
**Acoustics — Assessment of noise
annoyance by means of social and
socio-acoustic surveys**

*Acoustique — Évaluation de la gêne causée par le bruit au moyen
d'enquêtes sociales et d'enquêtes socio-acoustiques*

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This second edition cancels and replaces the first edition (ISO/TS 15666:2003), which has been technically revised.

The main changes compared to the previous edition are as follows:

- A relaxation of the requirement to ask both the 5-point verbal scale and the 11-point numerical scale. Both questions can still be asked but guidance has been provided about the advantages and disadvantages of each scale to aid question choice in situations where only one question will be asked.
- Clarification regarding assumptions that the question covers a 24 h period (day, evening and night) and the indoor and outdoor home environment.
- Additional guidance has been added in [Clause 6](#) describing the conventional cut-offs to define “highly” annoyed” for the 5-point verbal scale and the 11-point numerical scale, to enable comparisons between different surveys and contexts.
- Updated references.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Many countries have already developed regulations concerning the acceptability of environmental noise exposure, while others are likely to do so in the future. Such regulations often take into account relationships between noise exposure and noise-induced annoyance.

Measurement of environmental noise has been standardized. For example, ISO 1996 (all parts) contains detailed specifications about basic quantities and procedures, about acquisition of (noise) data, and about the application of these data to set noise limits.

The intent of this document is to provide specifications for the assessment of noise annoyance by social and socio-acoustic surveys. When these specifications are met, the statistically relevant possibilities of comparing and pooling survey results will be increased, thus offering more and better quality information for use by environmental policy makers.

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Acoustics — Assessment of noise annoyance by means of social and socio-acoustic surveys

1 Scope

This document provides specifications for socio-acoustic surveys and social surveys which include questions on noise effects (referred to hereafter as “social surveys”). It includes questions to be asked, response scales, key aspects of conducting the survey, and reporting the results.

It is recognized that specific requirements and protocols of some social studies may not permit the use of some or all of the present specifications. This document in no way lessens the merit, value or validity of such research studies.

The scope of this document is restricted to surveys conducted to obtain information about noise annoyance “at home”. Surveys conducted to obtain information about noise annoyance in other situations, such as recreational areas, work environments and inside vehicles, are not included.

This document concerns only the questions on noise annoyance used in a social survey and the most important additional specifications needed to accomplish a high level of comparability with other studies. Other elements which are required to provide high-quality social surveys, but which are not specific for social surveys on noise (such as sampling methods), can be found in textbooks (see References [1] and [2]).

Conformity with the recommendations of this document does not guarantee the collection of accurate, precise or reliable information about the prevalence of noise-induced annoyance and/or its relationship to noise exposure. Other aspects of study design, as well as uncertainties of estimation and measurement of noise exposure, can influence the interpretability of survey findings to a great extent.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1996-1, *Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures*

ISO 1996-2, *Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of sound pressure levels*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

**3.1
noise-induced annoyance**

one person's individual adverse reaction to noise

Note 1 to entry: The reaction may be referred to in various ways including, for example, dissatisfaction, bother, annoyance and disturbance due to noise (see References [3] and [4]).

Note 2 to entry: Community noise annoyance is the prevalence rate of this individual reaction in a community, as measured by the responses to questions specified in [Clause 4](#) and expressed in appropriate statistical terms.

**3.2
socio-acoustic survey**

social survey in which noise-induced annoyance is assessed and values of measured or calculated noise metrics are attributed to the respondents' home environment

Note 1 to entry: Many general social surveys of environmental factors including noise are not considered to be "socio-acoustic" surveys because they do not have associated (measured or modelled) noise data.

4 Specifications for wording and scaling of questions on annoyance

Two questions have been formulated: one question with a verbal rating scale; one with a numerical rating scale.

a) **Question with verbal rating scale**

Thinking about the last (12 months or so), when you are here at home, how much does noise from (noise source) bother, disturb or annoy you?

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

b) **Question with numerical rating scale, with introduction**

Introduction:

This uses a 0-to-10 opinion scale for how much (source) noise bothers, disturbs or annoys you when you are here at home. If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Question:

Thinking about the last (12 months or so), when you are here at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by (source) noise?

NOTE 1 There is an implicit assumption that the verbal and numeric scales address annoyance over the whole 24 h period during the last (12 months or so), i.e. annoyance integrated over the day-time, evening and night-time periods.

