld, de Jong, 1985b:59
1972 Copenhagen Traffic (DEN-075)		X o ns {3}		Own house	Noise (2 groups: 51-63, above 68 24hr L_{eq})	"..no significant relation.." with annoyance. [N≅950]	Relster, 1975:73
1979 French Behavioral Effects [ROAD TRAFFIC] (FRA-197)		X vb {4}		Renter/-owner	Noise (dichot-omy)	No "meaningful" difference between renters and owners but is a contrast between co-owners and low cost apartments (presumably renters) in an AID analysis. [N≅1480]	Lambert, Simonnet, 1980:23
1972 New Tokaido/ New Sanyo Railway (JPN-065)		X o ns {3}		Own/rent	Not repo-rted	"No relationship to whether..owns or rents..". [N≅420]	Sone et al., 1973: p. 12 in translation
Philadelphia Community Noise (USA-058)			X % sr {1}	Own/rent (based on type of dwelling)	None	Those in apartments are assumed to be renters and are at least 5% less likely to be annoyed. [N=490]	Bragdon, 1969:20; Bragdon, 1971: 169
1973 10-City French Traffic Noise (FRA-092)	X % {1}			Owner (Co-proprietors)/Tenants of apartments	Noise in 2 groups (12hr L_{eq})	At least 7% fewer apartment owners than renters are annoyed. Slightly higher annoyance for the 33 house owners. [N=349]	Vallet, et al., 1978:432, 434
1978 US Army Impulse Noise (USA-170)		X o ns {3}		Own/rent	Noise level, study area	Reactions to blast noise are not significantly different for (off-base) renters and owners. [N≅1730]	Schomer, 1982:9,10

Study	Lower	Same	Higher	Meas. Own	Controls	Comments	Reference
1975 British Railway (UKD-116)		X_{dB} ns {1}		Own/rent	Noise (24hr L_{eq})	Owners the equivalent of 1 dB more annoyed. [N=1449]	Fields, Walker, 1982b:220
1978 Spokane Community (USA-171)		X_o ns {3}		Home ownership	None	Spearman's rho is r_s=-.01 (not significant) [N≅750]	Perdue, Coates, 1979:53

Table 07 -- Issue 2.n: Dwelling type (single/multiple)

Hypothesis: Residents of single-unit dwellings are more annoyed

Study (Catalog ID number)	Finding: If single-unit dwelling then annoyance is: Lower	Same	Higher	Methodology: Measure of dwelling type	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1980 Australian 5-Airport (AUL-210)		X_{dB}^{sr} {6}		Detached house and 4 other groups	Noise (NEF)	Detached are slightly less annoyed. Significance test is for effect of 5 house types. [N=3245]	Hede, Bullen, 1982a: 80,112,117
1971 3-City Swiss [AIRCRAFT] (SWI-053)		X_{dB}^{ns} {1}		Single or multiple family house	Noise	Residual annoyance scores from regression of annoyance on noise level are within the equivalent of 3 dB. [N=3939]	Grandjean, et al., 1973:657; Graf, Meier, Müller, 1974:182
Scandinavian 9-Airport (SWE-035)			$X_{\%}$ {1}	Villa (semi-detached) / others	None	9% greater annoyance by villa and semi-detached. (18% vs. 9%) [N≅3740]	Rylander, Sörensen, Kajland, 1972:432
1977 French Light Aircraft (FRA-146)			X_{r}^{sr} {1}	Single family, apartment	Noise (Psophic index)	Dwellers in single homes are more annoyed. $r_{ax.n}$=0.16 [N≅700]	La Gêne ..., 1978:69, 121
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975-76 S. Ontario Community Noise (CAN-121)		X_{o}^{ns} {3}		Single, townhouse, apartment	Noise (L_{dn}), home ownership	39 of 42 tests showed no significant difference. Where a difference, townhouse are more annoyed than apartments. [N≅500]	Taylor, Birnie, Hall, 1978: 1381

Study	Lower	Same	Higher	Types	Controls	Comments	Reference
1979 Danish Railway (DEN-200)	X_{dB} {1}			Single family, multistory	Noise (24hr L_{eq})	Those in single family dwellings are the equivalent of at least 3 dB less annoyed for "strongly annoyed" but no difference for any "annoyed". [N≅610]	Andersen, Kühl, Relster, 1983:312; Reaktioner .., 1982:50-51
1975 Western Ontario Traffic (CAN-120)		X_{o} ns {3}		Single-unit, row house, apartment	Noise (24hr L_{eq})	Not significant tendency for higher annoyance in apartments at most noise levels. Significant interaction with noise. [N=300]	Bradley, Jonah, 1979a:598, 603
1980 British Sound Insulation of Flats [INTERIOR NOISE] (UKD-233)			X_{dB} {1}	Apartments/ attached houses	Insulation between flats (AAD, Aggregate Adverse Deviation)	Apartment dwellers are the equivalent of more than 20 dB less annoyed by the noise of neighbors. It is hypothesized that this is due to lower expectations. [N≅700]	Langdon, Buller, Scholes, 1983:258
1973 10-City French Traffic Noise (FRA-092)	X% {1}			Single units/ apartments	Noise (12hr L_{eq})	The 33 bungalow owners are at least 5% less likely to be annoyed than apartment owners or renters. [N=299]	Vallet, et al., 1978:432, 434
1972 Birmingham New Motorway (UKD-073)		X_{vb} {4}		"Type of dwelling"	None	"..type of dwelling... uncorrelated.." with annoyance. Contrast may be of 2-story houses and 8-19 story blocks of flats. [N≅360]	Lawson, Walters, 1973:9
1961 Central London Traffic (UKD-009)		$X_{\%}$ {1}		Flats, others (both attached & detached)	None	On an open question, 5% more in flats mention road traffic noise, but no difference for mentions of all outdoor sounds. [N=1377]	McKennell, Hunt, 1966:Table 10
1975 British Railway (UKD-116)		X_{dB} ns {1}		Flats attached detached	Noise (24hr L_{eq})	Flats are the equivalent of 2 dB more annoyed. [N=1453]	Fields, Walker, 1982b:219

Study	Lower	Same	Higher	Types	Controls	Comments	Reference
1978 Spokane Community (USA-171)		X_o ns {3}		Single, duplex, apartment, mobile home	None	Spearman's rho is r_s=-.02 (p=.54) [N≅750]	Perdue, Coates, 1979:53
Philadelphia Community Noise (USA-058)			$X_{\%}$ sr {1}	Apartment, other	None	Those in apartments are assumed to be renters and are at least 5% less likely to be annoyed. [N=490]	Bragdon, 1969:20; Bragdon, 1971: 169

Table 08 -- Issue 1.i.i: Length of residence

Hypothesis: Longer residents are less annoyed

Study (Catalog ID number)	Finding: With increased residence annoyance is: Less	Same	Higher	Methodology: Measure	Shortest separated time-period	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED								
1976-77 Dulles Concorde (USA-127)		X_s {1}		Years at residence	Under 2 years	None	In pre-Concorde interviews, residents under 2 years and over 10 years are within 5%, but are about 5% less annoyed than 3-9 years. [N=1776]	Kirschner Associates, 1976:21, 22
1969 Mixed Road and Aircraft (UKD-033)		X_{vb} {4}		Not reported	Not reported	Not reported	Relationship is "consistent" with "not very significant" relationships in other surveys. [N≅315]	Bottom, Waters, 1972:18
1982 British Helicopter Disturbance (UKD-225)		X_o ns {3}		Years in area	Under 4 years	Noise (study area)	Residence length not significantly related to annoyance in areas. [N≅480]	Atkins, Brooker, Critchley, 1983:24, Table 11
1961 Heathrow (UKD-008)		X_r ns {1}		6-month groups since moved in	6 months (not specifically contrasted)	Noise (average peak, PNDB)	$r_{ax.n}$=-0.02 [N≅1730]	McKennell, 1963: Apndx. D
1978 Canada 4-Airport [Toronto sample] (CAN-168)		X_r ns {1}		Time in house	Continuous variable	Noise (24hr L_{eq})	$r_{ax.n}$=0.03 [N≅670]	Taylor, 1984:247, 250

Study	Less	Same	Higher	Measure	Time	Control	Comments	Reference
1963 Schiphol (NET-013)			X_{vb} {4}	Time living in such areas	Not stated	Not reported	Those "only briefly" living in area are "less" annoyed. [N≅1000]	Bitter, 1972:266
1980 Australian 5-Airport (AUL-210)	X_{dB} ns {2}			Years at this address	Under 1 year, then 4 longer categories	Noise (NEF)	Life-time residents are the equivalent of more than 3 dB less annoyed than under 1 year, but all other lengths are less than 3 dB less annoyed. [N=3255]	Hede, Bullen, 1982a: 80,112,116; Bullen, Hede, Kyriacos, 1986:214
1967 Heathrow (UKD-024)		X_{dB} {1}		Years in area	Under 2 years	Noise (Average peak noise level)	The annoyance increase from 2 to 20 years is the equivalent of less than 3 dB. [N≅4690]	MIL Research, 1971:27,28, 174
1965 French 4-Airport (FRA-016)		X_{vb} {4}		Time since moved in	Not reported	None	Residence length does not "..influence.." annoyance. [N≅2000]	Centre ..., 1968:47
1971 3-City Swiss [AIRCRAFT] (SWI-053)		$X_{r\ sr}$ {5}		Months in community	Under 1 year	Noise level	w^2=0.003 Longer residents being more annoyed explains only 0.3% of the variance in the residuals from a regression analysis. [N=3924]	Grandjean, et al., 1973:659; Graf, Meier, Müller, 1974:174
Scandinavian 9-Airport (SWE-035)			$X_{\%}$ {1}	Year moved into area	Not reported	None	5% greater annoyance for residents of about 3 to 5 or more years of residence. [N≅3740]	Rylander, Sörensen, Kajland, 1972:432

Study	Less	Same	Higher	Measure	Time	Control	Comments	Reference
1953 USA 8-Airport (USA-004)		X_{vb} {4}		Months in the house	6 months	Age (under or over 40)	Long residence "does not necessarily reduce annoyance". [N≅3600]	Borsky, 1954:83
1961 St. Louis Sonic Boom (USA-007)		X_s {1}		Years in area	3 years	Distance from flight path (2 groups)	7% more of under 3 year residents are greatly annoyed in one group, 2% more in other group with no consistent pattern for intermediate lengths. [N=1145]	Borsky, 1962:34, 36, Apndx B p.5.
1974 French National Aircraft [AMBIENT NOISE] (FRA-099)			X_s {1}	Years in neighborhood	2-9 years compared to 10+ years	None	About 7% more of newer residents "very or fairly satisfied". [N≅1000]	Francois, 1975b:55
1975 Orly Aircraft [AMBIENT NOISE] (FRA-113)		X_s {1}		Years in neighborhood	2/9 years compared to 10+ years	Age (3 groups)	In oldest age group 18% more long residents are annoyed, in youngest 6% less long residents annoyed, overall 7% more older annoyed. [N≅990]	Francois, 1975b:57
1977 French Light Aircraft (FRA-146)			$X_{r_{ns}}$ {2}	Years in district	Years (continuous variable)	Noise (Psophic index)	$r_{ax.n}$=0.11 Annoyance increases with time. [N≅700]	La Gêne ..., 1978:68, 121
1975 German General Aviation (GER-114)		$X_{r_{sr}}$ {5}		Years in area, years in house	Years (continuous variable)	None	r_{ax}≅0.09 for area (barely significant). r_{ax}≅0.08 for time in house [N=398]	Rohrmann, 1975:64
1972 J.F.K. Airport (USA-059)		$X_{r_{ns}}$ {1}		Length of residence in area	Years (continuous)	None	r_{ax}=0.001 [N≅1500]	Leonard, Borsky, 1973: 697; Borsky, 1975:39

Study	Less	Same	Higher	Measure	Time	Control	Comments	Reference
1974 Warsaw Aircraft (POL-198)			X_r {1}	Not reported	Not reported	Sex	r_{ax}=0.24 for women is higher (statistically significant) than for men (r_{ax}=0.12). [N≅510]	Koszarny, Maziarka, 1975:6
1983 Controlled Exposure Helicopter (USA-235)		X_{dB} ns {1}		Years in house	Under 9 months	Noise (L_{eq})	New residents are the equivalent of 2.6 dB more annoyed (not significant). (n≅4000 daily ratings) [N≅330 respondents]	Fields, Powell, 1985:41
1980 Salt Lake City In-Home Rating [AIRCRAFT] (USA-219)	X_{dB} ns {2}			Years at current address	1 year (under 5 years analyzed separately)	Noise (Peak noise level, dB(A))	Each year reduces annoyance by the equivalent of 0.2 dB (not significant) (n≅1100 ratings of single flyovers) [N≅100 respondents]	Dempsey, Stephens, Fields, Shepherd, 1983:25,37
USSR 22 Settlement [AIRCRAFT] (USR-042)	X_s {1}			Length in 3 groups	Under 5 years	None	14% more of the under 5-year than over 10-year residents are annoyed. [N≅2000]	Karagodina, Soldatkina, Vinokur, Klimukhin, 1969:184
1957 USA Air Base (USA-006)			X_s {1}	Years in neighborhood in 5 groups	Under 1 year	Noise level	5% less annoyance for those under 1 year in 3 of four groups. [N=2328]	Borsky, 1961b:56
1969 Munich [AIRCRAFT] (GER-034)			X_{sr} {1}	Time in house, time in area	Under 1 year (not specifically contrasted)	Noise (FBl)	For time in area, $r_{ax.n}$= 0.20, in house $r_{ax.n}$=0.17. Longer residents more annoyed. [N≅660]	Deutsche . ., 1974: 208, 215, Apndx.A,72

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Study	Less	Same	Higher	Measure	Time	Control	Comments	Reference
1980 John Wayne Airport (USA-207)			X_{vb} {4}	Years	Under 2 years, 2-5 years, over 5	Noise (All are in 65 CNEL contour)	More long-term residents "consider" aircraft noise to be a problem. [N≅300]	VTN Consolidated, 1980: X-28
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED								
1968 London Traffic (UKD-030)			X_{vb} {4}	Length of residence	Under 6 months	Not reported	Under 6 months "..were more satisfied with noise.." [N≅1990]	Griffiths, Langdon, 1968:18
1986 Darmstadt Movers (GER-275)			X_{vb} {4}	Time since decided to move to present house	4 months from time decided on new house	Before /after annoyance at same locations	From moving decision (before moving) to 4 months after decision the noise satisfaction is "decreasing." [N≅150]	Paechter et al., 1988:73
1979 Hornsby Rifle Range Study (AUL-209)	$X_{r\ sr}$ {1}			Years at the address	Under 1 year	None	Longer residents are less annoyed, r_{ax}=-0.22. The relationship is also affected by age. [N≅190]	Hede, Bullen, 1982b:47; Hede, Bullen, 1981:55
1975-76 S. Ontario Community Noise (CAN-121)		$X_{o\ ns}$ {3}		Length of residence	Not reported	Noise (5-dB L_{dn} groups)	"..a positive relationship.." but not significant. [N≅300]	Taylor, Hall, 1977: 592, 594
1979 Danish Railway (DEN-200)	$X_{o\ ns}$ {3}			Years in house	1-5 years (less than 1 year not sampled)	Noise (24hr L_{eq})	"..the longer.." the residence the "smaller.." the disturbance with at least a 5% difference in 3 of 5 noise groups. [N≅ 610]	Andersen, Kühl, Relster, 1983:314; Reaktioner ..., 1982:88
1972 Copenhagen Traffic (DEN-075)		X_o {3}		Years in dwelling	Not reported	Noise (2 groups)	"..no significant relation.." with annoyance. [N≅950]	Relster, 1975:73

Study	Less	Same	Higher	Measure	Time	Control	Comments	Reference
1975 Western Ontario Traffic (CAN-120)		X_{r}^{sr} {6}		Months in dwelling	Not reported	Noise (24hr L_{eq})	$r_{ax.n}$=-0.08 Annoyance decreases with residence (significant). [N=1150]	Jonah, Bradley, Dawson, 1981:494
1976 Canada Impulse Noise (CAN-136)		X_{r}^{ns} {1}		Years exposure to forge noise	Not reported	Noise level, age	$r_{ax.nw}$=0.02 (w=age) [N≅600]	Seshagiri, 1981:56
Philadelphia Community Noise (USA-058)		$X_{\%}^{ns}$ {1}		Length of time at the address	1 year (9 groups)	None	Less than 5% difference for under 1,1-3 years and those over 10. [N≅500]	Bragdon, 1969:21; Bragdon, 1971:171
1973 10-City French Traffic Noise (FRA-092)	X_{r}^{sr} {1}			Years in the area	1-2 years (5 groups)	Noise (12hr L_{eq})	$r_{ax.n}$=-0.14 The reduction in annoyance with time is strongest at low noise levels. [N=872]	Vallet, et al., 1978:436, 437
1973 10-City French Traffic Noise (FRA-092)			X_{dB}^{ns} {2}	Conducted a new survey after two years	2 years since the previous survey	Noise (12hr L_{eq}), same study areas	Overall annoyance increased by about the equivalent of 3 dB (not significant) in the 2 years [N≅400]	Vallet, et al., 1978:438, 439
1975-76 l'Hay les Roses Barrier (FRA-124)	X_{vb} {4}			Years	Under or over 10 years	Noise (12hr L_{eq})	Residents over 10 years "..suffer less annoyance." [N≅690]	Vallet, Abramowitch, Lambert, 1979:968
1943 British Home (UKD-001)		X_{vb} {4}		Time in houses	Not reported	None	No "appreciable" effect on consciousness of sound from outside or from neighbor's house. [N≅2010]	Chapman, 1948:2

Study	Less	Same	Higher	Measure	Time	Control	Comments	Reference
1977 Zurich Pilot Traffic (SWI-158)			X_{vb} {4}	Not described	Not reported	None	"..not found an influence of" length of residence. [N≅1290]	Wanner, Wehrli, Nemecek, Turrian, 1977:112
1978 Zurich Time-of-day [ROAD TRAFFIC] (SWI-173)			X_{vb} {4}	Not described	Not reported	Noise	Not "a clear dependence.." for all population. Longer residents are more annoyed, but only in rural areas. [N≅1600]	Wehrli, Nemecek, Turrian, Hofmann, Wanner, 1978:146
1972 English Road Traffic (UKD-072)			X_{vb} {4}	Time in present accommodation/ time in neighborhood	Not reported	Traffic flow (vehicles per hour)	Residence time is not related to "any notable extent" to annoyance or to traffic flow [N≅5800]	Morton-Williams, Hedges, Fernando, 1978: 72, 73
1975 British Railway (UKD-116)	X_{dB} s {1}			Years at this address	Under 1 year	Noise (24-hr L_{eq}), age, house age	Life-time residents are the equivalent of 11 dB less annoyed, but even a 30-years residence is equivalent to less than 3 dB after controls. [N=1450]	Fields, Walker, 1982b:224-225, 232
1973-74 Sendai Road Traffic (JPN-094)			X_{dB} {1}	Duration of residence	Under 2 years, 2-8 years, over 8 years	Noise (L_{eq}), age, and 9 other variables	Very slight tendency (equivalent of less than 2 dB) for over 8 years to be more annoyed [N=939]	Shibuya, Tanno, Sone, Nimura, 1975:427
1969 Paris Road Traffic (FRA-041)			X_{o} ns {3}	Time in dwelling	Under 6-months (6 groups)	Noise level	No statistically significant relation with annoyance. [N≅690]	Aubree, Auzou, Rapin, 1971:42, 492

Table 09 -- Issue 1.c.i: Benefits from noise source (employment, access)

Hypothesis: Those benefiting from the noise source are less annoyed

Study (Catalog ID number)	Finding: If benefit, noise annoyance is: Lower	Same	Higher	Methodology: Type of benefit	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1961 Heathrow (UKD-008)	$X_{r_{ns}}$ {1}			Business or work connection with airport	Noise (Average peak)	$r_{ax.n}$=0.01 [N≅1730]	McKennell, 1963:6-5, Apndx. D
1963 Schiphol (NET-013)	X_{vb} {4}			Employed by firm concerned with aviation	Not known	Noise nuisance is "just as great" whether or not employed by a concern associated with aviation. [N≅1000]	Bitter, 1972: 266
1971 3-City Swiss [AIRCRAFT] (SWI-053)	$X_{r_{sr}}$ {6}			Flown more than 10 times, occupational ties of family	Noise level	w^2=0.006 Only 0.6% of residual annoyance explained by tendency for frequent flyers or those with occupation ties to be less annoyed. (n=2535 had flown at least once). [N=3920]	Graf, Meier, Müller, 1974:148, 218,220
1953 USA 8-Airport (USA-004)	X_o {3}			Occupational ties of family	None	Occupational connections are about equally likely for those most bothered (36%) and those least bothered (33%). [N≅3600]	Borsky, 1954:92
1977 French Light Aircraft (FRA-146)	$X_{r_{ns}}$ {1}			Household member's profession related to aeronautics	Noise (Psophic index)	$r_{ax.n}$=0.01 [N≅700]	La Gêne ..., 1978:68, 121

Study	Lower	Same	Higher	Benefits	Controls	Comments	Reference
1975 German General Aviation (GER-114)			X_r ns {1}	Involved professionally with airfield or aircraft	None	r_{ax}=-0.03 [N=398]	Rohrmann, 1975:64
1982 United Kingdom Aircraft Noise Index (UKD-242)	$X_\%$?s {1}			Work at airport or for company doing business with an airport	Noise (24hr L_{eq}, for 1 week)	"In some areas" economic ties are associated with a 25% decrease in rating of "not acceptable" (not individual-level analysis). [N≅2090]	Brooker, Richmond, 1985b:335; Brooker, Critchley, Monkman, Richmond, 1985:4,28, 59,131
1981 UK 5-General Aviation Airport [Leavesden sample] (UKD-243)			X_r ns {1}	Work at airport or for company doing business with an airport	Noise (L_{eq}, NNI)	Those working are not significantly less annoyed. $r_{ax.n}$=-0.04. [N=89]	Directorate ..., 1982a: 18,77,79
1980 John Wayne Airport (USA-207)	X_{vb} {4}			Use of airport, weekly, monthly, yearly, other	Noise (All are in 65 CNEL contour)	Users "..are less likely to state that...aircraft noise is a problem for you in your neighborhood.." [N≅300]	VTN Consolidated, 1980: X-30
1983 Controlled Exposure Helicopter (USA-235)			X_{dB} ns {1}	Household member employed by military	Noise (L_{eq})	A not significant 0.3 dB response reduction for military. (n≅4000 daily ratings) [N≅330 respondents]	Fields, Powell, 1987:488; Fields, Powell, 1985:41
1957 USA Air Base (USA-006)	$X_\%$ {1}			Family member at Air base or base-related business	Noise level	In all 4 noise groups those benefiting are more annoyed. In 3 groups at least 6% more of those benefiting are annoyed. [N=2328]	Borsky, 1961b: 57, 155

Study	Lower	Same	Higher	Benefits	Controls	Comments	Reference
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
CEC Impulse Noise (FRA-252, GER-253, IRE-254, NET-255)			X_{vb} {4}	Economic ties	Noise level	Those with ties might be less annoyed but the size of the effect is "hardly different". [N≅1610]	Groeneveld, de Jong, 1985b:59
1973 10-City French Traffic Noise (FRA-092)			X_{s} {1}	Heavy users of the rated expressway	Noise (12hr L_{eq})	Heavy users are at least 5% more annoyed in 7 groups, same in 2 and at least 5% less annoyed in 3 groups. [N≅1000]	Vallet, et al., 1978:432-434
1972 English Road Traffic (UKD-072)			X_{s} {1}	Car ownership, holding driving license	Traffic flow (Vehicles per hour)	Only 3% fewer car owners score high on disturbance. Disturbance is not related to traffic flow. [N≅5800]	Morton-Williams, Hedges, Fernando, 1978: 68, 72,88
1975 British Railway (UKD-116)			X_{dB} ns {1}	Member of household works for railway	Noise (24hr L_{eq})	Households with a railway employee are the equivalent of 2 dB less annoyed. [N=1449]	Fields, Walker, 1982b:226-227
1981 Alabama Blast Noise (USA-206)			X_{vb} ? {4}	Report "benefit in any way from nearby mines"	Noise level, study site	No "consequential" differences between the total sample and the subsample who either over-report numbers of blasts or have no economic connections. [N≅1040]	Fidell, Horonjeff, et al., 1982: G-10, G-12
1973-74 Sendai Road Traffic (JPN-094)			X_{dB} {1}	Owner of private car	Noise (L_{eq}) and 10 other variables	Car owners are less than the equivalent of 1 dB more annoyed than non-owners. [N=939]	Shibuya, Tanno, Sone, Nimura, 1975:427
1977 Netherlands New Railway (NET-195)	X_{vb} {4}			User of railway line	Not known	Users of the new railway line are "less" annoyed than others. [N≅130]	van Dongen, van den Berg, 1980:1 Summary

Table 10 -- Issue 1.d: Fear of danger from the noise source

Hypothesis: Fear of danger from the noise source increases annoyance

Study (Catalog ID number)	Finding: If fear or believe danger annoyance is: Lower	Same	Higher	Methodology: Indication of fear or perceived danger	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
USA Airport [9 Cities] (USA-022, USA-032, USA-044)		X_r {1}		Fear when aircraft overhead	None	Fear is the strongest predictor in a multiple classification analysis. R^2=0.16 before control for noise. [N≅8500]	Connor, Patterson, 1972:50,45, 113
1982 British Helicopter Disturbance (UKD-225)		X_{o_s} {3}		Fear overhead aircraft could crash	Noise (study area)	Annoyance and fear questions refer to all types of aircraft. Fearful are more annoyed in all areas ($p<.05$ in 4 of 5 areas). [N≅480]	Atkins, Brooker, Critchley, 1983:27
1961 Heathrow (UKD-008)		$X_{r_{sr}}$ {1}		Index: too low for safety, danger crash & volunteer danger	Noise level	$r_{ax.n}$=0.47 [N≅1730]	McKennell, 1963:4-5, Apndx. D
1967 Heathrow (UKD-024)		$X_{r_{sr}}$ {1}		Believe there is danger aircraft might crash nearby	Noise level, readiness to complain	Fear increases the percent of variance explained by 5%. [N≅4690]	Direct ..., 1971:77

Study	Lower	Same	Higher	Fear	Controls	Comments	Reference
1976 Heathrow Concorde (UKD-130)			Xr {1}	Believe there is danger aircraft might crash nearby	None	r_{ax}=0.17 for Concorde, r_{ax}=0.30 for aircraft generally. Fear does not contribute to Concorde annoyance after entering general aircraft annoyance in multiple regression analysis. [N≅2600]	McKennell, 1977: 25
1978 Canada 4-Airport [Toronto sample] (CAN-168)			X_{dB}^{sr} {1}	Volunteer danger as "aspect of aircraft or airport which concern you"	Noise (NEF and 24hr L_{eq})	$r_{ax.n}$=0.41. However, the study also found that the occurrence of a plane crash does not increase fear or annoyance. [N=554]	Hall, Taylor, Birnie, 1980:367; Taylor, 1984:247, 250
1978 Canada 4-Airport [1 General Aviation Airport] (CAN-168)			X_{dB}^{ns} {2}	Volunteer danger as "aspect of aircraft or airport which concern you"	Noise-(NEF)	Consistent strong relationship. Overall significance not tested. Not statistically significant within each small noise group. [N=176]	Birnie, Hall, Taylor, 1980b: 40, 41
1980 Australian 5-Airport (AUL-210)			X_{dB} {1}	How afraid of possible plane crash	Noise (NEF)	The most afraid are the equivalent of at least 15 dB more annoyed. [N≅3250]	Hede, Bullen, 1982a:106
1971 3-City Swiss [AIRCRAFT] (SWI-053)			X_{dB}^{sr} {1}	Fear plane might crash when hear it overhead	Noise level	Significant difference between residuals from regression analysis is equivalent to more than 3 dB. [N=3842]	Grandjean, et al., 1973:657; Graf, Meier, Müller, 1974:148, 211
1953 USA 8-Airport (USA-004)			X_{vb} ? {4}	Fear of crashes	None	Does not directly compare fear groups but does report that the more bothered are more fearful. [N≅3600]	Borsky, 1954:80

Study	Lower	Same	Higher	Fear	Controls	Comments	Reference
1972 J.F.K. Airport (USA-059)			$X_{r\ sr}$ {1}	Safety of low aircraft, fear of crash, startle	Noise (CNR)	$r_{ax.n}$=0.68 (June survey) and $r_{ax.n}$=0.55(August survey) [N≅1500]	Leonard, Borsky, 1973: 697, 701
1975 J.F.K. Airport (USA-110)			$X_{o\ sr}$ {3}	Safety of low aircraft, fear of crash, startle	Noise (CNR)	Significant difference (t-test) between mean annoyance scores of fear groups within study areas. [N≅1200]	Borsky, 1977:48, 51
1983 Controlled Exposure Helicopter (USA-235)			$X_{dB\ s}$ {1}	Fear crash when hear helicopters	Noise (L_{eq})	Those "usually" fearful are the equivalent of 7 dB more annoyed. (n≅4000 daily ratings) [N≅330 respondents]	Fields, Powell, 1987:488; Fields, Powell, 1985:42
1957 USA Air Base (USA-006)			$X_{\%}$ {1}	Spontaneous mention of aircraft as dangerous condition	Noise level	At least 27% more of the fearful are much annoyed. [N=2328]	Borsky, 1961b: 52, 155
1969 Munich [AIRCRAFT] (GER-034)			$X_{r\ sr}$ {1}	Fear associated with aircraft in many situations	Noise (FBl)	$r_{ax.n}$=0.39 Authors are uncertain about direction of causal link from fear to annoyance. [N≅660]	Deutsche . ., 1974: 177, 181 Apndx.A,72; Rohrmann et al., 1973: 774
1977 3-Phase JFK Concorde (USA-143)			$X_{\%}$ {1}	Fear of aircraft crashes	Distance from airport (3 groups)	At least 65% more high annoyance for most fearful. [N=5404]	Borsky, 1978: 10
1979 Canada 3-Airport General Aviation (CAN-181)			X_{vb} {4}	Worry possibility of crash	None	Lower median annoyance for those not worried. P>.05. [N=30]	Taylor, Birnie, Hall, 1980: 102

OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED

Study	Lower	Same	Higher	Fear	Controls	Comments	Reference
1975 Western Ontario Traffic (CAN-120)			X_{sr} {1}	Concern will be traffic accident near home	Noise (24hr L_{eq})	$r_{ax.n}$=0.25 [N=1150]	Jonah, Bradley, Dawson, 1981:494
1976 Hamburg Urban (GER-134)			X_{sr} {1}	Scale concerning assessed danger of noise source	Noise (L_m)	$r_{ax.n}$=0.38 [N=636]	Guski, Wichmann, Rohrmann, Finke, 1978: Table 2
074 1973 USC Los Angeles Freeway (USA-088)			X_{sr} {1}	Fear of freeway accidents harming property or family	Noise level, demographic characteristics	Fear explains 4% of the variance in a multiple regression analysis. [N≅600]	Jenkins, et al., 1974: 63, 64, 98
1975 British Railway (UKD-116)			X_{dB} {1}	Fear from crashes or crossing tracks	Noise (24hr L_{eq}), 9 other attitudes	The difference between the most and least fearful 10% of sample is the equivalent of about 13 dB. [N=1453]	Fields, Walker, 1982b:226-227, 233

Table 11 -- Issue 2.o: Belief that the noise could be prevented

Hypothesis: Belief that the authorities could prevent or reduce the noise increases annoyance

Study (Catalog ID number)	Finding: If believe noise could be reduced annoyance is: Lower	Same	Higher	Methodology: Measure of belief that could reduce	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
USA Airport [4 Cities] (USA-022)			X_r {1}	Designers, leaders, authorities are doing all they can	None	With no controls eta=.29. With noise level and 5 attitude variables (not necessarily causally prior) beta coefficient slightly reduced from b=.07 to b=.06. [N=3590]	Tracor Inc., 1971:54
USA Airport [2 Cities] (USA-044)			X_r ? {1}	Designers, leaders, authorities are doing all they can	None	r_{ax}=0.17. With noise level and 4 attitudinal variables (not necessarily causally prior) b=.07 and increase in R^2 is 0.004, not significant. [N≅1950]	Connor, Patterson, 1972:43, 45, 118
1961 Heathrow (UKD-008)			X_{sr} {1}	Believe officials, airlines, authorities, or designers could do something	Noise (Average peak, PNdB)	$r_{ax.n}$=-0.34 Results for beliefs about pilots might be different. [N≅1730]	McKennell, 1963: Appendix D, Appendix J-5.
1967 Heathrow (UKD-024)			X_{sr} {1}	Believe officials, airlines, authorities, or designers could do something	Noise (Average peak, PNdB)	$r_{ax.n}$=0.30. [N≅4690]	Directorate ..., 1971:75

Study	Lower Same Higher	Prevent	Controls	Comments	Reference
1976 Heathrow Concorde (UKD-130)	X_r {1}	Believe airport, airlines, or designers could do anything or now do all they can.	None	r_{ax}=0.18 for Concorde, r_{ax}=0.30 for aircraft generally, but it did not contribute to Concorde annoyance after entering general aircraft annoyance in multiple regression analysis. [N≅2600]	McKennell, 1977: 25
1961 St. Louis Sonic Boom (USA-007)	X% {1}	1) Believe sonic boom not necessary 2) Believe officials, pilots, Air Force could do something.	Distance from flight path (2 groups)	About 20% more are annoyed if believe the boom not necessary. About 13% more annoyed if felt boom could be reduced. [N=1145]	Borsky, 1962:26-27, 34 Apndx. p.10
1975 German General Aviation (GER-114)	$X_{r_{sr}}$ {1}	Believe recreational aircraft noise is partially avoidable	None	r_{ax}=0.51 [N=398]	Rohrmann, 1975:64
1983 Controlled Exposure Helicopter (USA-235)	X_{dB_s} {1}	Believe pilots or other authorities could reduce noise	Noise (L_{eq})	Those believing noise could be reduced "a lot" are the equivalent of about 8 decibels more annoyed. (n≅4000 daily ratings) [N=226 respondents]	Fields, Powell, 1987:488; Fields, Powell, 1985:42
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED					
1975 Western Ontario Traffic (CAN-120)	$X_{r_{sr}}$ {1}	Difficulty of reducing traffic noise in area	Noise (24hr L_{eq})	$r_{ax.n}$=-0.15. [N=1150]	Jonah, Bradley, Dawson, 1981:494

Study	Lower	Same	Higher	Prevent	Controls	Comments	Reference
1972 London Construction Site (UKD-074)			XdBer {1}	Whether believe that the noise could be reduced	Noise (L_{eq}), 4 attitude variables	Annoyance (previous week) reduced by the equivalent of more than 10 dB. The time frame for the noise reduction question is not specified. [N≅530]	Large, Ludlow, 1976:64; Ludlow, 1976:Table 26
1975 British Railway (UKD-116)			XdBs {1}	Believed ability of authorities to reduce noise	Noise (24hr L_{eq}) 9 attitudes (fear, sensitivity, etc.)	Those believing preventable are equivalent of about 15dB less annoyed. Effect is reduced but significant if 9 attitudes controlled. [N=1453]	Fields, Walker, 1982b:226-227, 233

Table 12 — Issue 1.b.ii: Annoyance with non-noise environmental impacts of the noise source

Hypothesis: Annoyance with non-noise impacts of the source increases annoyance with noise

Study (Catalog ID number)	Finding: If other nuisance, noise annoyance is: Lower	Same	Higher	Methodology: Type of non-noise nuisance	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1978 Canada 4-Airport [Toronto sample] (CAN-168)			X_{dsr} {1}	Perception of air pollution	Noise (5-dB NEF groups)	Significance of $p<.02$ in 2 of 3 NEF groups. [N≅550]	Hall, Taylor, Birnie, 1980:373, 378
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975 British Railway (UKD-116)			X_{ds} {1}	Index of dirt, smells, lights, privacy, property	Noise (24hr L_{eq})	The difference between the lowest and highest 10% of the sample is the equivalent of 26 dB. [N=1353]	Fields, Walker, 1982b:226

Table 13 -- Issue 1.f: General sensitivity to noise

Hypothesis: General sensitivity with noise increases annoyance

Study (Catalog ID number)	Finding: If say sensitive, annoyance is: Less	Same	More	Methodology: Indicator of sensitivity	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1961 Heathrow (UKD-008)			$X_{r_{sr}}$ {1}	Index: (6 Questions rate "noises in general")	Noise (Average peak, PNDB)	$r_{ax.n}$= 0.45, [N≅1730]	McKennell, 1963: Apndx. D, G
1961 Heathrow (UKD-008)			$X_{r_{sr}}$ {1}	Sensitivity to 7 common noises (eg. "banging door, dripping tap")	Noise (Average peak, PNDB)	$r_{ax.n}$= 0.17, [N≅1730]	McKennell, 1963: Apndx. D, G
1967 Heathrow (UKD-024)			$X_{r_{sr}}$ {1}	Sensitivity to 7 common noises (see UKD-008)	Noise (Average peak, PNDB)	$r_{ax.n}$= 0.18, [N≅4690]	Direct ..., 1971:75
1961 St. Louis Sonic Boom (USA-007)			X% {1}	Sensitivity to 7 common noises (see UKD-008)	Distance from ground zero (2 groups)	At least 5% more of the sensitive express "great" annoyance. [N=1145]	Borsky, 1962:34,39, Apndx. A, p. 17
1978 Canada 4-Airport [Toronto sample] (CAN-168)			$X_{r_{sr}}$ {1}	Self-rated sensitivity to "noise generally"	Noise (24hr L_{eq})	$r_{ax.n}$=0.33 [N≅670]	Taylor, 1984:247, 250

Study	Less	Same	More	Indicate	Controls	Comments	Reference
1976 Netherlands Military Airfield (NET-193)			X_r {1}	Self-rated sensitivity to noise generally	None	$r_{ax} \geq 0.38$ at all three airports. [N≅860]	de Jong, 1981b:6
1980 Australian 5-Airport (AUL-210)			X_{dB}^{s} {1}	5 questions about annoyance with common sounds	Noise level	High sensitivity groups are the equivalent of at least 10 dB more annoyed ($r_{ax.n}$= 0.37).[N≅3250]	Bullen, Hede, Kyriacos, 1986:212; Hede, Bullen, 1982a:107
1975 German General Aviation (GER-114)			X_r^{sr} {1}	5-item index for common sounds	None	r_{ax}=0.18 [N≅390]	Rohrmann, 1976:429; Rohrmann, 1975:79
1972 J.F.K. Airport (USA-059)		X_r^{ns} {1}		10 questions about reactions to common sounds	None	r_{ax}=0.03 (not significant) [N≅1500]	Leonard, Borsky, 1973: 697; Borsky, 1975:37
1975 English Mental Health Pilot [AIRCRAFT] (UKD-111)			$X_{\%}^{ns}$ {2}	Self rating of sensitivity relative to others	Noise (1 high and 1 low noise study area)	A 8% difference in "very" annoyed between 2 sensitivity groups is not significant. [N≅200]	Tarnopolsky, Barker, Wiggins, McLean, 1978:222, 223
1977 Heathrow Psychiatric Morbidity (UKD-148)			$X_{\%}^{sr}$ {1}	Self rating of sensitivity relative to others	Noise (NNI)	15% more are annoyed (top 3 of 6 points) in high sensitivity group. [N=5755]	Tarnopolsky, Morton-Williams, 1980:63, 64

OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED

Study	Less	Same	More	Indicate	Controls	Comments	Reference
1968 London Traffic (UKD-030)			X_{o} $_{sr}$ {3}	Rating of noise in shops, cafes, street, (may include home)	Noise (Traffic Noise Index)	Sensitivity measure might include environmental noise at home. Spearman rank order correlation for annoyance and sensitivity at least R_s=.89 within sites. [N≅1990]	Griffiths, Langdon, 1968:25
1972 London Traffic Noise (UKD-071)			X_{r} $_{sr}$ {1}	Rate general sensitivity to noise	Noise (24hr L_{eq})	Sensitivity increases R^2 for annoyance in a regression by 15% (from R_{an}=0.20 to R_{anx}=0.44). [N≅2870]	Langdon, 1976a:257, 258; Langdon, 1976c:252
1975 London/ Liverpool Panel [ROAD TRAFFIC] (UKD-118)			X_{r} $_{ns}$ {2}	Self-rating, Broadbent/ Gregory sensitivity scores	Noise level, study site	r_{ax}≅0.10 (not significant) within sites for Broadbent/ Gregory scale. [N=258].	Griffiths, Delauzun, 1977a:99, 100
1975-76 S. Ontario Community Noise (CAN-121)			X_{o} $_{sr}$ {3}	Self-rated sensitivity to noise generally	Noise (5-dB, L_{dn} groups)	Significant relationship (Kendall's tau) in 2 of 3 L_{dn} groups. [N≅300]	Taylor, Hall, 1977: 592, 593
1974 Brisbane S-E Freeway (AUL-226)			X_{r} $_{sr}$ {1}	Sensitivity to 10 common noises	Opinion of neighborhood (L_{10}, not entered step-wise regression)	Susceptibility increased R^2 by 6% over regression equation including neighborhood evaluation to which L_{10} did not contribute significantly. [N≅140]	Brown, 1980a:148; Brown, Law, 1978:56
1975-76 Australian 3-City Roadway (AUL-227)			X_{dB} $_{sr}$ {1}	Sensitivity to 10 common noises	Noise level	Difference between high and low sensitivity group is the equivalent of at least 5 dB. [N≅800]	Brown, 1978:70, 112
1974 Dordrecht Home Sound Insulation [ROAD TRAFFIC] (NET-106)			$X_{\%}$ $_{sr}$ {1}	Self-rated sensitivity to noise generally	None	At least 30% more of the very sensitive are more annoyed. [N≅300]	Bitter, 1979b:174, 175

Study	Less	Same	More	Indicate	Controls	Comments	Reference
1979 Hornsby Rifle Range Study (AUL-209)			$X_{r_{sr}}$ {1}	5 questions about annoyance with common sounds	Noise (ASEL-mean level of energy from impulses, dB(A))	$r_{ax.n}$=0.26 (significant). [N≅190]	Hede, Bullen, 1982b:47; Hede, Bullen, 1981:35, 48
1978 USA Expressway Opening (USA-156)			$X_{r_{s}}$ {1}	11-item scale of general sensitivity to noise	Noise level did not vary in the single study area	$r_{ax.n}$=0.23 after new highway opened. [N=131]	Weinstein, 1980:246
1976 Hamburg Urban (GER-134)			$X_{r_{sr}}$ {1}	5-item index of sensitivity to common sounds	Noise (L_m)	$r_{ax.n}$=0.22, [N=636]	Guski, Wichmann, Rohrmann, Finke, 1978: Table 2
1961 Central London Traffic (UKD-009)			$X_{\%}$ {1}	6-item scale of sensitivity attitudes	None	60% difference in annoyance between least and most sensitive. One of the 6 items concerns noise in the area. [N=1377]	McKennell, Hunt, 1966:VI 1,2, Table 26
1972 English Road Traffic (UKD-072)			X_{o} {3}	Self-description as more or less sensitive than most	Traffic flow (vehicles per hour)	At least 5% difference in sensitivity of high and low disturbance respondents. [N≅5800]	Morton-Williams, Hedges, Fernando, 1978: 72, 73, 85, 87
1975 British Railway (UKD-116)			$X_{dB_{s}}$ {1}	Importance of noise generally and own perceived sensitivity	Noise (24hr L_{eq})	An effect equivalent to about 9 dB, but it is reduced (not significant) if controlled for preventability, fear and believed health effect variables. [N=1453]	Fields, Walker, 1982b:228-229, 233

Table 14 -- Issue 1.c.ii: Belief in importance of noise source

Hypothesis: A belief in the importance of the noise source increases annoyance

Study (Catalog ID number)	Finding: If benefit, noise annoyance is: Lower	Same	Higher	Methodology: Indicator of importance	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1961 Heathrow (UKD-008)		X_{sr} {5}		Opinions about the importance of the airport	Noise (Average peak, PNdB)	Slightly more annoyance if believe airport is important. $r_{ax.n}$=0.06 [N≅1730]	McKennell, 1963:6-5, Apndx. D
1972 J.F.K. Airport (USA-059)	X_{sr} {1}			Opinion on importance of airport to nation, community, and own family	Noise (CNR)	Partial correlations ($r_{ax.n}$=-0.19, =-0.14) indicate that belief in importance reduces annoyance, but "importance" "added little to an understanding" when the other variables were included. [N≅1500]	Leonard, Borsky, 1973: 698, 699
1983 Controlled Exposure Helicopter (USA-235)	X_{dBs} {1}			Opinion on importance of the helicopter flights	Noise (L_{eq})	Those believing flights are "very important" are the equivalent of about 3 dB less annoyed. (n≅4000 daily ratings) [N=324 respondents]	Fields, Powell, 1987:488; Fields, Powell, 1985:42
1957 USA Air Base (USA-006)	X_{s} {1}			Importance for country and for local economy	Noise level	At least 12% more of those believing important are much annoyed. [N=2328]	Borsky, 1961b: 53, 161

Table 15 — Issue 1.b.i: Exposure to non-noise impacts of the noise source (objectively measured)

Hypothesis: *The presence of non-noise impacts from the noise source increases noise annoyance*

Study (Catalog ID number)	Finding: If other nuisance, noise annoyance is: Lower	Same	Higher	Methodology: Type of non-noise nuisance	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1978 Canada 4-Airport [Toronto sample] (CAN-168)		X_{dB}^{sr} {1}		Within 1/8 mile of flightpath (straight-line extension of runway)	Noise (5-dB NEF groups)	Relation significant in 2 of 3 NEF groups. Uncertain interpretation because the explanatory variables (fear and perceived air pollution) are not related to flight path position. [N=556]	Hall, Taylor, Birnie, 1980:376 378
1978 Canada 4-Airport [1 General Aviation Airport] (CAN-168)		$X_{o}^{?ns}$ {3}		Under/not-under flight-path/ training circuits	Noise (5-dB NEF groups)	Authors concerned that flightpath not accurately specified. [N≅170]	Birnie, Hall, Taylor, 1980b: 40, 41
1953 USA 8-Airport (USA-004)		$X\%^{ns}$ {1}		Position below flight path	Noise (SNL), ambient noise	Of 6 groups, those under the flight path have at least 5% greater annoyance in 3 and at least 5% less annoyance in 2. [N=2504]	Borsky, 1954:57
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975 British Railway (UKD-116)		$X_{dB}^{?s}$ {1}		Fumes or dust/dirt vibration (outside)	Noise (24hr L_{eq})	Trained observers rated the non-noise nuisances. Effect was large (5 dB equivalent) and significant but not after controlled for non-train railway noise or distance. [N≅1320]	Fields, Walker, 1982b:203, 206

Study	Lower	Same	Higher	Nuisance	Controls	Comments	Reference
1975 British Railway (UKD-116)			X_{dB} ?[s] {1}	Visibility	Noise (24 hr L_{eq})	Effect was moderate (4dB equivalent) and significant but not after controlled for predicted L_{eq}. [N≅1320]	Fields, Walker, 1982b:203, 206

Table 16 -- Issue 2.i.i: Amount of time at home

Hypothesis: Residents spending more time at home (i.e. exposed more) are more annoyed

Study (Catalog ID number)	Finding: If at home more, annoyance is: Lower	Same	Higher	Methodology: Measure of time at home	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
Scandinavian 9-Airport (SWE-035)			X_{dB} {1}	Working outside the community during the day	Noise level, sex, age	Those in community more annoyed by the equivalent of 3 dB over most of study noise levels when controlled for age. [N≅3740]	Sörensen, Berglund, Rylander, 1973:673
1980 Australian 5-Airport (AUL-210)		X_{dB} {1}		Number of the 3 daily time periods at home, also if occupation is "home duties".	Noise (NEF)	Slight, less than the equivalent of 3 dB, less annoyance for those with home duties. Authors state some respondents may say "at home" in morning if at home for breakfast. [N≅3250]	Hede, Bullen, 1982a:80, 112,117,118
1980 John Wayne Airport (USA-207)	$X_{\%}$ {1}			Work outside home at least 20 hours/week	Noise (All are in 65 CNEL contour)	Those at home are 10% less likely to agree "..aircraft noise is a problem for you in your neighborhood..". [N≅300]	VTN Consolidated, 1980: X-29
1969 Munich [AIRCRAFT] (GER-034)		X_{o} ns {3}		Time away from home for employment	None	Only workers studied. The reactions of workers away more or less than 50 hours a week do not differ. [N=440]	Deutsche . ., 1974: 222
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							

Study	Lower	Same	Higher	Measure T.	Controls	Comments	Reference
1975-76 S. Ontario Community Noise (CAN-121)		X_{o}^{ns} {3}		Time at home (weekday, weekend)	Noise (5-dB groups)	Relations between increasing time at home and annoyance "were positive.." (not significant). Housewives do not differ. [N≅300]	Taylor, Hall, 1977: 594
Dutch Tram and Road (NET-276)		X_{o}^{ns} {3}		Time at home	Noise level, type of tram noise	Time at home does not add significantly to the total explained variance. [N≅790]	Miedema, van den Berg, 1988: 343
1973 Vienna Traffic (AUS-093)		X_{o}^{ns} {3}		Wage earners compared to retired and homemakers	Noise level	A slightly higher level of annoyance for students is not statistically significant. [N≅2300]	Lang, 1975: 8, Fig. 7
1972 Toronto Community Noise (CAN-079)			X_{s} {1}	Hours in neighborhood	None	Those residents in area less than 12 hours a day are about 7% less bothered than the over 16 hours. [N=1484]	Bremner, 1973: Vol. I, p.10, Vol.II, p.97
1972 Copenhagen Traffic (DEN-075)		X_{o} {3}		Work outside home, at home in rush hour, weekend	Noise (2 groups: 51-63, above 68 24hr L_{eq})	"..no significant relation.." with annoyance. [N≅950]	Relster, 1975:73, 134
1976 Canada Impulse Noise (CAN-136)		X_{r}^{sr} {5}		Work at home (Include housewives)	Noise level	Those working at home are more annoyed (r_{ax}=-0.096) even when controlled for sex and time at home during week ($r_{ax.nsw}$=-0.088). [N≅600]	Seshagiri, 1981:56
Philadelphia Community Noise (USA-058)		X_{o}^{ns} {3}		Time spent daily in neighborhood	None	Those 8 hours or more out of area daily do not "differ significantly" [N≅500]	Bragdon, 1969:21