NOTE 2 The terminology 'at home' covers inside the home or outdoors at home, for example in the garden or on the balcony (see References [5] and [6]). See also [A.7](#) and [A.8 d](#)).

The rationale for the specification and wording is presented in [Annex A](#). The most accurate translations into several other languages are presented in [Annex B](#).

5 Additional specifications for conducting social and socio-acoustic surveys when assessing noise annoyance

General specifications for conducting social surveys of any kind are found in numerous articles, papers and textbooks (see References [1] and [2]). This clause does not give a comprehensive overview of these general specifications. The focus in this clause is on additional specifications with respect to the design of the questionnaire when asking about noise annoyance. More information is given in [Annex A](#).

- a) Each respondent may be asked both questions specified in [Clause 4](#). More information is given in [Annex A](#) about the advantages and disadvantages of the verbal and numerical scales to aid choice of question, if only one question is to be used.
- b) The questions shall be placed early in the questionnaire, unless this conflicts with other survey objectives, and before other, more detailed, questions about noise have been asked. Respondents shall not be eliminated on the basis of some previous question about whether they “hear” the noise, nor on the basis of length of residence. There is too great an uncertainty that respondents may conflate low levels of annoyance with not hearing the sound of the evaluated source (Reference [8]). If it is necessary to determine whether some respondents do not hear the noise source, a question about the audibility of the noise should be asked separately later in the survey. If other questions on noise annoyance are more important for the survey’s purposes, the specified annoyance questions may be asked later (see References [7] and [8]).
- c) When asking a question about annoyance, do not imply that the noise should be present in the respondent’s situation at home. Ask, for instance, about “noise from aircraft” instead of “noise from the aircraft”.
- d) When both questions are used, if pre-tests indicate that the questions are perceived as repetitious, include appropriate instructions. An example is presented in [Annex A](#).
- e) As discussed in Reference [8], the answer categories of the five-point verbal scale may be presented without numbers, in a vertical orientation that can visually depict their equal separation as follows:

CARD QV1 <div style="text-align: center;"> NOT AT ALL SLIGHTLY MODERATELY VERY EXTREMELY </div>
--

As discussed in Reference [8] the presentation for the numerical scale shall be as follows:

CARD QN										
NOT AT ALL										EXTREMELY
0	1	2	3	4	5	6	7	8	9	10

The chosen answer shall be marked clearly within one box.

- f) Prepare written instructions for interviewers. For telephone or personal interviews, the interviewers shall be provided with written instructions that
- instruct interviewers to ask questions exactly as written,
 - train interviewers to respond to “I don't understand” with methods that do not require paraphrasing the question,
 - urge respondents to choose between the offered answers, including those who respond “I don't know”,
 - request all respondents to answer these questions (new residents can be instructed to answer about only their recent period of residence and later excluded from some analyses) – for more details see Reference [8], and
 - if repetition is expected to be a problem, for some respondents provide interviewers with instructions as described in Reference [8].

6 Specifications for assessing the degree of annoyance

Results of the questions shall be given as the frequency or cumulative distributions of the individual annoyance scores, if available for each category of noise exposure, bearing in mind that it may be necessary to suppress values with low numbers (small samples) to preserve anonymity. Other (summarizing) statistics such as the mean or median annoyance score, or percentages of respondents who are annoyed to a certain degree, may be given.

“Defining highly annoyed”

The cut-offs used in individual countries or preferred by individual researchers to define the percentage of respondents who should be regarded to have at least a certain degree of annoyance, such as for example “highly annoyed” can vary, although such variations can impede cross-study comparisons. Over the past decades a science-based rationale has emerged to define “highly annoyed” as one of the following: (see NOTE 1, NOTE 2 and NOTE 3).

Consistent with what was originally proposed in Reference [9] “highly annoyed” is defined as the top 28 % for the 11-point numerical scale:

- Numerical values 8, 9, and 10 for the 11-point numerical scale (to be referred to as HA_N).

As specified in the extensive ICBen Team 6 analysis (see Reference [8]) and consistent with Reference [9] “highly annoyed” can be defined on the 5-point verbal scale as:

- The top two verbal response categories for the 5-point verbal scale (i.e., very and extremely) (to be referred to as HA_V).

It should therefore be noted, that as defined above, the two scales do not use the same cut-offs to define “highly annoyed”.