Study	Lower	Same	Higher	Measure T.	Controls	Comments	Reference
1973 10-City French Traffic Noise (FRA-092)		Xo {3}		Spending less than 3 hours a day away	Noise (12hr L_{eq})	Those at home are more annoyed than average in 3 comparisons, less annoyed in 6 comparisons and same in 3 comparisons. Both high and moderate annoyance compared. Noise/annoyance correlation is higher for those at home. [N≅1000]	Vallet, et al., 1978:432, 433
1972 Birmingham New Motorway (UKD-073)		Xo ns {3}		Housewives compared to daytime workers	None	Nighttime workers, housewives and daytime workers' reactions are not significantly different. [N≅690]	Lawson, Walters, 1973:8
1972 London Construction Site (UKD-074)		X_{dB} ?ns {1}		Usually at home in the daytime in the past week	Noise level, preventability, aircraft annoyance living conditions	Being at home increases annoyance by less than 1 dB equivalent (not significant) if controlled for noise level and 4 attitudinal variables in a multiple regression. [N≅530]	Large, Ludlow, 1976:64; Ludlow, 1976:53, Fig.39, Table 26
1975 British Railway (UKD-116)	X_{dB} s {1}			Employed or not employed	Noise (24hr L_{eq})	Those employed full or part time are the equivalent of 3 dB more annoyed than those not employed. [N=1451]	Fields, Walker, 1982b:221
1978 Spokane Community (USA-171)		Xo ns {3}		Employment status	None	Spearman's r_s=-0.05, p=.17. [N≅750]	Perdue, Coates, 1979:53,55
1969 Paris Road Traffic (FRA-041)		Xo ns {3}		Whether in dwelling during day	Noise level	Not statistically significant relation with traffic noise annoyance. [N≅690]	Aubree, Auzou, Rapin, 1971:42,43

Table 17 -- Issue 2.j: Isolation from noise at home (personal exposure)

Hypothesis: *Isolation from noise at home (noise insulation, room orientation,* usage of outdoors spaces) reduces annoyance

Study (Catalog ID number)	Finding: If relatively little attenuation annoyance is: Lower	Same	Higher	Methodology: Indicator of attenuation?	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1976-77 Dulles Concorde (USA-127)			X$_s$ {1}	INSULATION Type of house (mobile home, frame, masonry)	None	At least 5% greater annoyance for mobile vs. others and for frame or townhouse vs. masonry. These two comparisons are for different annoyance scale divisions. [N≅1700]	Kirschner Associates, 1976:22,23
USA Airport [7 Cities] (USA-022, USA-032)		X$_r$? {1}		INSULATION Estimated attenuation of house based on a list of characteristics	Noise level	When noise level is "corrected" for attenuation the noise/annoyance correlation is reduced not increased. (However, unpublished analyses found an effect after correcting coding errors.) [N≅6500]	Tracor Inc., 1971:46
1978 Canada 4-Airport [Toronto sample] (CAN-168)		X$_r$ ns {1}		OUTSIDE EXPOSURE Hours outdoors on weekends	Noise (24hr L_{eq})	$r_{ax.n}$ = 0.00 [N≅670]	Taylor, 1984:247, 250

Study	Lower	Same	Higher	Meas. Atn.	Controls	Comments	Reference
Schiphol and Marssum Sound Insulation in 1975 and 1977 (NET-115, NET-149)			X$_{dB}$ {1}	CHANGE INSULATION New sound insulation gave 5 to 20 dB reduction.	Noise level, individual characteristics	Survey repeated in the same homes 1 year before and 1 year after new sound insulation. Annoyance reduced by at least the equivalent of 3 dB for 7 of 8 locations. Less reduction in annoyance than expect from change in noise level at low noise levels, but more than expect at high noise levels. [N≅780]	de Jong, 1981c: 795
1975 Schiphol/ Marssum and 1975 Leeuwarden NIPO (NET-115, NET-844)			X$_{dB}$ {1}	SEASON (September to November)	Noise level, study area	Annoyance is reduced by the equivalent of 3 dB(A) from September after a hot summer, until November after a wet, cool autumn. [N=143]	de Jong, 1981b:8, Fig. 15
USA Airport [9 Cities] (USA-022, USA-032, USA-044)			X$_{dB}$? {1}	SEASON (October/ January compared to Summer)	Noise level	Mean annoyance in two small cities in the winter is the equivalent of 5 dB less than in 7 larger cities in the summer. However, annoyance in 4 of the 7 winter surveys is very similar to the summer surveys. [N≅8500]	Connor, Patterson, 1972:31-33; Fields, 1983: 966
1961 Heathrow (UKD-008)		X$_{\%\ sr}$ {5}		SEASON (September to Oct./Nov.)	None	2% fewer "Very" and 10% fewer "Moderately /Very" annoyed in October/November (114 respondents) than in early September (1731). (Barely significant, p<.05) [N=1845]	McKennell, 1963: Appendix R

Study	Lower	Same	Higher	Meas. Atn.	Controls	Comments	Reference
1972 J.F.K. Airport (USA-059)		X_r ns {1}		AIR CONDITIONING (rooms)	None	No relationship with use in living room, dining room, kitchen, and only small (not significant) correlation for bedroom, r_{ax}=0.05. [N≅1500]	Leonard, Borsky, 1973: 697; Borsky, 1975:41
1981 UK 5-General Aviation Airport [Leavesden sample] (UKD-243)			X_r ns {2}	INSULATION Any double glazing	Noise level	$r_{ax.n}$=0.18 (not significant). [N=89]	Directorate ..., 1982a: 79
1983 Controlled Exposure Helicopter (USA-235)			X_{dB} s {1}	INSULATION OUTSIDE EXPOSURE Window position & whether indoors or outdoors during flights	Noise (outside data, L_{eq})	Those estimated to have about 20 dB less exposure due to windows and being inside are the equivalent of 5 dB more annoyed. (n≅4000 daily ratings) [N≅330 respondents]	Fields, Powell, 1987:488; Fields, Powell, 1985:43
1977 3-Phase JFK Concorde (USA-143)			X_s {1}	SEASON (Summer to winter)	Distance from airport	At least 15% less "high" annoyance during the winter interviews. [N=5404]	Borsky, 1978: 20
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1975-76 S. Ontario Community Noise (CAN-121)		X_o ns {3}		AIR CONDITIONING at home	Noise (5-dB L_{dn} groups)	Air-conditioning may reduce noise exposure in the summer, but relations with annoyance not significant. [N≅300]	Taylor, Hall, 1977: 594

Study	Lower	Same	Higher	Meas. Atn.	Controls	Comments	Reference
1975 Great Britain Interior Noise [NEIGHBORS] (UKD-119)		X% ? {1}		INSULATION Age of dwelling (indicator of construction regulations)	None	Actual attenuation not measured. Bother by neighbors' noise increased with house age (by less than 5%) even though expect more attenuation due to improved construction regulations. [N≅3120]	Langdon, Buller, 1977b:500, 501 506
1978 Great Britain Interior Noise [NEIGHBORS] (UKD-220)			X_r {1}	INSULATION (AAD, Aggregate Adverse Deviation)	None	r_{ax}=0.26 for annoyance with neighbors' noises. Neighbors' noise level is not controlled. [N≅910]	Langdon, Buller, Scholes, 1981:213
1980 British Sound Insulation of Flats [INTERIOR] (UKD-233)			X_s {1}	INSULATION (AAD, Aggregate Adverse Deviation)	None	Bother by neighbors' noises increases by at least 6% from the 23 to 96+ AAD dB rated walls and floors. [N=709]	Langdon, Buller, Scholes, 1983:252
1977 London Area Panel [ROAD TRAFFIC] (UKD-157)		$X_{o\ ns}$ {3}		SEASON Season, temperature, and reported window opening	Noise level, study site	No significant difference between noise annoyance in different seasons though reports of window opening do differ. (n=888 interviews) [N=222 respondents]	Griffiths, Langdon, Swan, 1980:236
1975-76 Australian 3-City Roadway (AUL-227)			$X_{o\ sr}$ {3}	ROOM ORIENTATION Number of major activities on noisy side of house.	Number of heavy vehicles, neighborhood opinion	Location of activities increases R^2 by only 0.5% (significant) when controlled for a not causally prior variable. Height of house may have been related to noise levels outside the house and was also related to annoyance. [N≅800]	Brown, 1978:93

Study	Lower	Same	Higher	Meas. Atn.	Controls	Comments	Reference
German part of CEC impulse noise (GER-253)		X_{VD} ? {4}		INSULATION Single/Double glazing (not acoustically sealed)	None	Type of glazing does not "..appear to have any.." effect. The authors say the glazing difference may not affect noise level. [N≅490]	Kastka, Langdon, 1985:902
Sound insulation surveys [ROAD TRAFFIC] in Dordrecht and Amsterdam (NET-106, NET-258)			X_{dB} {1}	CHANGE INSULATION New sound insulation installed	Noise level, all individual characteristics	Improved sound insulation reduces annoyance to at least 5 dB below that predicted by steady state data. Noise levels decreased by about 2 to 13 dB. (n=512 interviews) [N=256 respondents]	van Dongen, 1981a: 814, 816
1977 Dutch Railway (NET-153)		X_o {3}		INSULATION (Measurements at 9 positions inside and outside house)	Noise (24hr L_{eq})	Correlations with general annoyance and inside window-closed Leq r_{an}=0.32, window-open L_{eq} r_{an}=0.26, outside L_{eq} r_{an}=0.30, but for activity interference index and all speech interference, outside L_{eq} more highly correlated. [N≅670]	de Jong, 1983a:298, 299
1973 Vienna Traffic (AUS-093)			X_{dB} {1}	ROOM ORIENTATION Main living rooms not toward noise	Noise level	If the main rooms are not toward the noise source, annoyance is reduced by the equivalent of at least 5 dB. [N≅2620]	Lang, 1975:7, Fig.5,6
1972 Calgary Noise (CAN-078)			X% {1}	SEASON (Summer to February)	None	At least 10% more are annoyed in summer than in February. Self-completion questionnaires were used. [N≅720]	Dunn, Posey, 1974:26,27 47,48
1972 Copenhagen Traffic (DEN-075)			$X_{o\ sr}$ {3}	INSULATION Double glazing	Noise (2 groups: 51-63, >68 24hr L_{eq})	"A relation was found.." with more annoyance when less attenuation. [N≅950]	Relster, 1975:68, 69

Study	Lower	Same	Higher	Meas. Atn.	Controls	Comments	Reference
1972 Copenhagen Traffic (DEN-075)			X_{o}^{sr} {3}	ROOM ORIENTATION, living and bedroom away from road	Noise (2 groups: 51-63, above 68 24hr L_{eq})	"A relation was found..". More annoyance when less attenuation. [N≅950]	Relster, 1975:68, 69
1972 Paris-Area Railway (FRA-063)			X_{dB}^{sr} {1}	ROOM ORIENTATION, % of rooms exposed to railway	Noise (L_{eq})	If all rooms face the railway, annoyance is the equivalent of 3.7 dB higher. [N≅350]	Aubree, 1973: p.29, 39 in English translation
1965 Paris Road Traffic (FRA-019)			X_{dB}^{sr} {1}	ROOM ORIENTATION One side of apartment not exposed to freeway	Noise (L_{50})	Those in apartment buildings parallel to the freeway are the equivalent of 2-5 dB less annoyed. [N≅360]	Lamure, Bacelon, 1967:9-11, Fig. 7
Philadelphia Community Noise (USA-058)	$X_{\%}$ {1}			AIR CONDITIONING	2 areas (Around airport, control area)	Air conditioning reduces annoyance by 13% in one area and increases by 12% in another. Both are "statistically significant." [N≅500]	Bragdon, 1969:20, 21
1973 10-City French Traffic Noise (FRA-092)			X_{vb} {4}	ROOM ORIENTATION under 40% or over 80% of windows face road	Noise (12hr L_{eq})	There is no effect above 65 L_{eq}. Below 65 L_{eq} the more exposed are more annoyed. Most are below 65. [N≅1000]	Aspects de La ..., 1976: 115
1977 Zurich Pilot Traffic (SWI-158)			$X_{o}^{?sr}$ {3}	ROOM ORIENTATION Living and bedroom not on street	None	Orientation has a certain ("gewissen") influence. The effect of the room type location only applies to houses directly on the street. [N≅1290]	Wanner, Wehrli, Nemecek, Turrian, 1977:112

Study	Lower	Same	Higher	Meas. Atn.	Controls	Comments	Reference
1977 Hampshire Village (UKD-160)		X% ? {1}		INSULATION Double glazing	None	This study does not find a 15% response difference. [N≅750]	Hawkins, 1980: 83
1975 British Railway (UKD-116)		X$_{dB}$ ns {1}		INSULATION Double glazing	Noise (24hr L_{eq})	Those with double glazing are the equivalent of 2.5 dB more annoyed. [N=1451]	Fields, Walker, 1982b:220
1969 Paris Road Traffic (FRA-041)		X$_{o}$ ns {3}		ROOM ORIEN-TATION Location of bedroom or radio/ TV room	Noise level	Not statistically significant relation with annoyance. [N≅690]	Aubree, Auzou, Rapin, 1971:42
1969 Paris Road Traffic (FRA-041)			X$_{dB}$ sr {1}	ROOM ORIEN-TATION Over 50% of rooms overlook the street	Noise (L_{50} dB(A))	Having more than half of the rooms overlook the street increases annoyance by the equivalent of approximately 5 dB. [N=462]	Aubree, Auzou, Rapin, 1971:66, 67

Table 18 — Issue 1.e: Ambient noise

Hypothesis: Low ambient noise exposure increases annoyance with an intrusive noise source

Study (Catalog ID number)	Finding: In low ambient annoyance is: Lower	Same	Higher	Methodology: Ambient source	Continuous noise data for: main	ambi.	Range of ambient noise	Comments	Reference
AIRCRAFT NOISE IS RATED IN PRESENCE OF AMBIENT									
1978 Canada 4-Airport [Toronto AIRCRAFT] (CAN-168)		$X_{r_{ns}}$ {1}		Road	L_{eq}	L_{eq}	49–72 (24hr L_{eq})	$r_{ax.n}<0.01$ [N≅670]	Taylor, 1984:250
1969 Mixed Road and Aircraft [AIRCRAFT] (UKD-033)			$X_{dB_{sr}}$ {1}	Road	NNI	L_{10} (Est)	65–75 L_{10}	Traffic noise estimates from estimated number of vehicles per day. Only 3 traffic sites at each of 3 aircraft levels. [N≅315]	Bottom, 1971:475; Bottom, Waters, 1972: 3
1984 CEC Combined Aircraft/ Road [AIRCRAFT] (FRA-239, UKD-238, NET-240)		$X_{dB_{ns}}$ {1}		Road	Leq 24hr	Leq 24hr	46–70 (24hr L_{eq})	Regression coefficient from combined analysis shows 24-dB ambient range increases annoyance by under 1 dB. [N=1739]	Diamond, Walker, 1986b:3
1964 Oklahoma City Sonic Boom (USA-012)		$X_{\%_{ns}}$ {1}		Community	No (Distance)	No	Not known	Urban and rural areas differ by less than 5% on many activity interference measures. Noise levels in the areas not known. [N≅3000]	Borsky, 1965: Vol.II 25, 28, 30

Study	Lower	Same	Higher	A Noise	Main	Ambi.	A range	Comments	Reference
1982 Heathrow Aircraft/ Road Comparison [AIRCRAFT] (UKD-241)		X_{dB} ns {1}		Road	NNI	L_{eq}	49-69 (L_{eq})	<1 dB equivalent reduction in annoyance for high ambient is not significant. [N≅417]	Cooper, et al., 1984: 304, 307
1967 Heathrow (UKD-024)			X_r sr {1}	Road	NNI	None (Minutes walk from main road)	Not known (Est. 57-79 PNdB)	Annoyance increases with a 5-point measure of walking time from main road. R^2 increases by 6%. [N≅4690]	MIL Research, 1971:41, 193
1971 3-City Swiss [AIRCRAFT] (SWI-053)		X_r ns {1}		Community (especially road)	L_{PN} =Log mean of aircraft peak PNDB	L_{50} L_{99}	40-68 L_{50} 30-55 L_{99}	Adding L_{99} or L_{50} to L_{PN} in multiple regression equation increases R^2 for aircraft annoyance by only 0.03%. Accompanying graphs do not show consistent effect of L_{50} or L_{99} for particular aircraft noise levels. Ambient does affect the relative ranking on an open question. [N≅3930]	Graf, Meier, Müller, 1974:86, 87,97, 141-144; Grandjean, et al., 1973:648
1980 Salt Lake City In-Home Rating [AIRCRAFT] (USA-219)			X_{dB} s {1}	Community	Peak (dB-(A))	L_{eq}	≅43-73 L_{eq}	Raters with lowest ambient are more annoyed (equivalent of 21 dB).(n≅1100 ratings of single flyovers) [N≅100 respondents]	Dempsey, Stephens, Fields, Shepherd, 1983:8,9, 25, 34

Study	Lower	Same	Higher	A Noise	Main	Ambi.	A range	Comments	Reference
1979 Swiss General Aviation (SWI-180)		X* {1}		Community	Average peak + L_{eq} (12-hr)	dB(A) (metric not reported)	3 groups from <41 dB(A) to >47 dB(A)	In about 32% of the groups, the lowest ambient are at least 5% more annoyed than the highest ambient. In 18% of the groups the highest ambient are at least 5% more annoyed. In 50% of groups reactions are similar. (Annoyance is 5+ on 11 point scale) [N≅1010]	Institute für ..., 1980: 56, 78, 79
1972 London Construction Site [AIRCRAFT] (UKD-074)		$X_{r\ ns}$ {1}		Road, construction	L_{eq}	L_{eq}	=52-69 L_{eq} road, =30-70 L_{eq} constr-uction	Aircraft noise annoyance correlates r_{an}=-0.004 with construction noise and r_{an}=-0.015 with road noise controlled for aircraft noise. [N=535]	Large, Ludlow, 1976:64
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED									
1975 British Railway (UKD-116)	$X_{dB\ ns}$ {2}			Community	L_{eq}	L_{eq}	<50 - 70> L_{eq}	The highest ambient group is the equivalent of 4dB more annoyed. (Not significant) [N=1453]	Fields, Walker, 1982b:197
CEC Impulse Noise (FRA-252, GER-253, IRE-254, NET-255)		X_{vb} {4}		Any non-impulse	L_{eq}	L_{eq}	41-70 L_{eq}	Multiple regression analysis shows "no influence of "residual noise". [N=~1610]	Groeneveld, 1986:11

Study	Lower	Same	Higher	A Noise	Main	Ambi.	A range	Comments	Reference
1977 Dutch Railway (NET-153)		X_{vb} {4}		Community	L_{eq}	L_{90}	37-44 L_{90}	"..not possible to draw reliable conclusions." No effect below 53 L_{eq}, more annoyance for higher ambient up to 66 L_{eq}, above 66 results are "ambiguous".- [N≅670]	de Jong, 1983a: 300; Peeters, de Jong, Kaper, Tukker, 1984: 47
1971 3-City Swiss [ROAD TRAFFIC] (SWI-053)		X_{r} ns {1}		Aircraft	L_{50}	NNI	5-37 NNI	R^2 for traffic annoyance increases by less than 0.00% if add L_{PN} to L_{99} or L_{50} in multiple regression. [N=949]	Graf, Meier, Müller, 1974:144; Grandjean, et al., 1973:648
1972 Paris-Area Railway (FRA-063)		X_{o} ns {3}		Community	Leq	Leq	47-67 L_{eq}	Annoyance increases with ambient r_{ax}=0.16, but ambient not significantly contribute to train noise annoyance if control for train noise. [N≅350]	Aubree, 1973: p.34, 36 in English translation
1968 Coventry Railway (UKD-029)	X_{vb} {4}			Neighbors in flats	No, only know distance	No	Not measured	Much higher annoyance in a block of flats where an observer reported considerable noise from people. [N≅85]	Walters, 1970:60

Study	Lower	Same	Higher	A Noise	Main	Ambi.	A range	Comments	Reference
1978 Zurich Time-of-day [ROAD TRAFFIC] (SWI-173)		X_{vb} {4}		Non-road noise in city, country, suburb	L_{eq}	Not measured. State that country is quieter.	Not measured	"No systematic and/or significant distinctions between .." reactions to road traffic in inner city, periphery or countryside. [N≅1600]	Wehrli, Nemecek, Turrian, Hofmann, Wanner, 1978:145
1977 Hampshire Village [ROAD TRAFFIC] (UKD-160)		X_{ns} {1}		Non-road traffic, local noise	L_{10}	Not measured. See comments	Not measured. See comments	Reaction to road traffic noise in these rural villages (752 interviews) is within 4% of that in a national (mainly urban) survey (843). [N=1595]	Hawkins, 1980: Fig. 6b (p.53-54)
1972 London Construction Site [CONSTRUCTION] (UKD-074)		X_{dB} ns {1}		Road	L_{eq}	L_{eq}	52-69 L_{eq}	In multiple regression, highest ambient respondents are equivalent of ≅2.5 dB less annoyed. [N=535]	Large, Ludlow, 1976:62,63; Ludlow, 1976:Table 23, Fig.34
1984 CEC Combined Aircraft/ Road [ROAD] (FRA-239, UKD-238, NET-240)			X_{dB} ns {2}	Aircraft	L_{eq} 24hr	L_{eq} 24hr	45-69 (24hr L_{eq})	Regression coefficient from combined analysis shows 24 ambient range increases annoyance by about 4 dB. [N=1739]	Diamond, Walker, 1986b:3
CEC Impulse Noise [ROAD] (FRA-252, GER-253, IRE-254, NET-255)		X_{vb} {4}		Impulse (primarily shooting)	L_{eq}	L_{eq}	<20-65 (24hr L_{eq})	Relation is inconsistent. Low impulse caused more traffic annoyance at low traffic levels and less at higher levels. [N≅1610]	Groeneveld, de Jong, 1985b:55

Study	Lower	Same	Higher	A Noise	Main	Ambi.	A range	Comments	Reference
1969 Mixed Road and Aircraft [ROAD] (UKD-033)		XdB ns {1}		Air-craft	L10 (E-st)	NNI	25-65 NNI	Traffic noise estimates from number of vehicles per day. Only 3 traffic sites at each of 3 aircraft levels. [N≅315]	Bottom, Waters, 1972: 22, Fig 14
198? Sydney Aircraft/Road Traffic survey[AIRCRAFT] (AUL-307)			Xvb {4}	Road	ANEF (est <20 & >25)	Leq (L10 L50 L95)	55-85 Leq	Low aircraft noise only known to be below 20 ANEF (Australian NEF). Not control aircraft noise in analysis. [N≅420]	Lawrence, Putra, 1989:894
1980's Brussels International Airport (BEL-288)		XdB {1}		Community	Ldn NNI	Mean Leq	47-59	Annoyance at highest and lowest ambient are separated by less than the equivalent of 2 dB. Three rural areas at intermediate noise levels are least annoyed. [N=677]	Jonckheere, 1988:329; Jonckheere, 1989:95
1987 Seoul Traffic (KOR-295)	XdB sr {1}			Type of area	Leq	None (type of area: industry, residential)	Not known	Main evidence shows residential areas are equivalent of 9 dB less annoyed. Leq has higher correlation than TNI. (Significant) [N=351]	Yu, 1987: 986-987
1989 Oslo Airport (NOR-311)		XdB ns {1}		Road traffic	Ldn	Leq (Est)	<55 - 65> Leq (Est)	Less than the equivalent of a 2 dB difference. Ambient noise levels only approximately estimated. [N≅3337]	Gjestland, Liasjø, Granøien, Fields, 1990:37

Table 19 -- Issue 3.d: Interviewing method (personal/telephone)

Hypothesis: Respondents express more annoyance in a telephone interview

Study (Catalog ID number)	Finding: Telephone yields annoyance which is: Lower	Same	Higher	Methodology: Accuracy of comparison	Methodology: Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1961 St. Louis Sonic Boom (USA-007)		X_{o}^{ns} {3}		Unknown (No "significant" differences)	Unknown but personal and telephone in same time period	"No significant differences.." in comparison of follow-up interviews. Analysis methods not described. (100 personal, 200 telephone) [N=300]	Borsky, 1962:8
1964 Oklahoma City Sonic Boom (USA-012)		$X_{\%}$ {1}		Unknown (No consistent differences)	Noise level (adjacent streets)	Controlled comparison shows no consistent pattern nor difference of more than 3% in indicators of sonic boom interference and complaint. (937 face-to-face, 666 telephone) [N=1603]	Borsky, 1965: Vol.II 38-41
Burbank Noise Change [AIRCRAFT] (USA-203)		X_{o}^{ns} {3}		Unknown (No significant differences)	Noise level, study area	"No significant differences.." About 25% are telephone interviews. (n≅5000 interviews) [N≅1000 respondents]	Fidell, Horonjeff, Teffeteller, Pearsons, 1981:32
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
USA 24-Site Community Noise (USA-102)		X_{vb} {4}		Unknown	Noise level, study area	"No overall pattern of differences was apparent". Reported that the telephone/interview differences were no larger than between telephone sites of similar noise exposure. [N≅490]	Fidell, 1978: 202

Table 20 -- Issue 1.h: Changes in noise exposure

Hypothesis: A new noise or change in noise changes annoyance more than would be predicted from reactions to a familiar existing noise

Study (Catalog ID number)	Finding: Change in annoyance is relatively: Small	Same	Large	Methodology: Reason noise changed	Direction and amount of change	Time elapsed since change	Comments	Reference
AIRCRAFT NOISE IS RATED								
1977 Roissy (FRA-150)		X_{dB} {1}		New airport	INCREASE: After new airport, levels of 98+ Psophic index	1 and 4 years	CROSS-SECTIONAL COMPARISON Roissy response 1 and 4 years after opening is less, but not as much as 3 dB less, than long-term Orly response. [N≅1400]	Francois, 1979a:14, 52
1967 Heathrow (UKD-024)	X_{vb} {4}			More aircraft	INCREASE: Gradual increase in number from 22 (1961) to 48 per day(1967)	Gradual change over 6 years	CROSS-SECTIONAL COMPARISON A "very slight" increase in annoyance (past week) is not statistically significant. Average peak level did not change but number of aircraft at least doubled with "some adaptation." [N≅4690]	Direct ..., 1971:4,5
Burbank Noise Change [AIRCRAFT] (USA-203)		X_{vb} {4}		Airport maint-enance	INCREASE: up to 10 Ldn	2 weeks to 3 months since last changes	LONGITUDINAL SURVEY Response patterns (past week) differ in the 4 locations. Single relationship represents both before and after data "reasonably". [N≅700]	Fidell et al., 1981: 26, 46; Fidell, Pearsons, 1985b:139

Study	Small	Same	Large	Reason	Direction	Time	Comments	Reference
Burbank Noise Change [AIRCRAFT] (USA-203)		X_{vb} {4}		Airport maint-enance	DECREASE: as low as -18 Ldn	2 weeks to 3 months since last changes	LONGITUDINAL SURVEY Response patterns (past week) differ in the 4 locations. Single relation-ship represents both before and after data "reasonably". [N≅800]	Fidell et al., 1981: 26, 46; Fidell, Pearsons, 1985b:139
Burbank Noise Change [AIRCRAFT] (USA-203)			X_{dB} {1}	Airport maint-enance	INCREASE: up to 10 Ldn	2 weeks to 3 months since last changes	LONGITUDINAL SURVEY In this re-analysis with mean (not "high") annoy-ance scale (past week), reac-tions exceeded those predicted from static data by more than 3 dB for most cases. [N≅700]	Raw, Griffiths, 1985:274
Burbank Noise Change [AIRCRAFT] (USA-203)		X_{dB} {1}		Airport maint-enance	DECREASE: as low as -18 Ldn	2 weeks to 3 months since last changes	LONGITUDINAL SURVEY In this re-analysis with mean (not "high") annoy-ance scale, reactions ex-ceeded those predicted from static data by less than 3 dB for most cases. [N≅800]	Raw, Griffiths, 1985:274
1981 Orange Country Operation Change [AIRCRAFT] (USA-204)		X_{vb} {4}		Modif-ied depar-ture proced-ure	BOTH INCREASE and DECREASE of less than 2 dB	2 to 3 weeks	LONGITUDINAL SURVEY "..neither exposure nor annoyance changed appreciably.." (n≅3100 inter-views) [N≅800 respondents]	Fidell, Mills, Teffeteller, Pearsons, 1982:27, 35,39, A-1

Study	Small Same Large	Reason	Direction	Time	Comments	Reference
1973 Los Angeles Airport Night (USA-082)	X_s {1}	Reduction in number of nighttime flights	DECREASE: ≅3 dB L_{dn} by "almost" eliminating night flights	1 week, 1 month	LONGITUDINAL SURVEY "Almost completely eliminating" the 50 night flights did not change overall or nighttime annoyance by more than 2%. (n≅1400 interviews) [N≅900 respondents]	Fidell, Jones, 1975:417, 419
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED						
Multi-site Traffic Flow Change (UKD-268)	X_{dB} {1}	Opened new road	INCREASE: 1 dB L_{eq}	Not known	LONGITUDINAL SURVEY Annoyance increased by the equivalent of 5 dB more than predicted from before survey data. [N=137]	Mackie, Davies, 1981:7, 10
1977 Netherlands New Railway (NET-195)	X_{dB} {1}	New railway line opened	INCREASE: After new line levels of 42-57 dB (24hr L_{eq})	4 & 16 months	COMPARISON OF PRE/POST CHANGE RESIDENTS The 15 residents arriving after the change are less annoyed by the equivalent of at least 3 dB more than the 133 who experienced the change. [N≅148]	de Jong, 1983a:301, 302
1972 New Tokaido/ New Sanyo Railway (JPN-065)	$X_{o\ ns}$ {3}	New railway line opened	INCREASE: Amount not reported	8 years	COMPARISON OF PRE/POST CHANGE RESIDENTS Some indication that residents from before 8-year old line opened are more annoyed (not significant). [N≅420]	Nimura, et al., 1975:7; Sone et al., 1973: (p.12 in translation)

Study	Small Same Large	Reason	Direction	Time	Comments	Reference
Southern England Road Opening (UKD-237)	X_{dB}^{s} {1}	Opened new roads	INCREASE: up to 15 dB L_{10}	2 to 3 months	CROSS-SECTIONAL COMPARISON More change than predicted. For increased noise 22 dB equivalent greater change than predicted from steady-state data. [N=82]	Griffiths, Raw, 1986: 215
Southern England Road Opening (UKD-237)	X_{dB}^{s} {1}	Opened new roads	DECREASE: by as much as -14 dB L_{dn} (6 sites)	2 to 3 months	CROSS-SECTIONAL COMPARISON More change than predicted. For decreased noise, 13 dB equivalent greater change than predicted from steady-state data. [N=254]	Griffiths, Raw, 1986: 213
Multi-site Traffic Flow Change (UKD-268)	X_{dB}^{s} {1}	Opened new roads	DECREASE: 3 to 8 dB L_{eq}	2 weeks to 6 months	LONGITUDINAL SURVEY Annoyance reduced by the equivalent of about 30 dB more than predicted from before survey data. (n≅1363 interviews) [N≅364 respondents]	Langdon, Griffiths, 1982:176; Mackie, Griffin, 1977:2
Noise Barriers in Wuppertal and Düsseldorf [ROAD TRAFFIC] (GER-282)	X_{dB}^{s} {1}	Acoustic barrier introduce	DECREASE: -3 to -18 dB L_{eq}	Not reported	CROSS-SECTIONAL COMPARISON Reduction in annoyance is equivalent to at least 3 dB more than predicted from steady-state data in 5 of 7 study areas. [N≅130]	Langdon, Griffiths, 1982:177; Kastka, Buchta, Paulsen, Ritterstaedt, 1984:i

Study	Small	Same	Large	Reason	Direction	Time	Comments	Reference
1980 Brisbane Noise Reduction (AUL-264)		X% {1}		Traffic diverted to new express-way	DECREASE: -10 dB	At least 15 months	CROSS-SECTIONAL COMPARISON After annoyance is almost equal to a control group at the same noise level. [N=141]	Brown, Hall, Kyle-Little, 1985:239-240
German 6-City Traffic Reduction (GER-246)			X$_{dB}$ {1}	Variety of traffic control actions	DECREASE: Average of -1 dB	1 year	LONGITUDINAL SURVEY For 1 dB decrease in noise level an annoyance reduction equivalent to 6-14 dB(A). This is attributed to a steadier traffic noise pattern. [N≅3400]	Kastka, 1980: 12.2; Kastka, 1981:25
1970-71 Heston Noise Barrier (UKD-050)		X$_{dB}$? {1}		Replace-ment of visual with acousti-cal barrier	DECREASE: 0 to 6 dB ("typic-al" 3-4 dB(A) L_{10})	Less than one year	CROSS-SECTIONAL COMPARISON Annoyance reduc-ed by more than expected from steady state data by the equ-ivalent of less than 3 dB. (Steady state data used slightly different annoyance scale.) [N≅450]	Scholes, 1977:A-149
1972 Minneapolis Freeway Noise Barrier (USA-069)		X$_{dB}$ {1}		Instal-lation of barrier	DECREASE: ≅0-12 dB(A) L_{10}	≅7 months	LONGITUDINAL SURVEY Annoyance reduction within 2 dB of prediction from pre-barrier data. (n≅270 interviews) [N≅200 respondents]	Lambert, 1978:93

Table 21 -- Issue 1.i.ii: Rate of adaptation to new noises

Hypothesis: As the time since an increase in noise lengthens, annoyance decreases

Study (Catalog ID number)	Finding: With increased time annoyance is: Less	Same	Higher	Methodology: Measure	Shortest separated time-period	Variables controlled	Comments	Reference
Burbank Noise Change [AIRCRAFT] (USA-203)		X% {1}		Days since change for airport maintenance	2 weeks to 3 months since last changes	Noise	For noise increase areas, for the percent high annoyance (past week) a less than 3% decrease in 1 area, increase then decrease in other area from about 2 to 8 weeks. (n≅1,500 interviews) [N≅600 respondents]	Fidell et al., 1985: 1064
1963 Welsh Village Impulse Noise (UKD-010)	X% {1}			Days since began bangs	1 to 14 weeks after noise began	Noise level	About 5% less "considerably" annoyed after the first 2 weeks of about 24 explosions (simulated sonic booms) occurring two days a week. (over 2000 interviews) [N=220 respondents]	Webb, Warren, 1967:382
1978 USA Expressway Opening (USA-156)			$\bar{X}_{os}$ {3}	Time elapsed between interview panels	12 months from 4th to 16th month after opening	Noise and individual variables (panel design)	Reactions of the panel increased by a "small" but significant amount from 4th to 16th month <u>after</u> new road opened. [N=131]	Weinstein, 1982:93

Study	Less	Same	Higher	Measure	Time	Control	Comments	Reference
1967 Huddinge New Motorway (SWE-026)			X% {1}	Time elapsed between inter-view panels	6 months from 6 months to 1 year after road opened	Noise and indiv-idual vari-ables (panel design)	7% increase in disturbance for panel 6 months after motorway opened to 1 year later. (n=120 interviews) [N=60 respondents]	Jonsson, Sörensen, 1973:574
1977 Netherlands New Railway (NET-195)	X_{dB} {1}			Time since new railway line opened	12 months from 4 or 16 months	Noise (24hr L_{eq})	"high" annoyance reduced by the equivalent of at least 3 dB but less than 3 dB reduction in "any" annoyance or in activity index between 4 and 16 months after change. [N≅130]	de Jong, 1983a:302
1980 Brisbane Noise Increase (AUL-265)			$X_{\%}^{ns}$ {2}	Time since opened road to more through traffic.	12 months from 7 to 19 months	Noise (L_{eq})	Increase by 10% in high annoy-ance from 7 to 19 months after a 6 dB change (not signific-ant). [N=20]	Brown, 1987:71
1972 New Tokaido/ New Sanyo Railway (JPN-065)	X_{dB} {1}			Time since new railway line opened	4 months compared to 8 years	Noise	Respondents by a 4-month old railway line are equivalent of 5 dB more annoyed than those by a 8-year old line. [N≅420]	Nimura, Sone, Ebata, Matsumato, 1975:8

Table 22 -- Issue 1.f(i): Relation between general noise sensitivity and noise level

Hypothesis: Residents of high noise areas are less sensitive to noise generally

Study (Catalog ID number)	Finding: If noise level is higher, sensitivity is: Less	Same	More	Methodology: Indicator of sensitivity	Noise measure	Comments	Reference
AIRCRAFT NOISE IS RATED							
1961 Heathrow (UKD-008)		$X_{r_{sr}}$ {1}		Index: (6 Questions rate "noises in general")	Noise (Average peak, PNDB)	r_{nx}=0.10, [N≅1730]	McKennell, 1963: Apndx. D, G
1961 Heathrow (UKD-008)	$X_{r_{sr}}$ {5}			Sensitivity to 7 common noises (eg. "banging door, dripping tap")	Noise (Average peak, PNDB)	r_{nx}=0.07, [N≅1730]	McKennell, 1963: Apndx. D, G
1967 Heathrow (UKD-024)	$X_{r_{ns}}$ {1}			Sensitivity to 7 common noises (see UKD-008)	Noise (Average peak, PNDB)	r_{nx}=-0.02 [N≅4690]	Direct ..., 1971:75
1978 Canada 4-Airport [Toronto sample] (CAN-168)	$X_{r_{ns}}$ {1}			Self-rated sensitivity to "noise generally"	Noise (24hr L_{eq})	r_{nx}=-.02 [N≅670]	Taylor, 1984:247, 250
1980 Australian 5-Airport (AUL-210)	$X_{r_{ns}}$ {1}			5 questions about annoyance with common sounds	Noise level	Slight decrease in sensitivity with noise (r_{xn}=-0.05) (not significant). [N≅3250]	Bullen, Hede, Kyriacos, 1986:212; Hede, Bullen, 1982a:107

Study	Less	Same	More	Indicate	Noise Meas.	Comments	Reference
1975 English Mental Health Pilot [AIRCRAFT] (UKD-111)		X% ns {1}		Self rating of sensitivity relative to others	Noise level (1 high noise and 1 low noise study area)	Less than a 1% difference in sensitivity for the 2 study areas. [N≅200]	Tarnopolsky, Barker, Wiggins, McLean, 1978:222, 223
1977 Heathrow Psychiatric Morbidity (UKD-148)	X% sr {1}			Self rating of sensitivity relative to others	Noise (NNI)	5% fewer are sensitive at high noise levels. [N=5755]	Tarnopolsky, Morton-Williams, 1980:63, 64
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1968 London Traffic (UKD-030)			Xo ?sr {3}	Rating of noise in shops, cafes, street, (may include home)	Noise (Traffic Noise Index)	Sensitivity measure might include environmental noise at home. Spearman rank order correlation of R_S=.62 between noise and sensitivity. [N≅1990]	Griffiths, Langdon, 1968:25
1972 London Traffic Noise (UKD-071)		Xo ns {3}		Rate general sensitivity to noise	Noise (24hr L_{eq})	A slight (not significant) decrease in sensitivity with increased noise (Spearman rank-order correlation r_s=-0.28). [N≅2870]	Langdon, 1976a:257, 258; Langdon, 1976c:252
1975 London/ Liverpool Panel [ROAD TRAFFIC] (UKD-118)		X% {1}		Self-rating, Broadbent/ Gregory sensitivity scores	Noise level, study site	Less than 5% difference between sensitivity at noisy and quiet sites. [N≅380]	Griffiths, Delauzun, 1977a:99, 100
1975-76 S. Ontario Community Noise (CAN-121)		Xo ns {3}		Self-rated sensitivity to noise generally	Noise (5-dB, L_{dn} groups)	Not significant difference in sensitivity between 3 noise level groups (Kruskal-Wallis test). [N≅300]	Taylor, Hall, 1977: 592, 593

Study	Less	Same	More	Indicate	Noise Meas.	Comments	Reference
1975-76 Australian 3-City Roadway (AUL-227)		X_{o}^{ns} {3}		Sensitivity to 10 common noises	Noise level	No significant difference in sensitivity between the 19 study areas. [N≅800]	Brown, 1978:70, 112
1974 Dordrecht Home Sound Insulation [ROAD TRAFFIC] (NET-106)		$X_{\%}^{ns}$ {1}		Self-rated sensitivity to noise generally	Noise (L_{eq})	4% more are very sensitive at high noise levels. [N≅300]	Bitter, 1979b:174, 175
1979 Hornsby Rifle Range Study (AUL-209)	X_{r}^{sr} {1}			5 questions about annoyance with common sounds	Noise (ASEL-mean level of energy from impulses, dB(A))	r_{nx}=-0.13 (significant). [N≅190]	Hede, Bullen, 1982b:47; Hede, Bullen, 1981:35, 48
1976 Hamburg Urban (GER-134)		X_{r}^{ns} {1}		5-item index of sensitivity to common sounds	Noise (L_{m})	r_{xn}=-0.05. [N=636]	Guski, Wichmann, Rohrmann, Finke, 1978: Table 2
1961 Central London Traffic (UKD-009)		$X_{\%}$ {1}		6-item scale of sensitivity attitudes	Noise (L_{10})	Annoyance not related to L_{10}. One of the 6 items concerns noise in the area. [N=638]	McKennell, Hunt, 1966:VI 1,2, Table 26
1972 English Road Traffic (UKD-072)		X_{vb} {4}		Self-description as more or less sensitive than most	Traffic flow (vehicles per hour)	Sensitivity shows no "notable" association with traffic flow.[N≅5800]	Morton-Williams, Hedges, Fernando, 1978: 72, 73, 85, 87

Table 23 -- Issue 1.g(i): Relation between noise level and moving

Hypothesis: People in high noise areas are more likely to move away

Study (Catalog ID number)	Finding: If noise level is higher, moving is: Less	Same	More	Methodology: Indicator of moving	Noise measure	Comments	Reference
AIRCRAFT NOISE IS RATED							
1969 Munich [AIRCRAFT] (GER-034)		$X_{r_{ns}}$ {1}		Taking actual steps toward moving {Q30}	Noise (FBl)	r_{xn}=0.02. [N≅660]	Deutsche ..., 1974: 190, Apndx.A.72
1973 Seattle-Tacoma Airport (USA-085)		$X_{\%_{ns}}$ {1}		Length of residence in 4 categories	Noise (NEF) in 10-dB zones	About 3% more (22% vs 25%) in high than low noise areas around the airport had lived less than 3 years in their residence. [N≅700]	Fiedler, Fiedler, 1975:504
1973 Seattle-Tacoma Airport (USA-085)			$X_{\%}$ {1}	Whether would remain in area if house sold	Noise (NEF) in 10-dB zones	About 11% more in high than low noise areas say would not remain in area if house sold (65% vs 54%). [N≅700]	Fiedler, Fiedler, 1975:504
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1972 Copenhagen Traffic (DEN-075)		X_{vb} {4}		"Willing to move away to avoid traffic noise"	Noise (2 groups: 51-63, above 68 24hr L_{eq})	"..inhabitants in noisy areas do not move away more frequently.." [N≅950]	Relster, 1975:83, 124

Table 24 — Issue 1.g: Relationship between annoyance and moving

Hypothesis: Annoyed residents are more likely to move to another area

Study (Catalog ID number)	Finding: If say plan to move annoyance is: Less	Same	More	Methodology: Indicator of moving	Variables controlled	Comments	Reference
AIRCRAFT NOISE IS RATED							
1969 Munich [AIRCRAFT] (GER-034)		X_r ns {1}		Taking actual steps toward moving {Q30}	Noise (FB1)	$r_{ax.n}$=-0.01. [N≅660]	Deutsche ..., 1974: 190, Apndx.A.72
1974-75 Roissy Before/ After Airport (FRA-098)		$X_{\%}$ ns {1}		Actually leaving area after airport opening	None	2% more (15% vs 13%) of those anticipating that aircraft noise would bother them "very much" moved than the other respondents. [N≅550]	Francois, 1975b: pp. 34,36
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED							
1979 French Behavioral Effects [ROAD TRAFFIC] (FRA-197)			X_{vb} ? {4}	Plans to move	Rent/-owner, amount of rent	Noise has an effect but is only an "incidental" effect. Noise has more effect on high-income renters. [N≅1480]	Lambert, Simonnet, 1980:59, 60
1967 Huddinge New Motorway (SWE-026)		$X_{\%}$ ns {1}		Actually moved	Noise (all respondents at about same level)	1% more of disturbed than undisturbed had moved between 6 months and 1 year after a motorway opened. [N=84]	Jonsson, Sörensen, 1973: 572
1975 British Railway (UKD-116)			X_{dB} s {1}	Plans to move	Noise (24hr L_{eq})	Those with plans to move are the equivalent of 6 dB more annoyed. [N=1453]	Fields, Walker, 1982b:228-229

Table 25 -- Issue 2.g.i: Slope of "high annoyance" dose/response curves below 55 L_{dn}

Hypothesis: Annoyance is not related to noise level at low noise levels (<55 L_{dn}).

Study (Catalog ID number)	Finding: below ≅55L_{dn}, slope is: 0,+	Describe shape of full curve as: [Test of shape?]	Range of noise levels	High annoyance defined as:	Comments	Reference
1978 Canada 4-Airport [1 General Aviation Airport] (CAN-168)	+ {1}	Linear, Quadratic Cubic predict "almost equally well"	10-30 NEF (≅45-65 L_{dn})	"Considerably" or "Extremely disturbing" on 5-point scale	The authors define high annoyance as the top 2 points; Schultz used only the top point. L_{dn}≅NEF+35 (Bennett, Pearsons 1981: 163) [N≅180: N≅65 at 45-55L_{dn}]	Birnie, Hall, Taylor, 1980b: 43
Scandinavian 9-Airport (SWE-035)	+ {1}	Not reported [No test of shape]	CNR, NEF (≅45-77 L_{dn})	Highly annoyed, 5th point on 5-point verbal scale	Schultz's estimate of a conversion to L_{dn} is used (Schultz, 1978: 397) [N≅2,900: N=704 at 44-54 Ldn]	Schultz, 1978: 397; Rylander, Sörensen, Kajland, 1972:427,433
1981 UK 5 General Aviation Airport (UKD-243)	+ {1}	Not reported [No test of shape]	35-60 12hr L_{eq} (≅L_{dn} 37-54)	"very much" annoyed, 4-point verbal scale	No sites above 56 L_{eq} (12-hr). [N≅390: N≅374 below 55 L_{dn}]	Brooker, Davies, 1984: 148, 149
1972 English Road Traffic (UKD-072)	+ {1}	Not reported [No test of shape]	≅44-77 L_{10} (18hr) (≅42+ L_{dn})	"quite a lot" or "very" bothered, 4-point scale	Survey question refers to the time "when you are indoors at home". "High" annoyance measure is less extreme than most "highly" annoyed indicators. [N≅1230: N under 55 L_{dn} unknown]	Harland, 1977b: 12-1-3; Harland, Abbott, 1977: Fig.2, Fig.4

Study	Slope<55	Full shape	Range	Annoyance	Comments	Reference
1972 London Construction Site (UKD-074)	+ {1}	Not reported [No test of shape]	≅30-70 12hr L_{eq} (≅27-67 L_{dn})	"Extremely" annoyed on 4-point verbal scale	Survey question referred to previous week. [N≅530: N>300 below 55 L_{dn}]	Large, Ludlow, 1976:62; Ludlow, 1976: Table 8, Fig.20
1975 British Railway (UKD-116)	+ {1}	Not reported [No test of shape]	≅35-73 24hr L_{eq} (30+ L_{dn})	"Very" annoyed, 4-point verbal scale	[N=1453: N≅303 below 55 Ldn]	Fields, Walker, 1982:187; Unpublished tabulations of data.
1971 3-City Swiss [AIRCRAFT] (SWI-053)	+ {3}	Not reported [No test of shape]	≅10-60 NNI (≅44-85 L_{dn})	Authors' judgement that 9+ on 11-point scale [11= "unerträglich stört" (unbearable)] should be considered "Stark störung" (strongly)	Results are for 3 airports; Schultz gives results for 2 airports. Schultz incorrectly states that the end points of the numerical rating scale are not labeled. (Schultz, 1978: 380) L_{dn}≅0.833 NNI+33.3, (Schultz, 1978: 399) [N≅3930: N=825 below 52 Ldn]	Graf, Meier, Müller, 1974: 98, 102, 114 (Table 4.7)
1979 Swiss General Aviation (SWI-180)	+ {3}	Shallow slope at low level then 2 steep slopes connected by plateau then decrease [No test of shape]	38-58 12hr L_{eq} (≅30-57 L_{dn})	Top 3 points on 11-point scale, 11=unbearable	417 of 1,430 respondents were excluded because connected with airport or disturbed by aircraft not originating at the airport. No night-flights were assumed to occur in estimating L_{dn}. [N≅1410: N≅1240 below 55 L_{dn}]	Institute für...1980: 56, 68

Study	Slope<55	Full shape	Range	Annoyance	Comments	Reference
1966 Stockholm, Gothenburg Road traffic (SWE-021)	+ {3}	Not reported [No test of shape]	44-72 24hr Leq (≅45-77 L_{dn})	Very or rather bothered on 4-point scale with a frequency of some degree of bother daily or (for the very bothered) at least once a week	May be relatively moderate degree of annoyance as almost 70% of the rather bothered are included with about 98% of the very bothered (Fog and Jonsson, 1968:32-34) Slightly positive regression for the lowest 9 dB. [N≅440: N=201 below 55 L_{dn}]	Fog and Jonsson, 1968: 32-34 50-51

Table 26--- Issue 1.j.i: Percent "high annoyance" below 55 L_{dn}

Hypothesis: Residents do not express "high annoyance" below 55 L_{dn}.

Study (Catalog ID number)	Annoyance scale Definition:	Annoyance scale Comments:	% annoyed at this level: 30-34 L_{dn}	35-39 L_{dn}	40-44 L_{dn}	45-49 L_{dn}	50-54 L_{dn}*	Noise metric from study	Noise method exclude include	Other noise evaluation comments	Comments:	Reference:
							*{}=55+					
AIRCRAFT NOISE IS RATED												
1980 Australian 5-Airport (AUL-210)	"Highly annoyed": 5th of 5 verbal points	[VERBAL 5] The authors believe that the 5th point is too extreme a measure of aircraft noise impact.					2% n≅45 a≅2 {7% n≅ 160 a≅9}	L_{dn}		Nominal predicted noise levels were corrected with noise measurements on an individual aircraft basis.	Sampling zone data indicate that low L_{dn} areas have few flights (n=5.1,n=1.7) but mean of top 5 levels of 77.3, 82.4 dB(A) peak.	Hede, Bullen, 1982a:34, 93,221,224
1978 Canada 4-Airport [1 General Aviation Airport] (CAN-168)	The authors define highly disturbed as "Considerably" or "Extremely disturbing" on 11-point bipolar, verbal scale	[VERBAL 11] Schultz (1978: 402) defines highly annoyed as "Extremely disturbing" (11th point on the 11-point bipolar scale)	-	-	-	5% n=32 a=3	11% n=33 a=3 {≅ 12% n≅ 53 a≅5}	NEF	-	L_{dn}=NEF+35 (Bennett, Pearsons 1981: 163). Noise levels based on airport logs and predicted levels from NEFCAL model.	Training circuits were included in the noise prediction model. It is noted that not all circuit flights may have followed the presumed circuit exactly.	Birnie, Hall, Taylor, 1980b: 41, 42
1961 Heathrow (UKD-008)	5+ on 7-point activity interference index. 5+ is closest to "very much" annoyed on a 4-point verbal scale.	[ACTIVITY INDEX] Schultz uses a more restrictive definition, 6+ on the 7-point scale. (Support for the 5+ definition is given in McKennell, 1963: 4.2, 4.3)				7% n= 512 a=DK	18% n= 313 a=DK {23% n= 366 a= DK}	NNI	Exclude events below 80 PNdB (67 dB(A)) peak	L_{dn}=0.76NNI+34.5 (Schultz, 1982: 1245 has correction of previously published formula Schultz, 1978: 392)	Earlier EPA reports defined "highly annoyed" as 5+ on the 7-point scale. Schultz's more restrictive (6+) definition gives 6% at 45+ L_{dn} and 10% at 50-55 L_{dn}. ["Clustering" survey, in Schultz, 1978]	Wilson, 1963:207; for annoyance scale definition see McKennell, 1963:Apndx J, p.9.