New research from large-scale investigations (see References [7] and [10]) have found that comparisons between the two scales can be improved with the following weighting scheme, whereby:

- Defining “highly annoyed” as the top two verbal response categories on the 5-point verbal scale (i.e., very and extremely) with ‘extremely’ counted in full, and ‘very’ weighted by a factor 0,4 (to be referred to as HA_{VW}). This creates a greater mathematical similarity between this scale and studies that have reported high annoyance as the top 28 % on the 11-point numerical scale. A detailed analysis of the perceived annoyance intensity encompassed by the top two categories “very” and “extremely” on a scale from 0 % to 100 % is provided in Reference [8].

NOTE 1 The term “highly annoyed” in this context refers to the percentage of the survey respondents reporting to be highly bothered, disturbed or annoyed, following the wording of the question but the convention is to refer to this group as “highly annoyed” and not the literary “bothered, disturbed or annoyed”.

NOTE 2 The verbal scale is an ordinal scale so if converted to a numerical scale for statistical purposes there needs to be clear evidence that the step-difference between each category is perceived by the respondent to be equal. The analysis in Reference [8] supports the assumption of equidistance between the verbal categories in general, but this can be sensitive to study demographics. The procedure for constructing the verbal scale (see Reference [8]) attempts to space the verbal modifiers at equal intervals of annoyance intensity along the annoyance axis.

NOTE 3 When reporting percentage highly annoyed, it is important to clearly state which scoring has been used to support comparison and harmonisation of data. It is however recognised that users and countries can conventionally adopt other forms of scoring due to preference or historical need, which cannot be based on a need to report the prevalence of high annoyance.

7 Specifications for reporting core information from social and socio-acoustic surveys

In Table 1, minimum specifications are presented for reporting core information from social and socio-acoustic surveys in scientific reports. This information is essential to judge whether comparisons with other surveys can be made. Further information can be found in Reference [11].

Table 1 — Minimum specifications for reporting core information from social and socio-acoustical surveys in scientific reports

Topic area	Item	Topic	Required information
Overall design	1	Survey date	Year and months of social survey
	2	Site location	Country and area/region of study sites
	3	Site selection	Any important, unusual characteristic of the study period or sites Map or description of study site locations relative to the noise source Rationale for site selection Site selection and exclusion criteria
	4	Site size	Number of study sites Number of dwellings by site
	5	Study purpose	State original study objective(s) State if respondents were aware of study objective(s)
Social survey sample	6	Sample selection	Population definition (i.e., is the sample drawn from a targeted area, local community, larger provincial/state, or representative of a national sample) Respondent sample selection method (probability, judgmental, etc.) Respondent exclusion criteria (age, gender, length of residence, etc.)
	7	Achieved sample	Number of respondents (sample size) Response rate Reasons for non-response
Social survey data collection	8	Survey methods	Method (face-to-face, telephone, online, mail.)
	9	Questionnaire wording	Exact wording of primary questionnaire items (including answer alternatives) and where appropriate, any valid skips
	10	Precision of sample estimate	Number of responses for main analyses, range of the average time taken to complete the survey per respondent.

Table 1 (continued)

Topic area	Item	Topic	Required information
Acoustical conditions (if applicable)	11	Noise source	Type of primary noise source (aircraft, road traffic, etc.) Types of noise source operations that are included or excluded Protocols to define the noise source (e.g. minimum level, operations, days of week)
	12	Noise metrics	Give the complete description of any appropriate noise metric reported for the source, in accordance with e.g. ISO 1996-1, ISO 1996-2 (if applicable): — Provide $L_{Aeq,24h}$, L_{dn} and L_{den} (or L_{Aeq} by time-period) for all locations or — provide conversion rule(s) to estimate $L_{Aeq,24h}$, L_{dn} and L_{den} under the specific study conditions from the study's preferred metric — Discuss the adequacy of the conversion rule(s) — Provide impulse and/or tone corrections
	13	Time period	Hours of day represented by noise metric Period (months, years) represented by noise metric Time period should coincide with the historical time reference period in the annoyance questions
	14	Estimation/measurement procedure	Estimation approach (modelling, measurement during sampled periods, etc.). Identify the standard followed and software used to quantify exposures
	15	Reference position	Nominal position relative to noise source and reflecting surfaces Present exposure (or give conversion rule) for noisiest façade, specifying whether reflections from the façade are taken into account or not
	16	Precision of noise estimate	Best information available on precision of noise exposure estimates
Basic dose/response analysis	17	Dose/response relationships	Tabulation of frequency of annoyance ratings for each category of noise exposure. Include discussion on the variance found within the relationship – either a qualitative discussion or quantitative assessment of how well any derived curve fits the spread of data.
	18	Participants counted as “not highly annoyed”	Clarification that participants who may have indicated a source was inaudible or “do not know” their annoyance magnitude, are treated as “not highly annoyed” in modelling where logistic regression analysis is used.