Study	Annoy/Def.	Annoy/Comments	30+	35+	40+	45+	50-5	Orig. L	Ex/Inc.	Noise Comments	General comments	Reference
1967 Heathrow (UKD-024)	5+ on 7-point activity interference index. 5+ is closest to "very much" annoyed on a 4-point verbal scale.	[ACTIVITY INDEX] Schultz uses a more restrictive definition, 6+ on the 7-point scale. (Support for the 5+ definition is given in McKennell, 1963: 4.2, 4.3)				5% n= 709 a=DK	4% n= 311 a=DK {6% n= 910 a= DK}	NNI	Exclude events below 80 PNdB (67 dB(A)) peak	L_{dn}=0.85NNI+33.5 (Schultz, 1978: 394)	These results are from a single table (P.2) and thus do not double count people in the 10 mile area as did Schultz (1978:393). Schultz's more restrictive annoyance definition (6+) gives 2% at 45+ L_{dn} and 3% at 50-55 L_{dn}. ["Clustering" survey, in Schultz, 1978]	MIL Research, 1971:190
1965 French 4-Airport (FRA-016)	"very" ("beaucoup") annoyed, on 4-point verbal scale	[VERBAL 4]					2% n≅ 200 a=DK {5% n≅ 500 a= DK}	R (French isopsophic index)	Exclude events below 80 dB(A) peak	L_{dn}=R-16.4 (Schultz, 1978: 393).	From the description on p.16 and the table on p.21, it appears that noise events below 80 dB (A) were excluded (Centre ..., 1968) ["Clustering" survey, in Schultz, 1978]	Josse, 1969:48; Centre ..., 1968: 113
1971 3-City Swiss [AIRCRAFT] (SWI-053)	Authors' judgement that 9+ on 11-point scale [11= "unerträglich stört" (unbearable)] should be considered "Stark störung" (strongly)	[NUMERICAL] Schultz thought that the end points of the numerical rating scale were not labeled. (Schultz, 1978: 380)		1% n= 223 a=DK	2% n= 242 a=DK	1% n= 243 a=DK	9% n= 117 a=DK {15% n= 343 a= DK}	NNI		L_{dn}=0.833NNI+33.3 (Schultz, 1978:399)	Some levels as low as 53 PNdB were included in the index calculation. The peak noise levels and numbers of aircraft are not reported separately for each NNI category. ["Clustering" survey, in Schultz, 1978]	Graf, Meier, Müller, 1974:98, 102,114, Apndx. 49

Study	Annoy/Def.	Annoy/Comments	30+	35+	40+	45+	50-5	Orig. L	Ex/Inc.	Noise Comments	General comments	Reference
Scandinavian 9-Airport (SWE-035)	highly annoyed ("störs mycket"), top point on 5-point verbal scale (Schultz, 1978: 380)	[VERBAL 5] The 4th point is rather annoyed ("störs ganska mycket"). The bottom point is "not notice", the next point is "notice but not annoyed". No information about filters or format.			1% n=71 a=1		7% n= 633 a=6 {n= 0)	Level, number of events above 70 db(A)	Exclude flights below 70 dB(A) peak. Exclude land-ings.	The effect of excluding all landings is unknown. The CNR and NEF (only landings) are used in an estimate which is suggested by Schultz, but which does not adjust for no landings.	These results are consistent with pre-vious plots (Schultz, 1978: 397) even though they are based on slightly different tables from the Swedish data. (Schultz, 1982: 1247) ["Clustering" survey, in Schultz, 1978]	Rylander, Sörensen, Kajland, 1972:427, 433, 443; Schultz, 1978: 397
USA airport [7 Cities] (USA-022, USA-032)	21+ on 45-point, 9-item activity index	[ACTIVITY INDEX] The authors claim that this is a "rea-sonable" definition of high annoyance. Schultz claims that it is not sufficiently severe.				≅5% n≅ 500 a=DK	≅1% n≅ 150 a=DK	CNR		L_{dn}=CNR-35 (Bennett, Pearsons, 1981: 162).	554 respondents are from noise environments below 80 PNL with less than 400 flights a day. Of these, 212 have less than 50 a day (Connor, Patterson, 1976: 25) ["Non-Clustering" survey, in Schultz, 1978]	Connor, Patterson, 1972:24,26; Tracor Inc., 1971:B-9
USA Airport [2 Cities] (USA-044)	21+ on 45-point, 9-item activity index	[ACTIVITY INDEX] The authors claim that this is a "rea-sonable" definition of high annoyance. Schultz claims that it is not sufficiently severe.				≅2% n≅ 120 a=DK	≅1% n≅ 130 a=DK	CNR		L_{dn}=CNR-35 (Bennett, Pearsons 1981: 162)	Only 25 respondents are from noise environments below 80 PNL. No respondent with more than 50 flights a day.(Connor, Patterson, 1976: 26) ["Non-Clustering" survey, in Schultz, 1978]	Connor, Patterson, 1972:9,24, 26
1961 Gatwick Aircraft (UKD-052)	"Very much" annoyed, 4-point verbal scale	[VERBAL 4]				≅2% n≅ 50 a=DK	-- {≅8% n≅ 370 a= DK)	NNI	Exclude less than 80 dB(A) peak fly-overs	L_{dn}=0.85NNI+33.5 (Schultz, 1978: 394)	Results reported for 10-dB groups, thus separate results for 50 and 55 L_{dn} are not available.	Ollerhead, Cousins, 1975: p.113

Study	Annoy/Def.	Annoy/Comments	30+	35+	40+	45+	50-5	Orig. L	Ex/Inc.	Noise Comments	General comments	Reference
1982 Decatur General Aviation (USA-250)	"Extremely or Very" annoyed, 5-point scale	[VERBAL 5] Respondents first were asked if they were annoyed, then asked to rank annoyance					-- {2% n=46 a=1 at 55 L_{dn}}	L_{dn}			No data below 55 L_{dn}.	Schomer, 1983b:1776
Mean of 11 clustering surveys ("Schultz curve")	Schultz's interpretation of "highly annoyed"	[SCHULTZ]				1%	2% {6%}	L_{dn}		This function gives 0% annoyed at about 45 L_{dn}.	Schultz states that the best fit for most surveys with a quadratic function was with 0 annoyance at 35 L_{dn} but that this involved extrapolation beyond the observations.	Schultz, 1978:391
1981 UK 5-General Aviation Airport (UKD-243)	"Very much" annoyed, 4-point verbal scale	[VERBAL 4]			≅2% n=93 a=3	≅3% n= 176 a=12	≅11% n=98 a=5 {≅16 a=1}	L_{eq}		L_{dn} could be calculated from time-period L_{eq} values. All noise levels are not represented at all airports.		Brooker, Davies, 1984:149; Directorate ..., 1982a: 40-44
OTHER NOISE (NOT AIRCRAFT NOISE) IS RATED												
1978 Canada 4-Airport [Toronto sample] [ROAD TRAFFIC] (CAN-168)	Authors define highly annoyed as "Considerably" or "Extremely disturbing" on any of 3 questions about "local", "main road" or "truck" traffic	[VERBAL 11] Schultz (1978: 402) defines highly annoyed as "Extremely disturbing" (11th point on the 11-point bipolar scale) Schultz (1978: 402)	-	-	-	-	5% n=37 a=3	L_{dn}	Include any non-road not subtracted by attendant	During 24-hour measurements an attendant obtained "sufficient detail" to subtract non-road noises (Hall, et al., 1980: 1693)	Peak noise levels are not reported. The relationship between numbers of vehicles and noise levels is not described. [In Addendum section in Schultz, 1978]	Hall, Birnie, Taylor, Palmer, 1981:1691, 1693

Study	Annoy/Def.	Annoy/Comments	30+	35+	40+	45+	50-5	Orig. L	Ex/Inc.	Noise Comments	General comments	Reference
USA 24-Site Community Noise (USA-102)	"Extremely" or "very" annoyed on 5-point scale (rating "noise in your neighbor-hood")	[VERBAL 5]					≅5% n= 298 a=4 {≅ 11% n= 503 a= 5}	L_{dn}		Sites were selected to avoid significant airport or highway exposure.	These data from the published report differ slightly from the prepublication data in Schultz. (1978:399) For the 9 lowest L_{dn} sites, L_1 ranged from 60 to 67 dB(A). ["Clustering" survey, in Schultz, 1978]	Fidell, 1978:199, 202; L_1 noise data from Simpson, et al., 1974: Attachment 3.
1971 3-City Swiss [ROAD TRAFFIC] (SWI-053)	Authors' judgement that 9+ on 11-point scale [11= "unerträg-lich stört" (unbear-able)] should be considered "Stark störung" (strongly)	[NUMERICAL] Schultz incorrectly states that the end points of the numerical rating scale are not labeled. (Schultz, 1978: 380)					-- {3% n= 352 a=DK }	L_{50}	include all non-aircr-aft	Conversion to L_{dn} used by Schultz (1978:396).	["Clustering" survey, in Schultz, 1978]	Graf, Meier, Müller, 1974:132, Appendix, p.49
1966 Stockholm, Gothenburg Road traffic (SWE-021)	Very or rather bothered on 4-point scale if reports daily or (for the very bothered) weekly annoyance	[VERBAL 4] This may be a relatively low degree of annoyance since almost 70% of the rather bothered are included with about 98% of the very bothered (Fog, Jonsson, 1968:32-34)			7% n=27 a=DK	4% n=54 a=DK	3% n= 120 a=DK {24% n= 129 a= DK}	L_{eq}		L_{dn}=1.13*L_{eq}-4.9 (Schultz, 1978:395)	The results here combine Tables 13 and 14 in the report. Schultz used only Table 14. Schultz states that the reason this survey did not cluster with the other surveys is not clear. ["Non-Clustering" survey, in Schultz, 1978]	Fog, Jonsson, 1968:32-34 50-51 Schultz, 1978:394, 395
1972 Copenhagen Traffic (DEN-075)	"Much" annoyed, 3-point verbal scale	[VERBAL 3] The question and context do not specify the noise being rated. (Relster, 1975, 118 and Kragh, 1977, 49)					4% n≅ 200 a=6 {n≅ 100 a=4}	Leq 24hr		L_{dn}=1.0024L_{eq} +3.36 (Schultz, 1978, 400)	Relationship of annoyance and noise level comes from Schultz's report of unpublished data. [In Addendum section in Schultz, 1978]	Schultz, 1978:400; Relster, 1975:118; Kragh, 1977: 68,69

Study	Annoy/Def.	Annoy/Comments	30+	35+	40+	45+	50-5	Orig. L	Ex/Inc.	Noise Comments	General comments	Reference
1975 British Railway (UKD-116)	"Very much" annoyed, 4-point verbal scale	[VERBAL 4]	0% n=46 a≅10	0% n=47 a≅10	1% n=68 a≅13	1% n= 140 a≅30	2% n= 203 a≅40	L_{dn}		The only published data are for 24hr L_{eq}.	These data come from unpublished tabulations.	Fields, Walker, 1980a: V.II, Apndx F. Q.17b

APPENDIX C: SYNOPSES OF FINDINGS

This appendix contains a synopsis of the evidence presented in the listings in Appendix B for each topic. These synopses in turn provide the basis for the tables in Chapter 3 in the text.

Each synopsis includes verbal descriptions under standard headings of the methodology and conclusions which pertain to the topic. The results of an analysis of the strength of the evidence on each topic are presented in a table under the heading "Tabulation of findings."

The synopsis headings should, for the most part, be self-explanatory. For more information the reader should consult the four-page "Key to synopsis information" which appears at the beginning of the appendix. For an example of how a synopsis can be interpreted the reader should consult the description under Stage VII in Chapter 2. The symbols used in the appendix are defined in the "LIST OF ABBREVIATIONS AND SYMBOLS" at the beginning of this report.

INDEX TO SYNOPSES

INDEX TO EN ROUTE NOISE ISSUES

Description of information contained in moderating variable synopses:

The information presented in the displays of evidence is summarized for each issue in a corresponding "Synopsis" table. Standard headings are used for each synopsis. In the reproduction of these headings presented on the next three pages the notes presented in square brackets explain the synopsis contents.

Key to Synopsis Information

Synopsis for Topic : [Title]

Moderating variable: [Description of the variable which is hypothesized to affect noise annoyance.]
[Description of the concepts which the variable represents.]

Concepts excluded: [Any similar variables or concepts which are not included under this topic in this synopsis.]

Hypothesis: [Hypothesis being tested with the data. This hypothesis provides the basis for the definition of the variable.]

Explanation: [Reasoning which supports the hypothesis.]

Tabulation of findings: [This table tabulates the evidence by the quality of the evidence and the amount of support for the hypothesis. Additional details about the methodology can be found in Section 2: Symbols and Abbreviations, Section 4: Methodology, and Appendix A.

HEADINGS	Finding: [Direction of support]												
	Hypothesis supported				No important difference					Opposite supported			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective [Xvb]	Objective:-				Subjective [Xvb]	Subjective [Xvb]	Objective:-		
	-standard [XdB, X%, Xr]		-other [Xo]		-standard [XdB, X%, Xr]			-other [Xo]			-other [Xo]	-standard [XdB, X%, Xr]	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S [sr, S p=NA]	ns			←Sig [sr, S]	OK/ns [ns, p=NA]	Sig→ [sr, S]					ns	OK/S [sr, S p=NA]
Number of Findings 13 $F=\sum_{i=1} F_i$	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}	F_{11}	F_{12}	F_{13}
	$\sum_{i=1}^{4} F_i$				$\sum_{i=5}^{9} F_i$					$\sum_{i=10}^{13} F_i$			
100%	$[(\sum_{i=1}^{4} F_i)/F]*100$				$[(\sum_{i=5}^{9} F_i)/F]*100$					$[(\sum_{i=10}^{13} F_i)/F]*100$			
Number of Respondents 13 $N=\sum_{i=1} N_i$	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
	$\sum_{i=1}^{4} N_i$				$\sum_{i=5}^{9} N_i$					$\sum_{i=10}^{13} N_i$			
100%	$[(\sum_{i=1}^{4} N_i)/N]*100$				$[(\sum_{i=5}^{9} N_i)/N]*100$					$[(\sum_{i=10}^{13} N_i)/N]*100$			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings 13 $F_s=\sum_{i=1} F_{si}$	$\sum_{i=1}^{4} F_{si}$				$\sum_{i=5}^{9} F_{si}$					$\sum_{i=10}^{13} F_{si}$			
100%	$[(\sum_{i=1}^{4} F_{si})/F_s]*100$				$[(\sum_{i=5}^{9} F_{si})/F_s]*100$					$[(\sum_{i=10}^{13} F_{si})/F_s]*100$			
Respondents 13 $N_s=\sum_{i=1} N_{si}$	$\sum_{i=1}^{4} N_{si}$				$\sum_{i=5}^{9} N_{si}$					$\sum_{i=10}^{13} N_{si}$			
100%	$[(\sum_{i=1}^{4} N_{si})/N_s]*100$				$[(\sum_{i=5}^{9} N_{si})/N_s]*100$					$[(\sum_{i=10}^{13} N_{si})/N_s]*100$			

The primary purpose of the preceding table is to count the numbers of survey findings (F=) and associated respondents (N=) which support or oppose a hypothesis. The following factors are evaluated in this classification in successive lines of the table headings:

Direction of support: The direction of a survey's finding is classified in the second line of the table into one of three groups: "Hypothesis supported", "Opposite supported", or " No important difference ". The numbers of findings

(F=) and respondents (N=) which are consistent with each of the these three directions are counted within the table. The table thus summarizes the listings in Appendix B in which the direction of support was indicated by the column in which an "X" was placed under the "Finding" heading.

The remaining lines of the table headings indicate the type of evidence which is provided.

Type of evidence: The type of evidence which supports the finding is initially classified under one of two headings:

Subjective: These findings are supported only by verbal statements without direct numerical evidence and were identified in Appendix B with the symbol "X_{VB}" under the "Findings" column.

Objective: These findings are directly supported by quantitative, numerical evidence which is classified under either of two headings:

Standard: Findings under the "standard" heading are supported by one of the three standard quantitative measures of the sizes of effects (3 dB, 5% difference, or 1% variance explained). In the listings in Appendix B this type of evidence was marked with the symbol "XdB", "X%", or "Xr".

Other: These "other" findings are based on either a significance test or some other objective, numerical analysis (for example the difference between means in subgroups of the sample). This evidence was marked with the symbol "Xo" in Appendix B.

Significance test evidence: The "standard" evidence is further classified to indicate whether there are any significance test results which contradict the primary classification which was based on the size of the effect. All significance tests are based on a $p<.05$ criterion. Findings are classified under one of four subheadings:

OK/S Findings under this heading either did not have significance tests or had significance test results which were consistent with size-of-effect classification.

ns Findings under this heading were not statistically significant. For and thus the significance test results do not reinforce the "important" effect classification.

OK/ns This subclassification appears under only the "Effect not supported" heading. Findings under this heading did not have significance tests or had significance test results which were consistent with the "no important difference" classification.

←Sig / Sig→ These subclassifications also appear under only the "Effect not supported" heading. This indicates that though there was a small effect which did not meet the "important effect" criterion, a significance test indicated that the small effect was significant in the direction of either supporting (←Sig) or opposing (Sig→) the hypothesis.

[The "standard" subtotal excludes findings which provide relatively weak or ambiguous evidence as indicated by (1) subjective criteria (X_{VB}) (2) non-standard "other" objective criteria (Xo), (3) no control

for noise level (indicated in "Variables controlled" column in the listings in Appendix B) or (4) questionable classification (indicated by a "?" in the "Findings" column in the listings in Appendix B).]

[Since a single survey usually provides only a single finding on a topic, the number of findings is usually the same as the number of surveys. The numbers of "Findings" will be greater than the number of surveys if one survey provides two findings on the same topic. In this instance, respondents are double counted within the detailed tabulations and the sum of these weights is described as "Number of interviews". However, the total number of respondents (N=) does not double count respondents.]

[In longitudinal surveys with repeated interviews of the same respondent only the number of respondents (not number of interviews) is reported.]

Conclusion: [Conclusions about support for the hypothesis are presented.]

En route noise issue: [The statement of the en route noise issue is reproduced here.]

Further research: [Suggestions are presented for future research on this topic.]

Synopsis for Topic 01: Age of respondent

Moderating variable: Age of respondent

Concepts excluded: None

Hypothesis: Older people are more annoyed.

Explanation: As people age they may become generally less tolerant of environmental problems. People who have difficulty hearing may find that the environmental noise makes it more difficult to understand speech.

Heading notes: None

Tabulations: 63 Findings, 63 Surveys, 77,122 Respondents

HEADINGS	Finding: Older people are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=63	11	1	1	1	1	14	1	12	13	2			6
	14				41					8			
100%	22				65					13			
Number of Respondents N=77,122	18824	800	750	510	1150	17994	180	13954	11011	2890			9059
	20,884				44,289					11,949			
100%	27				57					16			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=19	6				10					3			
100%	31				53					16			
Respondents N=26,206	7520				13576					5110			
100%	29				52					19			

Conclusion: The data do not support a direct relationship between age and annoyance. Less than 20% of the evidence supports the hypothesis. There is more support, but still less than 50%, for the opposite hypothesis that younger people are more annoyed. For three surveys a relationship with age disappears after being controlled for length of residence. Two of the surveys had positive

relationships with age. One had a negative relationship with age.

En route noise issue: Issue 2.k: Community differences--age of population
Would en route reactions be more severe in communities with older residents.?

Further research: Respondents' ages are correlated with length of residence and with experiencing changes, especially slow changes, in the environmental noise in some residential areas. In countries where the acoustical properties of houses have changed over time, age may also be correlated with some aspects of the noise attenuation provided by the dwelling. Little more can be learned from existing publications, but reanalyses of data sets with information about age, length of residence, and long-term changes in the local noise environment might provide information about all three variables.

Synopsis for Topic 02: Sex of respondent

Moderating variable: Sex of respondent

Concepts excluded: None

Hypothesis: Women are more annoyed.

Explanation: When many of these surveys were conducted in the 1960's, women were at home more than men and thus were exposed to environmental noise at home more than men. With a higher exposure women might be expected to be more annoyed than men. Graf, Meier and Müller (1974) have argued, however, that men should be expected to be more annoyed on the grounds that men are subject to more stress at work, are less able to adapt to stress, and are at home during some of the highest noise exposure hours in the evening.

Heading notes: Under "Claim that women home more?" a "yes" indicates that the publication suggests that women in the surveyed communities would be expected to be at home more during the day.

Tabulations: 47 Findings, 47 Surveys, 62,479 Respondents

HEADINGS	Finding: Women are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=47					2	19	1	15	7	1			2
	0				44					3			
100%	0				94					6			
Number of Respondents N=62,479					5669	23557	1500	15600	10718	2290			3145
	0				57,044					5,435			
100%	0				91					9			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=15	0				15					0			
100%	0				100					0			
Respondents N=24,725	0				24725					0			
100%	0				100					0			

Conclusion: The sex of the respondent is not related to reactions to noise.

En route noise issue: Issue 2.i.ii: Methodology--over-sampling women
Would estimates of en route noise reactions be biased if a study sample include a high proportion of women?

Further research: If there is a small effect, it might be accurately estimated in a reanalysis of the original, individual-level annoyance data.

Synopsis for Topic 03: Social status (social class or occupational status)

Moderating variable: Social class or occupational status of respondent or head of household

Social class or occupational status is measured by such variables as social class, prestige of the household heads' occupation, or a broad grouping of occupation (eg. blue collar/while collar occupations).

Concepts excluded: (See heading notes)

Hypothesis: High status residents are more annoyed.

Explanation: It is most often assumed that high status causes greater noise annoyance. No single theory for such a relationship is consistently offered. Possible theories are that high status people have fewer serious problems to be concerned with, that high status people are generally more sensitive to problems, that high status respondents are more likely to admit being bothered by any problem, that high status people are engaged in quieter activities in their homes or that high socioeconomic residents are more concerned about the quality of their neighborhood. One theory, that higher status respondents live in quieter areas, is not tested by the present tabulations because the effect of noise level is removed in the analyses.

Heading notes: Findings are only reported in this table if noise level has been controlled in the analysis. For all but one finding multivariate analysis techniques were used. For the one finding, a separate analysis showed that noise level was not related to status.

Tabulations: 22 Findings, 22 Surveys, 33,701 Respondents

HEADINGS	Finding: High social status residents are:													
	Less annoyed				No important difference					More annoyed				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subje	Objective:-				Subje	Subje	Objective:-			
	-standard		-oth	ctive	-standard			-oth	ctive	ctive	-oth	-standard		
	Sig. test evidence		er		Significance test evidence supports			er			er	Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
Number of Findings F=22	1					8	1	4	3	1		1	3	
	1				16					5				
100%	4				73					23				
Number of Respondents N=33,701	630					16879	4690	2512	6620	300		480	1590	
	630				30,701					2,370				
100%	2				91					7				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=12	0				8					4				
100%	0				67					33				
Respondents N=23,039	0				20969					2070				
100%	0				91					9				

Conclusion: Less than half of the findings support the hypothesis that high status causes important differences in annoyance. While most of the studies support a finding of no important difference, it should be noted that almost none of the studies find that lower status respondents are more annoyed. It is possible that there might be some weak effect which does not meet the arbitrary "importance" criterion which has been set for this study. It should also be noted that since noise level was controlled in the analyses, the present review has not considered whether higher status people live in quieter areas.

En route noise issue: Issue 2.1.i: Community differences--social status
Would en route reactions be greater in high socioeconomic status areas?

Further research: A secondary analysis of existing data could provide a more precise estimate of any small effect of status on annoyance.

Synopsis for Topic 04: Income

Moderating variable: Income of respondent or family

Concepts excluded: (See heading notes)

Hypothesis: High income residents are more annoyed.

Explanation: It is most often assumed that high income causes greater noise annoyance. No single theory for such a relationship is consistently offered. Possible theories are that high income people have fewer serious problems to be concerned with, that high income people are engaged in quieter activities in their homes or that high income residents are more concerned about the quality of their neighborhood. One theory, that higher income respondents live in quieter areas, is not tested by the present tabulations because the effect of noise level is removed in the analyses.

Heading notes: Findings are only reported in this table if noise level has been controlled in a multivariate analysis.

Tabulations: 10 Findings, 10 Surveys, 15,846 Respondents

HEADINGS	Finding: High income residents are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=10						4	1	2					3
	0				7					3			
100%	0				70					30			
Number of Respondents N=15,846						9986	1150	3230					1480
	0				14,366					1,480			
100%	0				91					9			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=8	0				5					3			
100%	0				63					38			
Respondents N=12,616	0				11136					1480			
100%	0				88					12			

Conclusion: Since no more than half of the findings support the hypothesis, the hypothesis that high income causes important differences in annoyance is not supported. While most of the studies support a finding of no important difference, it should be noted that none of the studies find that lower income respondents are more annoyed. It is possible that there might be some weak effect which does not meet the arbitrary "importance" criterion which has been set for this study. It should also be noted that since noise level was controlled in the analyses, the present review has not considered whether higher income people live in quieter areas.

En route noise issue: Issue 2.1.ii: Community differences--income
Would en route reactions be greater in high socioeconomic status areas?

Further research: A secondary analysis of existing data could provide a more precise estimate of any small effect of income on annoyance.

Synopsis for Topic 05: Education

Moderating variable: Education of respondent

Education is measured by years of education, age when left school or broad groupings of educational level.

Concepts excluded: (See heading notes)

Hypothesis: More highly educated people are more annoyed.

Explanation: It is most often assumed that high education is associated with greater noise annoyance. No single theory for such a relationship is consistently offered. Possible theories are that high education people have fewer serious problems to be concerned with, that high education people are generally more sensitive to problems, that high education respondents are more likely to admit being bothered by any problem, that high education people are engaged in quieter activities in their homes or that high education residents are more concerned about the quality of their neighborhood. One theory, that higher education respondents live in quieter areas, is not tested by the present tabulations because the effect of noise level is removed in the analyses.

Heading notes: Findings are only reported in this table if noise level has been controlled in a multivariate analysis.

Tabulations: 18 Findings, 18 Surveys, 23,983 Respondents

HEADINGS	Finding: High education residents are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=18						6	4	2	2				4
	0				14					4			
100%	0				78					22			
Number of Respondents N=23,983						10783	7270	830	2210				2690
	0				21,093					2,890			
100%	0				88					12			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=13	0				10					3			
100%	0				77					23			
Respondents N=20,274	0				18053					2221			
100%	0				89					11			

Conclusion: Since less than half of the findings support the hypothesis, the hypothesis that high education status causes important differences in annoyance is rejected. While most of the studies support a finding of no important difference, it should be noted that none of the studies report that lower education respondents are more annoyed. It is possible that there might be some weak effect which does not meet the arbitrary "importance" criterion which has been set for this study. It should also be noted that since noise level was controlled in the analyses, the present review has not considered whether higher education people live in quieter areas.

En route noise issue: Issue 2.1.iii: Community differences--education
Would en route reactions be greater in high socioeconomic status areas?

Further research: A secondary analysis of existing data could provide a more precise estimate of any small effect of education on annoyance.

Synopsis for Topic 06: Home ownership

Moderating variable: Owning home

Home owners include those owning or paying for their home. In some, but not all surveys, all other residents are renters of dwellings. The surveys do not usually include residents from institutional settings who might not be paying for their lodging. In some, but not all, countries home ownership and type of dwelling (single or multiple unit) are highly correlated.

Concepts excluded: None

Hypothesis: Homeowners are more annoyed.

Explanation: Residents who have a greater financial investment in a neighborhood will be more likely to be concerned about and annoyed with a local noise.

Heading notes: None

Tabulations: 23 Findings, 23 Surveys, 25,327 Respondents

HEADINGS	Finding: Homeowners are:													
	Less annoyed				No important difference					More annoyed				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
Number of Findings F=23	1	1				3		6	4	1	1		6	
	2				13					8				
100%	9				57					35				
Number of Respondents N=25,327	349	100				5004		4800	5190	300	2000		7584	
	449				14,994					9,884				
100%	2				59					39				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=7	2				3					2				
100%	29				43					29				
Respondents N=8,157	449				5004					2704				
100%	6				61					33				

Conclusion: The hypothesis is not supported. The majority of the findings

show no effect. However, as for the socioeconomic status variables, it is possible that there might be a small effect which does not meet the "importance" criteria.

En route noise issue: Issue 2.m: Community differences--home ownership
Would en route reactions be more severe in communities with more home owners?

Further research: Secondary analyses might provide better estimates of any small effects of home ownership. However, home ownership and type of residence are so highly related that the independent effects of the two variables could probably not be separated.

Synopsis for Topic 07: Dwelling type (single/multiple)

Moderating variable: Type of dwelling

The most frequently made distinctions are between single-unit detached dwelling, multiple-unit row houses and apartments in multi-story structures.

Concepts excluded: Distinctions between dwellings which are explicitly classified by the effects of construction on attenuation of outside sounds have been described under a separate heading: personal dose mitigation at home. Ratings of the noise of neighbors are not used as evidence to compare apartments and detached housing.

Hypothesis: Residents of single unit dwellings are more annoyed.

Explanation: People in single unit homes might be more annoyed because they would have quieter surroundings with less noise from neighbors.

Heading notes: None

Tabulations: 14 Findings, 14 Surveys, 18,463 Respondents

HEADINGS	Finding: Residents of single unit dwellings are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=14	2				1	3		3	1				4
	2				8					4			
100%	14				57					29			
Number of Respondents N=18,463	909				3245	6769		1550	360				5630
	909				11,924					5,630			
100%	5				65					30			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=6	2				3					1			
100%	33				50					17			
Respondents N=10,246	909				8637					700			
100%	9				84					7			

Conclusion: Annoyance is not affected by type of dwelling.

En route noise issue: Issue 2.n: Community differences--dwelling type
Would en route reactions be more severe in neighborhoods with single unit housing.?

Further research: Secondary analyses might provide better estimates of any small effects. However, home ownership and type of residence are so highly related that the independent effects of the two variables could probably not be separated.

Synopsis for Topic 08: Length of residence

Moderating variable: Length of time that respondent has lived in the present home

Length of residence is usually measured as the number of months or years the resident has lived in the present home. In some studies the length of residence in the area, rather than dwelling, may be obtained. The "life time resident" category may be qualitatively different from the other length-of-residence groups.

Concepts excluded: Time which has elapsed since a change in noise levels is not considered in this table. The effects of time elapsed since a measured change in noise levels are summarized in the next table.

Hypothesis: Longer length-of-residence respondents are less annoyed.

Explanation: It is commonly assumed that people "get used to" the noise after a certain period of time. The residents are assumed to either completely ignore the noise or to adapt their behavior patterns so that the noise is not noticed as being disruptive. While it seems certain that people will react differently to the first few times they hear a noise, it is not clear how long-term reactions (eg. 10 years or more) might compare with shorter, but not first, reactions (eg. under a year). Changes in reactions over the first few days of residence have not been studied. The length of residence is correlated with the age of the respondent and, possibly, with the date of construction of the dwelling. In any particular area longer residence may also be associated with noise level increases of a gradual (eg. traffic noise on a main road) or relatively abrupt nature (eg. jet aircraft noise in the early 1960's).

Heading notes: The "Shortest separated time period" identifies the shortest time period group which was separately analyzed in the analysis. If adaptation is completed by one year then the effect might be identified if under one-year residents and other residents are explicitly compared, but the effect might not be detected in a linear regression analysis in which length is continuously coded as number of months of residence.

Tabulations: 44 Findings, 44 Surveys, 61,322 Respondents

HEADINGS	Finding: Newer residents are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=44	5	2		4	2	11	1	4	7	1	1	2	4
	11				25					8			
100%	25				57					18			
Number of Respondents N=61,322	8238	1100		3440	4322	14870	1150	2420	16615	690	610	3355	4512
	12,778				39,377					9,167			
100%	21				64					15			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=16	4				8					4			
100%	25				50					25			
Respondents N=23,798	4088				14033					5677			
100%	17				59					24			

Conclusion: The hypothesis is not supported. No more than 25% of evidence supports the hypothesis. Annoyance does not automatically disappear with increasing residence. The implications for the extent to which there is some adaptation to noise over time are somewhat unclear because of the confounding effects of gradual changes in noise levels, the presence of life-time residents, the correlation between age and length of residence and the possibility that major adaption may occur in the first few days or months of residence. Two surveys compared life-time residents and other long-term residents.(Bullen, Hede, and Kyriacos, 1986; Fields and Walker, 1982). In these two surveys life-time residents were less annoyed than other residents, but all other residents reacted similarly. Length of residence may be correlated with study area (ie. sample cluster). As a result the sampling variances for the effects of length of residence may be greater than for other variables used in typical noise surveys.

En route noise issue: Issue 1.i.i: Change--length of residence
Would en route reactions be more severe because residents would not have lived with the noise for a long time?

Further research: This issue could be usefully explored by conducting a detailed secondary analyses of these data sets by obtaining copies of the individual level data sets and systematically analyzing the independent effects of the correlated variables of length-of-residence, age of resident, life-time residency, and (with supplementary data where possible) history of noise level changes in area.

Synopsis for Topic 09: Benefits from noise source (employment, access)

Modifying variable: Benefit from noise source

Benefit is defined by any indication that the respondent benefits from the source. Examples of benefits include employment or use of the transport mode.

Concepts excluded: Living near the noise producer is not sufficient to show a benefit. A particular benefit must be explicitly measured. While a perception of a specific benefit is included, a perception of the general importance of the noise source is not included (see Topic 14: Belief in importance of noise source).

Hypothesis: Those benefiting from the noise source are less annoyed.

Explanation: People may be less annoyed if they receive some benefit from the transportation mode or some organization associated with the transportation mode. The noise source might even be welcomed if it reminded the respondent of the benefits, such as employment derived from the source. However, it might also be hypothesized that employees who do not want to be reminded of their employment would find the noise more annoying than other residents.

Heading notes: None

Tabulations: 18 Findings, 18 Studies, about 28,453 Respondents

HEADINGS	Finding: Employees and users of the noise source are:													
	Less annoyed				No important difference					More annoyed				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
Number of Findings F=18						9	1	1	3	2			2	
	0				14					4				
100%	0				78					22				
Number of Respondents N=28,453						12435	3920	3600	3650	430			4418	
	0				23,605					4,848				
100%	0				83					17				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=9	0				8					1				
100%	0				89					11				
Respondents N=12,485	0				10157					2328				
100%	0				81					19				

Conclusion: Benefits have little or no effect on annoyance with noise. Only 4 of the 18 studies supported the hypothesis. Only one of the nine studies with standard quality findings supported the hypothesis.

En route noise issue: Issue 1.c.i: Airport--benefits from airport
Would en route reactions be more negative because residents do not directly benefit from a nearby airport?

Further research: The proportion of the population which receives benefits from the noise source could be examined using many of the existing publications. This may indicate that even if benefits affected reactions, too small a proportion of the population benefits from the presence of a source to affect the overall annoyance level in a population.

Synopsis for Topic 10: Fear of danger from the noise source

Moderating variable: Fear that there is danger from the noise source

For most aircraft noise studies this is the fear that an aircraft may crash near the residence. The fear may be for other people's safety, especially for non-aircraft surveys.

Concepts excluded: None identified

Hypothesis: Fear of danger from the noise source increases annoyance.

Explanation: If the resident feels the noise source is dangerous, then hearing the noise will remind the resident of that fear and increase noise annoyance.

Heading notes: None

Tabulations: 21 Findings, 21 Surveys, 44,713 Respondents

HEADINGS	Finding: Fear of danger from the noise source:													
	Decreases annoyance				No important difference					Increases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			-Sig	OK/ns	Sig-					ns	OK/S	
Number of Findings F=21										2	2	1	16	
	0				0					21				
100%	0				0					100				
Number of Respondents N=44,713										3630	1680	176	39227	
	0				0					44,713				
100%	0				0					100				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=14	0				0					14				
100%	0				0					100				
Respondents 22,899	0				0					22899				
100%	0				0					100				

Conclusion: Fear of danger from a noise source is associated with annoyance with the noise source. The statement that fear actually causes annoyance can not be proven with these survey data. There may be some tendency for a negative attitude toward aircraft noise to cause some residents to attribute negative attributes to all

aspects of the aircraft. The frequently found correlation between noise level and fear has been controlled for in all of the "standard" quality findings.

En route noise issue: Issue 1.d: Airport--fear of danger
Would en route reactions be less than those around airports because aircraft might be perceived as less of a danger?

Further research: Further survey analysis of existing data could determine whether fearful attitudes disappear at low noise levels and at great distances from airports. Combinations of laboratory and field experiments might be performed to determine whether information about aircraft safety could reduce fear levels.

Synopsis for Topic 11: Belief that the noise could be prevented

Moderating variable: Preventability: the belief that the noise can be prevented or reduced.

The respondent only needs to express the belief that something more could be done to reduce or prevent the noise. The "preventability" label for this concept is slightly different from the "misfeasance" concept which includes the additional judgement that there are particular individuals who are currently negligent because they are not reducing the noise.

Concepts excluded: Simply distrusting or characterizing the authorities' motives negatively is not sufficient. Whether or not some statement is made about the motives of the authorities, there must be a direct statement that the noise could be reduced.

Hypothesis: The belief that the authorities could prevent or reduce the noise increases annoyance.

Explanation: It is assumed that if people feel that a noise could be controlled then they will judge that the noise is not necessary and that their own exposure to the noise is unnecessary. Some people may feel that annoyance is not possible or reasonable without a possibility that the noise can be controlled. This belief is represented by the statement that "there is no point in being annoyed if nothing can be done about it."

Heading notes: None

Tabulations: 11 Findings, 11 Surveys, 19,462 Respondents

HEADINGS	Finding: The belief that the noise could be prevented:												
	Decreases annoyance				No important difference					Increases annoyance			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=11													11
	0				0					11			
100%	0				0					100			
Number of Respondents N=19,462													19462
	0				0					19,462			
100%	0				0					100			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=6	0				0					6			
100%	0				0					100			
Respondents N=9,779	0				0					9779			
100%	0				0					100			

Conclusion: Annoyance is closely related to the belief that something could be done to reduce the noise levels. This raises the possibility that residents' annoyance could be changed if their beliefs could be changed about the feasibility of reducing noise levels. On the other hand it is possible that annoyance may, at least partially, cause the belief in preventability. This is popularly expressed in the belief that.."the noise is so terrible that there must be something that someone could do".

En route noise issue: Issue 2.o: Change--belief that the noise could be prevented. Would en route reactions be affected to the extent to which people felt that aircraft design or aircraft routing alternatives could reduce their noise exposure?

Further research: Little additional information could be derived from secondary analyses. Some type of experimental or quasi-experimental research would be needed to obtain insight into the extent to which people's feeling of annoyance could be changed by only changing their beliefs about the extent to which the noise could be reduced.

Synopsis for Topic 12: Annoyance with non-noise environmental impacts of the noise source

Moderating variable: Respondents' feelings about non-noise environmental nuisances from source.
This variable includes feelings about dust, dirt, odors, lights, air pollution and effect on the respondent's property.

Concepts excluded: Reactions to vibration or to interference with television picture reception are not included. If the objective characteristics of the non-noise nuisance have been independently measured, then the finding is included under Topic 15, exposure to non-noise impacts of the noise source (objectively measured). Due to the typically high correlation between noise level and non-noise nuisances, findings are only reported if noise level has been controlled.

Hypothesis: Annoyance with non-noise impacts of the source increases annoyance with noise.

Explanation: Residents who find non-noise nuisances annoying may also be more likely to notice and be annoyed by the noise nuisances associated with the source.

Heading notes: None

Tabulations: 2 Findings, 2 Surveys 1,903 Respondents

HEADINGS	Finding: Those annoyed by non-noise nuisances are:												
	More annoyed				No important difference					Less annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=2													2
	0				0					2			
100%	0%				0%					100%			
Number of Respondents N=1,903													1903
	0				0					1,903			
100%	0%				0%					100%			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=2	0				0					2			
100%	0%				0%					100%			
Respondents N=1,903	0				0					1903			
100%	0%				0%					100%			

Conclusion: The two studies with evidence both support the hypothesis. However, the direction of causation is not clear. It may be that being annoyed with noise leads to annoyance with other nuisances.

En route noise issue: Issue 1.b.ii: Airport--annoyance with non-noise environmental impacts of the noise source

Would en route reactions be reduced because residents would be less likely to be annoyed with non-noise aspects of the aircraft?

Further research: Social survey data from data archives could be analyzed to determine if the same patterns are present in other surveys. However, these analyses would not answer the fundamental questions about causation.

Synopsis for Topic 13: General sensitivity to noise

Moderating variable: Sensitivity with noise generally

General sensitivity with noise is often measured with self-ratings of perceived sensitivity to "noise generally", or questions about attitudes towards noise as a general environmental problem or with ratings of annoyance with common sounds (eg. dripping water, barking dog).

Concepts excluded: Ratings of environmental noise in the respondent's area are excluded because they may include ratings of the noise source. In general, ratings of sensitivity should not be direct assessments of noise sources for which the noise level would vary greatly between respondents.

Hypothesis: General sensitivity with noise increases annoyance.

Explanation: If there is a general noise sensitivity trait and people are aware of it, then they should be more likely to express annoyance with specific noises.

Heading notes: None

Tabulations: 24 Findings, 23 Surveys, 36,435 Respondents

HEADINGS	Finding: General sensitivity with noise												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=24						1					3	2	18
	0				1					23			
100%	0				4					96			
Number of Interviews N=38,165						1500					8090	458	28117
	0				1,500					36,665			
100%	0				4					96			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=14	0				0					14			
100%	0				0					100			
Interviews N=24,363	0				0					24363			
100%	0				0					100			

Conclusion: Perceived sensitivity to "noise generally" is related to ratings of specific environmental noises. This is a strong, consistent relationship. As with all attitudinal variables the exact causal linkages are not clear. Part of the relationship might be due to some more general response patterns, such as the willingness to report and types of problems. The direction of the causation could be reversed for some individuals whose experience with the rated noise source may have provided their basis for concluding that they are especially sensitive to noise.

En route noise issue: Issue 1.f: Airport--general noise sensitivity of population Would en route reactions be greater because noise-sensitive people live in the types of quiet areas which will be impacted by en route noise? (This direct question is addressed under Topics 22, 23 and 24.)

Further research: Further research might help to determine how much of the noise sensitivity relationship is due to noise sensitivity and how much is associated with more general personality or attitudinal characteristics. This research could be pursued with more detailed reviews of some past studies, more precise measures of relevant attitudinal characteristics, and studies of reactions to other noise sources.

Synopsis for Topic 14: Belief in importance of noise source

Modifying variable: Belief that the noise source is important

The respondent believes that the noise source is generally important.

Concepts excluded: If the respondent perceives a specific, objective, personal benefit, then the finding is included under Topic 9: Benefits from noise source (employment, access). Some questions about benefits are confounded with judgements about noise annoyance and are thus excluded. For example, a question about whether a benefit outweighs the annoyance from the noise would not be included.

Hypothesis: A belief in the importance of the noise source increases annoyance.

Explanation: Respondents may be less annoyed if they believe that the noise producer preforms an important economic or military function for the community or country.

Heading notes: None

Tabulations: 4 Findings, 4 Studies, 5,882 Respondents

HEADINGS	Finding: The belief that the noise source is important:													
	Decreases annoyance				No important difference					Increases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subje	Objective:-				Subje	Subje	Objective:-			
	-standard		-oth	ctive	-standard			-oth	ctive	ctive	-oth	-standard		
	Sig. test evidence		er		Significance test evidence supports			er			er	Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
Number of Findings F=4					1								3	
	0				1					3				
100%	0				25					75				
Number of Respondents N=5,882					1730								4152	
	0				1,730					4,152				
100%	0				29					71				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=4	0				1					3				
100%	0				25					75				
Respondents N=5,882	0				1730					4152				
100%	0				29					71				

Conclusion: A belief in the importance of the noise source reduces annoyance to some extent. Three of the four studies met the criteria for supporting this hypothesis. The other found too small an effect to meet the $r_{ax \cdot n}=0.10$ criteria.

En route noise issue: Issue 1.c.ii: Airport--believed importance of noise source Would en route reactions be more negative because residents do not directly benefit from a nearby airport?

Further research: An important question is whether the belief in importance does in fact vary over time or between locations and can thus create major differences between the noise impact on communities.

Synopsis for Topic 15: Exposure to non-noise impacts of the noise source (objectively measured)

Moderating variable: Non-noise environmental impacts of the noise source (objective measure)
Non-noise environmental nuisances from a noise source, especially a transportation noise source, include dust, dirt, fumes, lights, vibration, visibility of the source, and severance of property. The position relative to the flight path serves as surrogate for these variables in aircraft surveys.

Concepts excluded: Subjective feelings about the impacts are not included in this synopsis (See Topic 12, annoyance with non-noise environmental impacts of noise source). Numbers of noise events are not considered to be a non-noise impact. Due to the typically high correlation between noise level and non-noise nuisances, findings are only reported if noise level has been controlled.

Hypothesis: The presence of non-noise impacts from the noise source increase annoyance.

Explanation: Resident's annoyance with non-noise aspects of the noise source may increase their sensitivity and annoyance with all aspects of the noise source including the noise.

Heading notes: None

Tabulations: 5 Findings, 3 Surveys 4,380 Respondents

HEADINGS	Finding: Presence of non-noise impacts													
	Reduces annoyance				No important difference					Increases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
Number of Findings F=5						1		1					3	
	0				2					3				
100%	0%				40%					60%				
Number of Interviews N=5,870						2504		170					3196	
	0				2,674					3,196				
100%	0%				46%					54%				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=2	0				1					1				
100%	0%				50%					50%				
Respondents N=3,060	0				2504					556				
100%	0%				82%					18%				

Conclusion: The data provide only moderate, questionable support for the hypothesis. The five findings come from only three studies. Only a slight majority of the studies support the hypothesis. Four of the five studies do not meet the "standard" quality criteria. The comments in Appendix B show why the existing studies do not provide a good test of the hypothesis. Authors of the Canada 4-Airport study expressed concern about the quality of the non-noise nuisance measure (position relative to flight path). The railway survey shows that the presence of such non-noise nuisances are highly correlated with other factors including noise level and that the relationship can disappear when controlled for factors which could be affected by measurement errors in noise level.

En route noise issue: Issue l.b.i: Airport--exposure to non-noise impacts of the noise source (objectively measured)

Has annoyance in conventional airport setting been heightened because residents near airports are likely to be subject to other non-noise environmental nuisances which are associated with either relatively low flying aircraft or with ground-based characteristics of aircraft such as traffic congestion?

Further research: Objective measures of non-noise impacts have not often been measured in connection with social surveys. New data collection would be necessary to increase the knowledge about this issue.

Synopsis for Topic 16: Amount of time at home

Moderating variable: The amount of time a respondent is at home.

Amount of time at home is assumed to be an indicator of the amount of noise exposure. Some surveys include direct questions about time at home or in the neighborhood. Other surveys use employment status as an indicator of time at home.

Concepts excluded: Sex is not used as a surrogate indicator for time at home, although the occupation "housewife" can be used as an indicator of time spent at home. (See Table 2 for classification by sex.)

Hypothesis: Residents spending more time at home are more annoyed.

Explanation: People who are at home more have a higher noise dosage and thus might be expected to be annoyed more. This effect could be mitigated somewhat because almost all residents are at home during the theoretically most sensitive times of day (evening and night). The noise dose may also not vary greatly between any large population subgroups for two reasons; (1) most homemakers spend parts of the day away from the home and (2) when noise exposure is summed logarithmically, a reduction by 50% in the number of hours of exposure would be equivalent to only a small, 3 decibel difference in noise exposure.

Heading notes: None

Tabulations: 17 Findings, 17 Surveys, 19,765 Respondents

HEADINGS	Finding: Those at home more are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	~standard		~other		~standard			~other			~other	~standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=17	2					2	1	10					2
	2				13					2			
100%	12				76					12			
Number of Respondents N=19,765	1751					3780	600	8410					5224
	1,751				12,790					5,224			
100%	9				65					26			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=5	2				2					1			
100%	40				40					20			
Respondents N=9,341	1751				3850					3740			
100%	19				41					40			

Conclusion: Amount of time at home does not affect reactions to noise. Most of the findings are not classified as "standard" because the studies did not report the sizes of effects which were not statistically significant.

En route noise issue: Issue 2.i.i: Community differences--amount of time at home Should en route reaction predictions adjust for the amount of time that residents are at home?

Further research: A reanalysis of the original, individual interview data sets would provide direct estimates of the accuracy of the estimated relationship between number of hours at home and annoyance.

Synopsis for Topic 17: Isolation from noise at home (personal exposure)

Moderating variable: Extent isolated from the sound at the residence

Isolation is measured in five different ways: building attenuation (F=14 findings), orientation of rooms towards noise source (F=9), season of year (F=6), installation of air conditioning (F=3), and out-of-doors exposure time F=2).

Concepts excluded: An individual respondent's beliefs about the relative impact of noise under different conditions is not included. As with all analyses, the dependent variable is the overall, summary annoyance with the noise source at home and the objective is to determine whether some variable (in addition to noise level) affects that overall annoyance.

Hypothesis: Isolation from noise at home (noise insulation, room orientation, usage of outdoor spaces) reduces annoyance.

Explanation: Environmental noise levels outside the home affect annoyance. If the outside noise exposure is important then it would be expected that further individualized modifications in noise exposure would, for the same exterior noise level, also affect the annoyance of those differentially exposed individuals. The mechanism for individualizing exposure differs somewhat depending upon the particular indicator. While some type of attenuation by the structure (including the windows) enters into most of the indicators, additional factors are also considered. When exposure is indicated by the orientation of specific rooms to the noise source, then the relative importance of the activities which occur in the rooms (sleeping, talking, cooking) is also considered. For season-of-year and out-of-doors exposure indicators, the number and sometimes significance of outside activities is considered. For the air conditioning equipment indicator the effects of masking by interior air handling equipment as well as the effect of closed windows are being considered. Because of these differences, the findings have been tabulated separately for each type of indicator as well as for all indicators combined.