Annex A (informative)

Rationale for wording and scaling of questions on annoyance

A.1 General

In this annex the rationale for the specifications for wording and scaling of the specified questions about annoyance is presented, largely based on the IC BEN Team 6 analysis (Reference [8]).

A.2 Types of question

Direct rating questions:

- name the noise source;
- ask for respondents' attitude towards the noise;
- present respondents with choices between a limited number of answers.

Such direct rating questions have been almost universally accepted as the primary measure of the relationship between noise and residents' reactions. Answers to such direct questions are more explicit and more readily interpreted than indirect questions or comparison questions (the two other types of questions that are sometimes used for special purposes in noise surveys).

Indirect questions attempt to ascertain the underlying impact of noise on people with

- open questions in which the noise source is not identified,
- questions in which respondents report complaint actions rather than an attitude, or
- questions in which respondents report behavioural reactions rather than an attitude.

Although useful for specific purposes, these have not supplanted the direct questions as the primary indicator of noise impact because they can only be used to infer indirectly how people may feel about noise exposure. In addition, such indirect questions may highlight non-acoustic factors which may or may not be directly related to noise exposure (see Reference [12]). Indirect, open questions that allow respondents to volunteer their own answers are expensive to analyse and require survey designs and procedures which are different from those presented in this document and therefore are outside of the scope of this TS. For this reason, answers from indirect, open questions cannot be directly compared with those obtained from the methods used with this document. Similarly, willingness-to-pay type questions (e.g. higher taxes for lower noise from a particular noise source) are not directly comparable with the methods used in this document.

The other type of question, a comparison question, provides an anchor for a rating by asking respondents to compare their attitude towards the specified noise to their attitude towards some other object. The overwhelming problem with comparison questions is the absence of a common, shared anchor that could provide a uniform point of comparison across surveys or even across neighbourhoods in the same survey. The most obvious anchors, other neighbourhood nuisances, vary so greatly from site to site that they cannot be used for comparing noise responses at different sites. Magnitude estimation techniques could, in theory, use other shared reference points to resolve this problem, but previous research has found that such techniques are not sufficiently refined for a question to be recommended for wide usage in noise-reaction surveys (see Reference [13]).

A.3 "Noise", is unwanted sound

As per the scope of this document, the term "noise" is used rather than "sound" because this document is designed to measure and assess the existence of annoyance towards a sound source. Therefore, participants who are not "bothered", "disturbed" or "annoyed" by the sound source under consideration (i.e. do not consider the sound "noise") should select the survey answer "not at all". This document acknowledges that the audibility of the sound source(s) identified in a survey may not be unwanted in either some or all cases by participants. It is recognized that the human response to sound, regardless of the source, can vary widely depending on multiple non-acoustic factors including context, expectations and preferences. However, it is outside of the scope of this document to measure and/or assess factors comprising the category "not at all".

A.4 Unipolar scales (neutral-negative)

From many previous surveys, it has been found that reactions to noise are overwhelmingly either negative or neutral (see Reference [8]). Therefore, the questions should use unipolar scales that extend from a negative pole (extremely annoyed) to a neutral position (not at all annoyed), but not to a positive pole (extremely enjoyable).

A.5 Two questions

This document provides a choice between two annoyance scales, although it is recommended that both questions are used. Using more than one scale is consistent with the most basic principles in psychometrics to increase the reliability of a measurement. It also enhances comparability between studies and advances the body of evidence pertaining to the interchangeability between the two questions and by extension the optimal derivation of "highly annoyed".

A.6 Verbal and numerical scale

It is appreciated that it may not always be possible to include both questions in a survey due to space and cost constraints. Each of the scales has different strengths and weaknesses (see Reference [8]). If having to choose between the scales it may be useful to consider the following points.