Heading notes: Under "Methodology: Indicator of isolation" five terms are used to categorize the type of isolation: INSULATION (acoustical insulation, i.e. double glazing, building construction), ROOM ORIENTATION (i.e. whether any rooms or selected rooms have windows on the street), SEASON (time of year at which survey was conducted), AIR CONDITIONING (installation), and EXTERIOR EXPOSURE (time out-of-doors).

Tabulations: 33 Findings, 30 Surveys, 39,119 Respondents

[Note: One finding (USA-235) which presents results from an index which combines the effects of window closing and time outside is tabulated only once in the combined tabulation (first tabulation) but appears in both the "Insulation" and "Exterior Exposure" tabulations.]

HEADINGS	Finding: Increased isolation from sound:													
	Increases annoyance				No important difference					Decreases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
COMBINED RESULTS FOR ALL TYPES OF ISOLATION														
Number of Findings F=33						7	1	4	1	1	4	1	14	
	0				13					20				
100%	0				39					61				
Number of Interviews N=47,031						14491	1845	1882	490	1000	3990	89	23244	
	0				18,708					28,323				
100%	0				40					60				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=11					2					9				
100%	0				18					82				
Respondents N=7,511					2121					5390				
100%	0				28					72				

HEADINGS	Finding: Increased isolation from sound:													
	Increases annoyance				No important difference					Decreases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
RESULTS FOR ONLY CROSS-SECTIONAL DESIGN, INSULATION (attenuation) FINDINGS														
Number of Findings F=12						4		1	1		1	1	4	
	0				6					6				
100%	0				50					50				
Number of Respondents N=17,689						11821		690	490		950	89	3649	
	0				13,001					4,688				
100%	0				74					27				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=3					1					2				
100%	0				33					67				
Respondents N=1,870					1451					419				
100%	0				78					22				

HEADINGS	Finding: Increased isolation from sound:													
	Increases annoyance				No important difference					Decreases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
RESULTS FOR ONLY PANEL DESIGN INSULATION (attenuation) FINDINGS														
Number of Findings F=2														2
	0				0					2				
100%	0				0					100				
Number of Respondents N=1,036														1036
	0				0					1,036				
100%	0				0					100				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=2										2				
100%	0				0					100				
Respondents N=1,036										1036				
100%	0				0					100				

HEADINGS	Finding: Increased isolation from sound:													
	Increases annoyance				No important difference					Decreases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
RESULTS FOR ONLY ROOM ORIENTATION FINDINGS														
Number of Findings F=9								1		1	3		4	
	0				1					8				
100%	0				11					89				
Number of Respondents N=8,522								690		1000	3040		3792	
	0				690					7,832				
100%	0				8					92				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=4										4				
100%	0				0					100				
Respondents N=3,792										3792				
100%	0				0					100				

HEADINGS	Finding: Increased isolation from sound:													
	Increases annoyance				No important difference					Decreases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
RESULTS FOR ONLY CLIMATE FINDINGS														
Number of Findings F=6							1	1					4	
	0				2					4				
100%	0				33					67				
Number of Respondents N=16,834							1845	222					14767	
	0				2,067					14,767				
100%	0				12					88				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=1										1				
100%	0				0					100				
Respondents N=143										143				
100%	0				0					100				

HEADINGS	Finding: Increased isolation from sound:												
	Increases annoyance				No important difference					Decreases annoyance			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
RESULTS FOR ONLY AIR CONDITIONING FINDINGS													
Number of Findings F=3						2		1					
	0				3					0			
100%	0				100					0			
Number of Respondents N=2,300						2000		300					
	0				2,300					0			
100%	0				100					0			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=0													
100%	??				??					??			
Respondents N=0													
100%	??				??					??			

HEADINGS	Finding: Increased isolation from sound:													
	Increases annoyance				No important difference					Decreases annoyance				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
RESULTS FOR ONLY OUTSIDE EXPOSURE FINDINGS														
Number of Findings F=2						1							1	
	0				1					1				
100%	0				50					50				
Number of Respondents N=1,000						670							330	
	0				670					330				
100%	0				67					33				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=2					1					1				
100%	0				50					50				
Respondents N=1,000					670					330				
100%	0				67					33				

Conclusion: The majority of the studies and interviews support the conclusion that, in general, the degree of isolation does affect annoyance. However, due to small numbers of studies (especially for "standard" findings), it is not clear whether each of the different types of indicators of isolation is important. Some special considerations apply to several indicators. Two of the 6 surveys supporting the cross-sectional design INSULATION (attenuation) hypothesis are for insulation from noise from adjacent dwellings. Both of the panel design surveys of changes in noise INSULATION (attenuation) come from studies in which the home was improved during the respondent's tenure. Most of the studies for the ROOM ORIENTATION indicator were conducted in large multiple unit dwellings which may give more dwelling-to-dwelling variation in exposure than is found for single family, detached dwellings.

En route noise issue: Issue 2.j: Community differences--isolation from sound at home (attenuation)

Would en route reactions to Advanced Turboprop aircraft be increased because the exposure may be attenuated less by buildings?

Further research: The critical issue is the amount of reduced impact which is associated with each decibel reduction in acoustical attenuation. The question is whether the same benefit can be achieved by acoustical attenuation as can be achieved by reduction at source? Secondary analyses of the primary data sets could provide

estimates, though probably not definitive estimates, of the answer to this question. Such analyses would also identify the issues which should be addressed in order to design further research which might provide definitive answers.

Synopsis for Topic 18: Ambient noise

Modifying variable: Ambient noise level

Ambient noise includes any noise, other than that from the rated noise source, which is present in the environment. When aircraft noise is rated the ambient noise is usually dominated by road traffic and is either described as road traffic or, more generally, as "community noise". When road traffic is rated the "ambient" noise is aircraft noise.

Concepts excluded: Questions which either explicitly or implicitly request a relative ranking of noise sources are not examined. Such a ranking is implicit in open questions in which respondents volunteer the names of noises which bother them.

Hypothesis: Low ambient noise exposure increases annoyance with an intrusive noise source.

Explanation: Annoyance with a low level noise source could be reduced if it is sometimes masked by high level ambient noises. Annoyance with a high level noise source could be increased if it is relatively intrusive in the absence of other high level noise sources. However, it could also be hypothesized, that the high level noise source will be more annoying when there are other high level noise sources, because the other sources will create a greater sensitivity to all noise.

Heading notes: The rated noise source is either implicit in the survey title or is indicated in square brackets (eg. [ROAD]) under the "Study" heading. Under "Methodology" the ambient noise source is identified. The specification of a noise metric (ie. L_{eq}) under "Continuous noise data" indicates that the study attempted to measure or estimate noise levels to at least the nearest decibel. If a non-noise variable is listed under this heading (ie. distance, number of events) that variable was used as a surrogate for noise level. "Range of ambient noise" indicates whether there was a large variation in the ambient noise level. Too narrow an ambient noise range could mean that an ambient noise effect might not be detected.

Tabulations: 22 Findings, 17 Surveys, 23,769 Respondents

HEADINGS	Finding: Low ambient noise:												
	Decreased annoyance				No important difference					Increases annoyance			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			<-Sig	OK/ns	Sig->					ns	OK/S
Number of Findings F=22 (17)		1		1		11		1	4			1	3
	2				16					4			
100%	9				73					18			
Number of Interviews N=28,917		1453		85		14695		350	5490			1739	5105
	1,538				20,535					6,844			
100%	5				71					24			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=13 (9)	1				9					3			
100%	8				69					23			
Interviews N=13,707	1453				10100					2154			
100%	10				74					16			

Conclusion: The balance of the evidence suggests that ambient noise level does not affect the evaluation of a specified noise. Only 5 of the 22 findings support the ambient effect hypothesis. Of the 22 findings only 13 are "standard" quality and (as is indicated in parentheses) these are actually based on only 9 studies. The widely held view that ambient noise level affects annoyance appears to have been based on findings about the relative ranking of noise sources and not the absolute rating of a noise source. The surveys have included some large ambient/source noise level differences (mean=24 dB, greatest 40 dB) It is possible that an effect for very wide deviations in ambient noise levels (eg. 60 dB) would not have been detected with these surveys' designs.

En route noise issue: Issue 1.e: En route situation--ambient noise exposure Would en route noise reactions be higher if ambient noise levels are lower than those normally found in the urban or suburban settings near major airports?

Further research: Some of the lack of agreement may be due to the diverse analysis techniques used. A reanalysis of the original, individual level data might be able to provide a "best estimate" of the ambient effects, test for more complex patterns and determine the reliability of the present results.

Synopsis for Topic 19: Interviewing method (personal/telephone)

Moderating variable: Telephone or personal interview method

Most noise survey questionnaires have been administered by interviewers in respondents' homes. For many topics, interviews are now conducted more economically by telephone.

Concepts excluded: A study is only included if both methods were used in the same study.

Hypothesis: Respondents express more annoyance in a telephone interview.

Explanation: There is not a strong argument for an effect of method of administration. It might be argued that respondents would be more likely to provide negative criticism of their neighborhood or of authorities when the interviewer was not present.

Heading notes: Under "Accuracy of comparison" information about how great a difference could be detected would be reported if available.

Tabulations: 4 Findings, 4 Surveys, 3393 Respondents

HEADINGS	Finding: Respondents interviewed by telephone are:													
	Less annoyed				No important difference					More annoyed				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
Number of Findings F=4						1		2	1					
	0				4					0				
100%	0				100					0				
Number of Respondents N=3,393						1603		1300	490					
	0				3,393					0				
100%	0				100					0				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=1	0				1					0				
100%	0				100					0				
Respondents N=1,603	0				1603					0				
100%	0				100					0				

Conclusion: There is no evidence that the type of administration affects the level of annoyance to an important extent. However the sizes of the effects which could have been detected were not reported.

En route noise issue: Issue 3.d: Methodology--interviewing method. Could a new en route survey provide data which are comparable to the previous, personal interview studies?

Further research: Two of these studies could be reanalyzed to determine whether they could have detected a large effect. Any new survey could be easily designed to provide an accurate estimate of the effect of survey method.

Synopsis for Topic 20: Changes in noise exposure

Moderating variable: A change in noise level

Residents experience a change in noise levels in their area either because there is a change in the amount or level of the noise or because noise barriers are constructed. If the change has an independent effect on annoyance then the post-change reactions must be greater than would have been predicted from steady-state data on reactions to the new noise level.

Concepts excluded: Simply comparing reactions before and after a change is not sufficient for being included. It is necessary to compare the post-change reactions to steady state reactions at the same noise level.

Hypothesis: A new noise or change in noise will impact annoyance more than would be predicted from reactions to a familiar, existing noise.

Explanation: Residents who experience a change in noise level may appreciate the reduced or increased impact of noise in the new situation more than would residents who have always experienced a similar noise environment. Other mechanisms might also be hypothesized. Residents may be using the rating scale to make comparative judgements rather than absolute judgements. In other instances residents know that a change in the noise source has occurred and such knowledge, rather than the actual noise level, may be responsible for changing their attitudes toward the noise.

Heading notes: Under the "Findings" heading, the "Same" column contains findings if the reactions to the new noise conditions are not substantially larger than would be expected from steady-state data. Under "Direction and amount of change", the direction of change in noise level is given in upper case letters (DECREASE, INCREASE, BOTH). "BOTH" identifies a study in which results were not presented separately for the increasing and decreasing noise level sites. Under "Time elapsed since change", the time between the change in noise levels and the post-change interview(s) is given. Each entry in the "Comments" column begins with a label for one of three types of study designs in upper case letters. All of the study designs compare their post-change noise/annoyance relationship with some other steady-state noise/annoyance relationship which is assumed to be representative of reactions for noises which have not changed. The designs differ in the type of steady-state noise/annoyance relationship which is used as the baseline for the comparison. For a "LONGITUDINAL SURVEY", the steady-state noise/annoyance relationship comes from a pre-change social survey within the same study area(s). The same residents are often, but not always, interviewed before and after the change. For a "CROSS-SECTIONAL COMPARISON", the noise/annoyance relationship comes from another survey or from other control areas in the same study. For a "COMPARISON OF PRE/POST CHANGE RESIDENTS", the steady-state noise/annoyance relationship comes from new residents who moved into the study area after the change in noise level.

Tabulations: 19 Findings, 14 Surveys, 14,097 Respondents

HEADINGS	Finding: When the noise level changes, respondents:													
	Under-react to change				No important difference					Over-react to change				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
RESULTS FOR BOTH INCREASE AND DECREASE IN NOISE LEVEL														
Number of Findings F=19	1			1		5		1	3				8	
	2				9					8				
100%	11				47					42				
Number of Interviews N=16,516	900			4690		2991		420	2300				5215	
	5,590				5,711					5,215				
100%	34				35					32				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=13	1				4					8				
100%	8				31					62				
Interviews N=8,656	900				2541					5215				
100%	10				29					60				

HEADINGS	Finding: When the noise level changes, respondents:													
	Under-react to change				No important difference					Over-react to change				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
RESULTS FOR ONLY INCREASE IN NOISE LEVEL														
Number of Findings F=8				1		1		1	1				4	
	1				3					4				
100%	13				38					50				
Number of Interviews N=8,277				4690		1400		420	700				1067	
	4,690				2,520					1,067				
100%	57				30					13				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=5					1					4				
100%	0				20					80				
Respondents N=2,467					1400					1067				
100%	0				57					43				

HEADINGS	Finding: When the noise level changes, respondents:												
	Under-react to change				No important difference					Over-react to change			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			-Sig	OK/ns	Sig-					ns	OK/S
RESULTS FOR ONLY DECREASE IN NOISE LEVEL													
Number of Findings F=10	1					4			1				4
	1				5					4			
100%	10				50					40			
Number of Interviews N=7,439	900					1591			800				4148
	900				2,391					4,148			
100%	12				32					56			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=8	1				3					4			
100%	13				38					50			
Respondents N=6,189	900				1141					4148			
100%	15				18					67			

Conclusion: The evidence is quite mixed on whether residents are overreacting to change. The balance of the evidence suggests that people are sensitive to changes and not ignoring change, but even this pattern is not maintained when the four standard quality, increase-in-noise-level surveys are weighted by numbers of interviews. Part of the lack of consistency may be because the surveys have diverse designs such that the relative number of respondents is a poor indicator of relative accuracy. The survey designs differ in whether there are repeated interviews with the same respondent (a single respondent who provides two interviews is given a weight of one) and in the relative size of the comparison groups (one study compares 15 new residents to 133 previous residents and is counted as having a sample size of 148 respondents). Though it is not possible to provide a conclusion about whether residents are overreacting to change, it does appear that substantial changes in noise levels are followed by substantial changes in annoyance. The two studies which appeared to have under reactions, all had relatively small changes in noise levels. In addition there are other studies which have documented changes in reactions.[Dawson, 1973; Lawson and Walters, 1973; Prescott-Clarke, 1980] Those studies do not appear in this table because they do not include a steady-state comparison.

En route noise issue: Issue 1.h: Change--change in noise levels
Would en route reactions be more severe than are predicted from steady-state noise data because there is a change in noise level?

Further research:

The existing data should be more carefully examined. At the very least, there should be some attempt to estimate the relative precision of the different findings to determine whether this leads to a clearer pattern. A more useful, but still limited, project would be to conduct a detailed secondary analyses of these data sets by corresponding with the original researchers, obtaining copies of the individual level data sets and calculating the same statistics for each data set. Additional studies of reactions to changes could be useful, but only if they were designed with detailed knowledge of previous studies.

Synopsis for Topic 21: Rate of adaptation to new noises

Moderating variable: Time which has elapsed for residents who have been exposed to an increase in noise level.
These data are usually gathered as part of a longitudinal study of repeated interviews with respondents who have experienced a change in noise level.

Concepts excluded: The effects of a change in noise exposure were presented for Topic 20. The effects of the length of exposure for relatively steady-state conditions were presented in Table 8 (Length of residence).

Hypothesis: As the time since an increase in noise level lengthens, annoyance decreases.

Explanation: It is assumed that people "get used to" the noise with time. As with the previously studied length-of-residence topic, however, it is not clear whether this type of adaptation may be largely confined to a short period, perhaps as short as a few days, after a change.

Heading notes: "Time elapsed since change" is the time which elapsed from the change in noise exposure until the administration of the interviews.

Tabulations: 7 Findings, 7 Surveys, 1581 Respondents

HEADINGS	Finding: As time since a change increases:												
	Annoyance increases				No important difference					Annoyance decreases			
	Type of evidence				Type of evidence					Type of evidence			
	Objective: -			Subjective	Objective: -				Subjective	Subjective	Objective: -		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=7	1	1	1			1							3
	3				1					3			
100%	43				14					43			
Number of Respondents N=1,581	60	20	131			600							770
	211				600					770			
100%	13				38					49			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=6	2				1					3			
100%	33				17					50			
Respondents N=1,450	80				600					770			
100%	6				41					53			

Conclusion: There is not consistent support for the hypothesis. There is some weak support for the possibility that reactions may reduce over the first 6 months of exposure. The study (UKD-010) with the most data about reactions within the first three months did find a reduction from the second to fourteenth week of exposure, but there was no consistent pattern for the other short-term study (USA-203) which had less data. Although two studies of reactions in the fourth to sixteenth month came to opposite conclusions, two of the three studies which started with the fourth month base line found a reduction in annoyance, while both of the studies with at least a six-month baseline found an increase in annoyance. Substantial differences in other aspects of the studies make it impossible to compare the studies closely and come to final conclusions.

En route noise issue: Issue 1.i.ii: Change--rate of adaptation to new noises
Would en route reactions be more sever because residents would not have lived with the noise for a long time? Even if there is initially greater annoyance, will annoyance decrease with time?

Further research: Some of the remaining noise change studies may have some information about this issue which was not highlighted in the published reports but which could be drawn from the published data. New longitudinal data sets might provide very useful data if they were designed to control for the possible methodological problem of changes in annoyance responses with repeated interviews (Fields and Powell, 1985: 32-35) and with seasonal effects.

Synopsis for Topic 22: Relation between general noise sensitivity and noise level

Moderating variable: Sensitivity with noise generally

General sensitivity with noise is often measured with self-ratings of perceived sensitivity to "noise generally", or questions about attitudes towards noise as a general environmental problem or with ratings of annoyance with common sounds (eg. dripping water, barking dog).

Concepts excluded: Ratings of environmental noise in the respondent's area are excluded because they may include ratings of the noise source. In general, ratings of sensitivity should not be direct assessments of noise sources for which the noise level would vary greatly between respondents.

Hypothesis: Residents of high noise areas are less sensitive to noise generally.

Explanation: Noise sensitive people would be expected to avoid living in high noise areas and, if they moved into the area, would be more likely to move away from the high noise area.

Heading notes: None

Tabulations: 17 Findings, 16 Surveys, 30,199 Respondents

HEADINGS	Finding: Those at high noise levels are:													
	More annoyed				No important difference					Less annoyed				
	Type of evidence				Type of evidence					Type of evidence				
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-			
	-standard		-other		-standard			-other			-other	-standard		
	Sig. test evidence				Significance test evidence supports							Sig. test evidence		
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S	
Number of Findings F=17	1		1		1	8		3	1				2	
	2				13					2				
100%	12				76					12				
Number of Interviews N=31,929	1730		1990		1730	10764		3970	5800				5945	
	3,720				22,264					5,945				
100%	12				70					19				
STANDARD SUBTOTALS	Subtotals for standard quality findings													
Findings F=12	1				9					2				
100%	8				75					17				
Interviews N=20,169	1730				12494					5945				
100%	9				62					29				

Conclusion: High noise areas do not contain fewer noise-sensitive residents. The evidence does not support the hypothesis that high noise levels from one source result in an atypically noise insensitive population of residents.

En route noise issue: Issue 1.f(i): Airport--general noise sensitivity in high noise areas

Would en route reactions be greater because noise sensitive people live in the types of quiet areas which will be impacted by en route noise?

Further research: The most useful research should probably be directed at understanding the direct relations between residential choice and noise level rather at further evaluating the relation between sensitivity and noise level.

Synopsis for Topic 23: Relation between noise level and moving

Moderating variable: Moving or planning to move

The measure of moving must either be information about actually moving or about plans to move.

Concepts excluded: Feelings about only wanting or desiring to move are not tabulated.

Hypothesis: People in high noise areas are more likely to move away to other areas.

Explanation: If people find the noise is a sufficiently serious problem then some people should decide to leave because of the noise.

Heading notes: None

Tabulations: 4 Findings, 3 Surveys, 2,310 Respondents

HEADINGS	Finding: Those at high noise levels are:												
	Less likely to move				No important difference					More likely to move			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:			Subjective	Objective:				Subjective	Subjective	Objective:		
	-standard		-other		-standard			-other			-other	-standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=4						2			1				1
	0				3					1			
100%	0				75					25			
Number of Interviews N=3,010						1360			950				700
	0				2,310					700			
100%	0				77					23			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=3	0				2					1			
100%	0				67					33			
Interviews N=2,060	0				1360					700			
100%	0				66					34			

Conclusion: Although three of the four studies do not support the hypothesis there is very little evidence on this issue and even this evidence is indirect. A number of German surveys have examined reasons people give for moving and have concluded that noise is a relatively unimportant factor in moving and thus does not result in leaving unrepresentative populations in high noise areas.

En route noise issue: Issue 1.g(i) Airport--moving from high noise areas
Would en route reactions be greater because quiet areas have more noise sensitive residents?

Further research: Some information might be obtained from a literature review of non-survey studies of the relationship between noise and moving. New studies would probably be needed to better understand the relation between noise and the decision to move.

Synopsis for Topic 24: Relation between noise annoyance and moving

Moderating variable: Moving or planning to move

The measure of moving must either be information about actually moving or about plans to move.

Concepts excluded: Feelings about only wanting or desiring to move are not tabulated.

Hypothesis: Annoyed residents are more likely to move to another area.

Explanation: If noise bothers people enough to make them leave an area then the remaining population will be an atypical, noise-tolerant population.

Heading notes: None

Tabulations: 5 Findings, 5 Surveys, 4227 Respondents

HEADINGS	Finding: Those who move are:												
	Less annoyed				No important difference					More annoyed			
	Type of evidence				Type of evidence					Type of evidence			
	Objective:-			Subjective	Objective:-				Subjective	Subjective	Objective:-		
	~standard		~other		~standard			~other			~other	~standard	
	Sig. test evidence				Significance test evidence supports							Sig. test evidence	
	OK/S	ns			←Sig	OK/ns	Sig→					ns	OK/S
Number of Findings F=5						3				1			1
	0				3					2			
100%	0				60					40			
Number of Respondents N=4,227						1294				1480			1453
	0				1,294					2,933			
100%	0				31					69			
STANDARD SUBTOTALS	Subtotals for standard quality findings												
Findings F=3	0				2					1			
100%	0				67					33			
Respondents N=2,197	0				744					1453			
100%	0				34					66			

Conclusion: The evidence in the tables is mixed. Though only two of the 5 studies support the hypothesis, the respondent-weighted results support the hypothesis. The confidence in any pattern is weak because of the relatively small number of studies and respondents. The causal relationships are unclear. It may be that rather than annoyance causing people to move, it is the decision to move that allows people to critically evaluate their home's noise environment.

En route noise issue: Issue 1.g: Airport--moving by annoyed residents
Would en route reactions be underestimated because airport populations systematically exclude the aircraft-noise sensitive residents.(Finke, et al., 1975: 341; Paechter, et al., 1988)

Further research: See discussion for previous topic.

Synopsis for Topic 25: Slope of "high annoyance" dose/response curves below 55 L_{dn}

Study topic: Slope of the "high" degree of annoyance curves at low noise levels

Is the response to noise independent of noise level at low noise levels?

Concepts excluded: Results are not included if noise levels do not drop from approximately the equivalent Of 55 L_{dn} to at least 45 L_{dn}. The observations for calculating the slope below 55 L_{dn} must be separated by at least 8 dB. The definition of the annoyance variable excludes many studies. Standard quality findings are based on verbal annoyance scales which are dichotomized at a word indicating a large amount of annoyance. Typical words are "very", "considerably", "strongly", or "extremely". Non-standard findings are based on an author' own decision that a dichotomization of some other type of numerical index indicates a large amount of annoyance. The studies for which Schultz provided such a division are also included (Schultz, 1978).

Hypothesis: Annoyance is not related to noise at low noise levels (<55 L_{dn}).

Explanation: It has often been hypothesized that there are supersensitive individuals who will be annoyed by noise regardless of the noise level. Kryter hypothesizes that this will represent perhaps 4 to 8% of the respondents below an L_{dn} of 55 dB (Kryter, 1984: 532). It could however also be hypothesized that the slope will still be positive even though it may be less than at higher noise levels.

Heading notes: Under "Finding", the relationship is indicated as "0" if annoyance does not change or is negative at low noise levels or "+" if there is a positive relationship. Under "Describe shape of full curve as" the authors' descriptions are reported for the shape of the dose/response curve over the entire noise range covered by the study. In square brackets any formal significance test of the shape of the curve is provided. Under "High annoyance described as:" the definition for "high" annoyance on the annoyance scale is given. Several of these studies were reanalyzed by Schultz (1978) with a different division than that recommended by the original authors. There is no scientific basis for choosing one division over another. When available, the authors' divisions have been accepted on the assumption that the primary researchers are more familiar with the data. Under "Range of noise levels" and "Comments" the basis for converting noise metrics to L_{dn} is given.

Tabulations: 8 Findings, 8 Surveys, 4,012 Respondents

[Note: The "standard" findings' synopsis includes the five findings based on the respondents' direct verbal rating of high annoyance. The three non-standard findings rely on the researcher's judgement about the division of a numerical scale which should be equivalent to a high annoyance rating.] [One study listed in Appendix B (UKD-072) also shows a positive relationship but is not tabulated because the number of interviews below 55 L_{dn} is not reported.]

Not supported		Hypothesis supported	
Annoyance decreases with noise level below ≅55 L_{dn}		No relationship between annoyance and noise level below ≅55 L_{dn}	
High annoyance defined:		High annoyance defined:	
directly by respondent	indirectly by author	indirectly by author	directly by respondent
F=5	F=3	F=0	F=0
N=1,746	N=2,266	N=0	N=0
{1}	{3}	{3}	{1}

Totals:	Against:	F=8 N=4,012	Support: F=0 N=0
Subtotal standard data:	Against:	F=5 N=1,746	Support: F=0 N=0

Conclusion: The hypothesis is rejected. All eight findings support the conclusion that over the range of at least 45 to 55 L_{dn} the amount of high annoyance decreases with decreasing noise level. Kryter has argued that some survey data shows that the annoyance curve is asymptotic at least below 50 L_{dn} (Kryter, 1982: 1223-1224). None of those survey data met the criterion of having two observations below 55 L_{dn} which were separated by at least 8 decibels. If Kryter rather than Schultz's NNI to L_{dn} conversion method had been used, then the 1967 Heathrow survey would have met the present study's inclusion criterion. However, the conclusion would not have been changed because annoyance still decreases from 2% to 1% over the specified range. The lack of a relationship shown in the Kryter article (Kryter, 1982: Fig.2, p.1224) comes from an analysis based on a noise index which has not been used in any other survey: the noise level for the configuration of airport operations which is worst for a particular location, regardless of how often that operation mode occurs. The other 1967 Heathrow noise indices and those in other aircraft noise surveys combine information about both worst and normal modes of operation.

En route noise issue: Issue 2.g.i: En route situation--slope of dose-response curve below 55 L_{dn}

Would en route reactions be sensitive to differences in noise levels below 55 L_{dn}?

Further research: The shape of the dose/response relationship at low noise levels could be estimated with secondary analyses of existing data using probit, logit and other curvilinear models which are appropriate for dose/response relationships. New social surveys could be conducted at low noise levels to estimate the relationship between annoyance and noise level at low noise levels. Such surveys would have greater credibility than existing studies if their noise measurement programs were designed to overcome noise measurement problems encountered at low noise levels.

Synopsis for Topic 26: Percent "high annoyance" below 55 L_{dn}

Topic: Amount of high annoyance below 55 L_{dn}

Concepts excluded: The definition of the annoyance variable excludes many studies. The general intent is to only report verbal annoyance scales which are dichotomized at a word indicating a large amount of annoyance. Typical words are "very", "considerably", "strongly", or "extremely". Findings have also been included when the authors dichotomized some other type of numerical indices and then went on to describe the division as indicating a large amount of annoyance. The studies for which Schultz provided such a division are also included (Schultz, 1978).

Hypothesis: Residents do not express "high annoyance" below 55 L_{dn}.

Explanation: Much of the interest in response to noise has focused on indicators of relatively high measures of annoyance. The best known article summarizing results from noise surveys described the findings as a measure of the percentage "highly annoyed". The USEPA specified 55 L_{dn} as a level in outdoor residential areas which is adequate to "protect public health and welfare with an adequate margin of safety"(Information..., 1974:3).

Heading notes: Under the "Annoyance Scale" heading the operational definition of high annoyance is provided. Several of these studies were reanalyzed by Schultz (1978) with a different high annoyance division than that recommended by the original authors. There is no scientific basis for choosing one division over another. When available, the original authors' divisions have been accepted on the assumption that the primary researchers are more familiar with the data. The percentage which the annoyance scale division places in the high annoyance category is presented at five different noise levels under the heading "% annoyed at this level". The basis for each finding is defined both by the numbers of interviews (n=) and numbers of study areas (a=). "Noise metric from study" is the metric which was used to aggregate the annoyance scores into noise groups. The heading "Noise which method exclude, include" summarizes any published remarks about the criteria for including or excluding noise events from the calculated noise metric. Under "Other noise evaluation comments" and "Comments" the basis for converting noise metrics to L_{dn} is given.

The numbers in braces "{}" under "50-54 L_{dn}" are for the interval which includes 55 L_{dn}.

Tabulations: 16 Findings, 16 Surveys, 6243 Respondents

Findings at 50–54 Ldn

	0% annoyed	1–4 % annoyed	5–9% annoyed	10% or more	Total
Totals:	F=0	F=8	F=4	F=3	F=15
	N=0	N=1,359	N=1,085	N=444	N=2,888

Findings at 45–49 Ldn

	0% annoyed	1–4 % annoyed	5–9% annoyed	10% or more	Total
Totals:	F=0	F=6	F=4	F=0	F=10
	N=0	N=783	N=1,753	N=0	N=2,536

Findings at 40–44 Ldn

	0% annoyed	1–4 % annoyed	5–9% annoyed	10% or more	Total
Totals:	F=0	F=4	F=1	F=0	F=5
	N=0	N=474	N=27	N=0	N=501

Findings at 35–39 Ldn

	0% annoyed	1–4 % annoyed	5–9% annoyed	10% or more	Total
Totals:	F=1	F=1	F=0	F=0	F=2
	N=47	N=223	N=0	N=0	N=270

Findings at 30–34 Ldn

	0% annoyed	1–4 % annoyed	5–9% annoyed	10% or more	Total
Totals:	F=1	F=0	F=0	F=0	F=1
	N=48	N=0	N=0	N=0	N=48

Conclusion: The best evidence from the existing surveys is that there is some high annoyance below 55 L_{dn}. All five surveys with data between approximately 40–44 L_{dn} reported some high annoyance. The evidence is thus clear on the existence of some annoyance. These findings should be considered to be only general indicators of the amount of annoyance which might be observed at a given noise level. The precision of the findings is affected by the variation in annoyance measures, noise metrics and the effects of difficulties in accurately estimating low level, noise exposures.

En route noise issue: Issue 1.j.i: En route situation--annoyance at low noise levels. Would low levels of exposure to en route noise cause any high noise annoyance?

Further research: New social surveys of response to noise in low noise environments are needed to provide better information. The most critical requirements for such surveys are that they be conducted in a large number of representative locations and that the accuracy of their noise estimates be known.

APPENDIX D: RELATIONSHIP TO TWO PREVIOUS PUBLICATIONS

Some of the evidence presented in this report was previously published in abbreviated form in two publications. The present publication is more comprehensive and includes a few small corrections to tabulations presented in the previous reports. None of these corrections altered the conclusions of the previous reports.

Some of the implications of this evidence for en route noise issues were discussed at a 1989 FAA/NASA en route noise symposium in a paper labeled "Social Survey Findings on En route Noise Annoyance Issues" (Fields, 1990a). The table on the next page shows the relationship between the 19 topics discussed in the noise symposium paper and the 26 topics in the present report.

A 1990 paper discussed a partially overlapping set of 19 topics (Fields, 1990b). The table on the next page relates those topics to the 26 topics in the present report.

Table: Correspondence between topics in three publications[a]

Table #	Variable name	Variable heading in each publication: Current report	Noise-con 1990	En route symposium	En route Index #
01	Age	Demog.	Demog.		2.k
02	Sex of respondent	Demog.	Demog.	Methods	2.i.ii
03	Occupation and social status	Demog.	Demog.		2.l.i
04	Income	Demog.	Demog.		2.l.ii
05	Education	Demog.	Demog.		2.l.iii
06	Home ownership	Demog.	Demog.		2.m
07	Dwelling type (single/multiple)	Demog.	Demog.		2.n
08	Length of residence	Demog.	Demog.	Change	1.i.i
09	Personal benefits (measured)	Demog.	Demog.	Airport	1.c.i
10	Fear danger from source	Attitude	Attitude	Airport	1.d
11	Perceived preventability of noise	Attitude	Attitude		2.o
12	Non-noise impact perception	Attitude	Attitude	Airport	1.b.ii
13	Sensitivity to noise	Attitude	Attitude	Airport	1.f
14	Perceived importance	Attitude	Attitude	Airport	1.c.ii
15	Non-noise impact (measured)	Situation	Other	Airport	1.b.i
16	Amount of time at home	Situation	Other	Methods	2.i.i
17	Isolation from noise	Situation			2.j
17a	Noise insulation of home	Situation			2.j.a
17b	Room orientation to noise	Situation			2.j.b
17c	Climate	Situation			2.j.c
17d	Air conditioning	Situation			2.j.d
17e	Exposure outside dwelling	Situation			2.j.e
18	Ambient noise level	Situation	Other	Setting	1.e
19	Interview method (phone/person)	Methods		Methods	3.d
20	Changed noise (compare to steady)	Change		Change	1.h
20a	Increase in noise level	Change	Other	Change	1.h.a
20b	Decrease in noise level	Change			1.h.b
21	Time since noise increase	Change	Other	Change	1.i.ii
22	Noise level and sensitivity	Sensitiv.		Airport	1.f(i)
23	Noise level and moving	Sensitiv.		Airport	1.g(i)
24	Moving and annoyance	Sensitiv.		Airport	1.g
25	High annoyance slope below DNL 55 dB	Noise		Setting	2.g.i
26	High annoyance below DNL 55 dB	Noise		Setting	1.j.i

[a] The present publication is compared to two previous publications: a paper given at an en route noise symposium (Fields 1990a) and a paper given at Noise-Con 90 (1990b). The abbreviation "Demog." is short for "Demographic." The abbreviation "Sensitiv." is short for "Sensitivity" and refers to the possibility that people in high noise areas have been self-selected by sensitivity to noise.

APPENDIX E: INSTRUCTIONS AND FORM FOR CHECKCODING

This appendix contains material which was given to each of the five checkcoders who completed the checkcoding test which was described in Chapter 2. Questions #1 and #2 were individualized for each study by supplying the checkcoder with a complete list of publications for Question #2 and with basic information about the study (sample size, dates, location, etc.) for Question # 3.

TABLE OF CONTENTS

INSTRUCTIONS

INTRODUCTION

The coding of the findings from a study is performed by answering the four questions on the attached questionnaire. The four pages of instructions come first. The questionnaire follows. If this information has been sent by FAX, however, there will be a gap in the page numbering and the pages will need to be shuffled into the correct order because Question #1 and Question #2 will have been sent as a separate fax.

The first three questions concern the study as a whole. The fourth question consists of a table in which specific findings for each of 19 hypotheses are recorded.

EXPLANATION FOR QUESTION # 1

This description is included primarily to be certain that the coder is rapidly introduced to the primary characteristics of the study. If any items in the description are discovered to be wrong they should be noted, but it is not necessary to specially search for information to confirm all of the description.

EXPLANATION FOR QUESTION # 2

This list is again provided primarily for the coder's convenience. The publications have been numbered so that they can be referred to by number in Question #4. As for Q.#1, the list is provided primarily for the coder's convenience. If any errors are discovered they should be noted, but it is not necessary to check the accuracy of the entries.

The coder will probably not read all publications in detail, but rather read the most complete publication in detail and then only read selected parts of shorter publications.

EXPLANATION FOR HEADINGS ASSOCIATED WITH QUESTION # 3

Question #3 requests that the coder examine the dependent variables, the noise reaction questions, which have been included in a study. This question has been included to aid a coder's task in two instances. If a study does not contain even a single suitable reaction question, then Question #3 serves to rapidly eliminate the study from further consideration. If, on the other hand, the study contains a number of alternative scales or methods for scoring the scales, then Question #3 assists the coder in locating the preferred scale for these analyses. It should be noted that though Q.#3 is addressed to the study as a whole, the problem of choosing between alternative reaction measures may need to be faced several times within a study. In some cases, the analyses for different moderating variables may involved new choices between alternative reaction measures.

Criteria for all noise reaction questions:

Any noise reaction question must meet all the following standard criteria to be included in this study:

1. Noise topic: The survey question or the context of the question within the questionnaire must make it clear that noise not other aspects of the source are being asked about.

2. Subjective evaluation: The question must request the respondent to make a subjective evaluation of a reaction, feeling, rating, or evaluation of the noise. A rating of an objective quantity (the number of aircraft) is not satisfactory, but a rating of a subjective quantity such as annoyance or loudness is satisfactory.

3. Residential context: The survey question or the context of the question within the questionnaire implies that the reactions concern the time when the respondent is on his/her own property, not when at work or in some other location.

4. Present-time orientation: The survey question or the context of the question within the questionnaire implies that the reactions concern the respondent's present or habitual reaction to a noise which the respondent experiences.

CAN'T CODE A SCALE?

If a noise reaction scale is used in a survey but it is not one of the five designated scales, the coder may wonder whether the scale was intentionally excluded or whether there are some definitional uncertainties. The following four types of scales have been intentionally excluded:

1 An activity interference question about a single activity.
2 A dichotomized report of whether or not a sound is heard.
3 A rating of only evening or only nighttime noise.
4 A rank ordering of reactions to noise sources

EXPLANATION FOR HEADINGS ASSOCIATED WITH QUESTION # 4

Question #4 is, of course, the primary question for the coding task. Each block in the table summarizes the information available about each of the 19 hypotheses. The information requested in some columns is rather complex and is described under the appropriate heading below.

"Discussed in Publication" Heading for Q.4

This column is a simple descriptive statement. The "Discussed in publication column" simply indicates whether the author even discusses the particular hypothesis. The coder may find it easiest to scan the publication to determine how many hypotheses are discussed before moving on the more difficult additional coding tasks.

"Type of Evidence" and "Direction of Evidence Relative to Hypothesis" Headings

The primary purpose of this coding is, of course, to determine which hypothesis is supported by the data presented in the publication. This requires that the coder first determine what types of evidence are available and then examine the results for the preferred type of evidence.

The table on the next page aids the coder by presenting a hierarchical preference listing for each type of evidence. The table describes the six types of evidence which may be used to determine whether the evidence in a publication support a hypothesis, support the opposite of the hypothesis, or show a factor has no effect. The relevant criteria are presented for each of the six types of evidence. If multiple types of evidence are available for a study, then the first ranked evidence should be recorded for Question 4. Thus, only one of the "Type of evidence" codes will be checked for each hypothesis.

In determining whether evidence is preferred or even admissible for a particular hypothesis on Question 4, the coder must consider three other issues:

1) The reaction measure must be acceptable. If it is unacceptable based on the criterion developed for Question #3, then the evidence is dismissed and coded as "Unacceptable annoyance reaction question" in Question #4.
2) If the results are presented for alternative combinations of control variables, then the preferred combination of control variables should be selected. This issue is raised under "Other considerations" in the table on the next page.
3) If the evidence is presented by contrasting the impact in different contrasting groups, then the possibility of non-linear relations must be considered. This issue is raised under "Other considerations" in the table on the next page.

Preference ranking	Explanation of "Type of Evidence"		Criterion for classifying "Direction of evidence relative to hypothesis"			Other considerations	
	Symbol	Definition	SUPPORT hypothesis	SAME (No important difference)	SUPPORT OPPOSITE of hypothesis	Control variables	Contrast-group definitions
1st	dB	Decibel equivalent: A measure of the difference in the degree of annoyance in contrasting groups of an explanatory variable when that difference is expressed as the number of decibels which cause the same sized difference in annoyance.	⟨ 3dB	⟩ 3dB	⟨ 3dB	NOTE: If results are reported with control variables, consult the preference ranking for control variables below.	NOTE: If more than two contrasting groups are given, consult the preference ranking for group definitions below.
2nd	%	Percentage difference: A measure of the difference in the percentage who are annoyed in contrasting groups of an explanatory variable.	⟨ 5%	⟩ 5%	⟨ 5%		
3rd	r	Proportion of variance explained: The percentage of the variance in annoyance scores which is associated with the explanatory variable.	⟨ 1% variance	⟩ 1% variance	⟨ 1% variance		
	NOTE: Significance test results are totally ignored in all coding if any of previous three types of evidence are available.						
4th	Sig	Significance test: Standard test of the statistical significance of an explanatory variable's effect.	p⟩ .05	p⟨ .05	p⟩ .05		
5th	Other	Other: Other objective multiple observations of differences in annoyance scores in contrasting explanatory variable subgroups within each of a several sample groupings (for example, within each study area).	3/4 of comparisons support	less than 3/4 of comparisons support	3/4 of comparisons support		
6th	Verbal	Verbal: There is a verbal statement, without associated numerical results from analyses, describing the effect or lack of effect of the explanatory variable.	"related" "strong"	"none" "weak" etc	"related" "strong"		

Control variables: If the results are reported for alternative sets of control variables, choose the controls according to the following preference list:

1st [For age/length of residence or house type/tenure findings only] Control for noise level and respondent's age or length of residence or for house type or tenure.
2nd Control for noise level and study area
3rd Control for noise level
4th Report uncontrolled relationship between annoyance and the modifying variable.
5th Control for noise level and additional variables if they may be causally prior. [If the variables are clearly not causally prior (ie. other annoyance variables) then use another basis for classification (possibly "Verbal")].

Contrast-group definitions: To conclude that there is an effect, the required size of the effect must be observed either in the contrast between the two largest subgroups of the explanatory variable or between the two most distant subgroups (ie. for age, between the oldest and youngest age group). If the difference is measured between the two most distant subgroups then at least 5% of the sample or the population must be in each group and the average annoyance for the intermediate groups must be between that of the most distant subgroups.

"Control for Noise" Heading for Q.4

This is a simple descriptive statement for the particular finding which has been reported. Check "YES" or "NO" to indicate whether the effect of noise level has been removed (ie. controlled for) in the analysis which examines the hypothesis.

"Major Weakness" Heading for Q.4

This is a simple descriptor to be used to indicated when there is a special weakness in the evidence. Check "YES" if some aspect of the methodology or analysis means that the direction of the evidence is uncertain or if the authors emphasize that the direction of the effect appears to be tenuous because of a methodological weakness. Note, however, that the results of a statistical significance test should NOT be considered in this coding. More detailed, but infrequently applied, rules have been developed for this coding, but have not been reproduced here in an attempt to simplify this particular coding task.

"Reference and Page Number" Heading for Q.4

Indicate the author, date, and page number which identifies the location of the evidence in the publication within the list of publications listed at Question #2. When the publications have been consecutively numbered, the number can be entered instead of the author and date. This information is valuable in attempting to understand any differences in the coding.

QUESTIONNAIRE

This questionnaire requests you to determine whether a community noise study has provided evidence on 19 hypotheses about residents' responses to noise. The first three questions concern the study as a whole. Question #4 is a form for recording the evidence on each of the hypotheses.

Q.1 Does this description of the study appear to be correct?

- ○ YES
- ○ NO (Please mark corrections)

Description of survey in noise survey catalog
PLEASE REPLACE THIS WITH THE SEPARATELY FAXED VERSION OF THIS QUESTION.

Q.2 Does this appear to be a complete and correct listing of all publications and reports prepared about this data set?

○ YES
○ NO (Please mark additions and corrections)

Listing of all reports
PLEASE REPLACE THIS WITH THE SEPARATELY FAXED VERSION OF THIS QUESTION.

Q.3 Does this study include results for a standard type of noise reaction scale?

○ YES [MARK TYPE OF SCALE IN BOX AND CONTINUE TO Q.4]
○ NO [END QUESTIONNAIRE]

Instruction:	Determine if there is a standard type of noise reaction scale. The criteria mentioned in the last column are described in the instructions for Question 3.
NOTE:	If there are several noise reaction scales, you should proceed sequentially through the preference list and then stop as soon as a standard scale has been found which meets the criteria.

Preference ranking	Type of human response measure	Is it in the study?	Does it meet all criteria? (See instructions)
1st	Multiple question index: Several questions are combined in a noise reaction index. This does not include an index consisting primarily of activity interference questions. (See 5th Rank)	○ NO↓ ○ YES→	○ NO ○ YES
2nd	Summary, multi-point question: A single noise reaction question for which three or more categories are retained and scored in the analysis.	○ NO↓ ○ YES→	○ NO ○ YES
3rd	Summary, high-annoyance scale: A single noise reaction question which is dichotomized into two categories for the analysis with one category being considered to be very high or extreme annoyance.	○ NO↓ ○ YES→	○ NO ○ YES
4th	Summary, moderate-annoyance scale: A single noise reaction question which is dichotomized into two categories for the analysis with the greater annoyance category including all who are at all annoyed or all who are at least moderately annoyed.	○ NO↓ ○ YES→	○ NO ○ YES
5th	Activity question index: Several activity interference questions are combined in an noise reaction index.	○ NO↓ ○ YES→	○ NO ○ YES
6th	Other: A type of scale which is not mentioned above, but which is not excluded from consideration. See "Can't Code a Scale" in the accompanying instructions for Question 3.	○ NO↓ ○ YES→	○ NO ○ YES

Q.4 What evidence does the study provide on the hypotheses?

[INSTRUCTIONS: MARK THE CORRECT CIRCLES BELOW
SEE INFORMATION SHEET FOR QUESTION #4]

ID #	Hypothesis (note direction)	Discuss in publication?	Evidence on the hypothesis				Reference & page number
			Type of evidence in publication.	Direction of evidence relative to the hypothesis	Control for noise?	Major weakness?	
**** DEMOGRAPHIC VARIABLES ****							
#1.	Age: Older people are more annoyed.	○ NO ○ YES→	○ Unacceptable reaction question ○-dB ○-% ○-r ○-Sig. ○-Oth. ○-Verbal	○SUPPORT ○SAME ○OPPOSITE	○ NO ○ YES	○ NO ○ YES	
#2.	Sex: Women are more annoyed.	○ NO ○ YES→	○ Unacceptable reaction question ○-dB ○-% ○-r ○-Sig. ○-Oth. ○-Verbal	○SUPPORT ○SAME ○OPPOSITE	○ NO ○ YES	○ NO ○ YES	
#3.	Occupation and social status: Annoyance is greater for high status and high social class respondents.	○ NO ○ YES→	○ Unacceptable reaction question ○-dB ○-% ○-r ○-Sig. ○-Oth. ○-Verbal	○SUPPORT ○SAME ○OPPOSITE	○ NO ○ YES	○ NO ○ YES	
#4.	Income: Annoyance is greater for high income respondents.	○ NO ○ YES→	○ Unacceptable reaction question ○-dB ○-% ○-r ○-Sig. ○-Oth. ○-Verbal	○SUPPORT ○SAME ○OPPOSITE	○ NO ○ YES	○ NO ○ YES	
#5.	Education: Annoyance is greater for high education respondents.	○ NO ○ YES→	○ Unacceptable reaction question ○-dB ○-% ○-r ○-Sig. ○-Oth. ○-Verbal	○SUPPORT ○SAME ○OPPOSITE	○ NO ○ YES	○ NO ○ YES	

ID #	Hypothesis (note direction)	Discuss in publication?	Evidence on the hypothesis				Reference & page number
			Type of evidence in publication.	Direction of evidence relative to the hypothesis	Control for noise?	Major weakness?	
#6.	Home ownership: Homeowners are more annoyed.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#7.	Dwelling type (single/multiple): Annoyance will be greater for people in single unit houses.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#8.	Length of residence: Annoyance will decrease with length of residence.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#9.	Personal benefits (objective): Annoyance is reduced if benefits (economic, convenience) are received from the noise producer (airport or other noise source).	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
			**** ATTITUDINAL VARIABLES ****				
#10.	Fear danger from source: Annoyance is increased if the respondent associates fear with the sound of the noise source.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#11.	Perceived preventability of noise: Annoyance is greater for people who believe that a noise can be prevented or reduced.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#12.	Non-noise impact perceptions: Noise annoyance is increased by annoyance with associated environmental nuisances.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#13.	Sensitivity to noise: Annoyance with aircraft or other transportation noises will be greater for people who are generally sensitive to noise.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )dB ( )% ( )r ( )Sig. ( )Oth. ( )Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	

ID #	Hypothesis (note direction)	Discuss in publication?	Evidence on the hypothesis				Reference & page number
			Type of evidence in publication.	Direction of evidence relative to the hypothesis	Control for noise?	Major weakness?	
#14.	Perceived importance: Annoyance is reduced if the respondent believes that the noise source is important.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )-dB ( )-% ( )-r ( )-Sig. ( )-Oth. ( )-Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
**** SITUATIONAL VARIABLES ****							
#15.	Non-noise impact (objective): Noise annoyance is increased by the presence of associated environmental nuisances from the noise source. (Environmental impact is objectively measured, ie. visibility, flight-path.)	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )-dB ( )-% ( )-r ( )-Sig. ( )-Oth. ( )-Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#16.	Amount of time at home: Residents who spend more time at home will be more annoyed.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )-dB ( )-% ( )-r ( )-Sig. ( )-Oth. ( )-Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#17.	Isolation from noise: The greater the acoustical isolation from the noise source the less the annoyance.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )-dB ( )-% ( )-r ( )-Sig. ( )-Oth. ( )-Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#18.	Ambient noise level: Annoyance with a specified noise source is greater in low ambient noise environments.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )-dB ( )-% ( )-r ( )-Sig. ( )-Oth. ( )-Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	
#19.	Interview method (telephone/person): Respondents will express more annoyance in a telephone interview.	( ) NO ( ) YES→	( ) Unacceptable reaction question ( )-dB ( )-% ( )-r ( )-Sig. ( )-Oth. ( )-Verbal	( )SUPPORT ( )SAME ( )OPPOSITE	( ) NO ( ) YES	( ) NO ( ) YES	( ) NO ( ) YES

ERRATA SHEET

DOT/FAA/EE-92/03
"EFFECT OF PERSONAL AND SITUATIONAL VARIABLES ON NOISE ANNOYANCE: WITH SPECIAL REFERENCE TO IMPLICATIONS FOR EN ROUTE NOISE"
August 1992

Correction:

Technical Report Documentation Page, DOT Form 1700.7, Item 8. Performing Organization Report No.: Change "NASA CR - 189670" to "NASA CR - 189676"