The 5-point verbal scale is recommended where there is a need for the clearest, most transparent communication. The simple task of choosing a word is most likely to be easily performed by all respondents. The resulting selected word is, when presented in a report, simply passed on to readers as the respondent's choice. The protocol used to choose the answer scale words attempts to ensure that the commonly understood meaning of the word is consistent with its position on the scale. If developed in line with the methodology proposed (see Reference [8]) the descriptive verbal categories can generally be considered to be equidistance from each other, making the verbal scale interval. As specified in Reference [8] equal distance between variables is subject to study demographics and therefore not necessarily guaranteed, such that the resulting data would be ordinal in nature. Another disadvantage is that within cultures the meaning of language can change over time, which could influence the respondents' perception of the verbal scale (see Reference [14]). Although efforts have been made to stabilize the response categories across cultures (see Reference [8]), the terminology used in the response categories can be culturally bound and this can add uncertainty to cross-study comparisons.

The simplicity of the 11-point numerical scale circumvents some of the issues related to the verbal scale. The most obvious difference being that the spacing along the 11-point scale is equal, which provides a pragmatic rationale for treating the data as "continuous" in statistical testing, even though the scale is ordinal by definition. Further advantages are that it may offer a more sensitive assessment of annoyance, as the respondent has a greater number of possible response options. While this may prove to be true, it is acknowledged that more options may also contribute to fluctuations in annoyance ratings, without meaningful changes in noise. Disadvantages of the scale are seen to be the lack of verbal descriptions across the scale as only the two poles of the scale are given semantic descriptors and that defining "highly annoyed" at 28 % means that respondents who score 7 or 8 are treated very

differently. Further, there may be ambiguity arising from providing so many response categories and the values between the extreme anchor points do not have clearly defined differences.

Each scale has strengths and weakness. This document encourages individual researchers to balance these against their unique research objectives. If having to choose between the verbal and/or the numerical scale, the recommendation is to use the 11-point numerical scale, as it affords the greatest options for statistical testing and cross-study comparisons.

It should be noted, that given the different scoring methods for the verbal scale and the numerical scale, small differences in annoyance scores between the two scales are expected (see References [7] and [15]).

Using both the verbal scale and the numerical scale enhances the ability to compare findings between studies, taking into account the different methods of scoring available for each scale (See [Clause 6](#)).

A.7 General, non-specific reaction questions

The recommended questions seek to obtain general, consistent reactions that allow respondents to integrate their experiences over different times and locations in and around their home (e.g. on a balcony, in a garden). They do not specify one particular combination of conditions because an overall response measure necessarily involves an integrated response over a range of different types of experiences. The questions do not explicitly list the range of conditions over which the experiences should be integrated as a complete list would involve too many conditions (e.g. room in a home, location on property, season of year, day of week, hour of day, window-opening conditions, activity during exposure, number of noise events, and peak levels of noise events).

If there is a need to evaluate noise annoyance responses in a certain situation (e.g. indoors at home or season or a particular time of the day) the recommended questions can be repeated later in the survey, for the combination of conditions. Whilst taking note that the survey should not be too long and complex. If asking about a particular time of the day, the precise hours being considered should also be stated in the question, e.g. 'Morning (07.00-12.00) and should align with an appropriate noise metric to characterise that time period, as appropriate. See References [7] and [8] for discussions of placement of questions and seasonality of data collection on annoyance responses.

A.8 Wording of the questions

The details involved in the final decisions on wording of the English, five-point verbal scale are as follows.

- a) *Thinking about the last (12 months or so), when...*

The indefinite “thinking” and “12 months or so” encourages a general response to the noise, rather than an exclusive comparison of the last 12 months with any other period.

- b) *..you..*

The respondent’s own reaction, not that of family members, is requested. In the instructions for interviewers, it should be made clear from the beginning of the interview that the respondent’s own reaction is required. Therefore, in the question itself the word “you” should be sufficient; “you personally” might complicate the understanding of the question by the respondent, especially in some cultures.

- c) *..are..*

The habitual, present tense of the verb “are” encourages the habitual, general response as explained in a). Therefore, the present tense should be used instead of the (grammatically more correct) past tense.

d) *..here at home..*

This phrase is intended to measure the general evaluation for the respondent's dwelling environment while excluding the broader neighbourhood shopping and recreation areas (as might be suggested by "around here") but not strictly restricting answers to inside the building (as would be implied by "in your house"). In the instructions for interviewers, the following preamble to the question should be included: "at home means inside your home or outdoors at home, for example in the garden or on the balcony".

e) *..how much..*

This phrase prepares the respondent for choosing an answer of degree of response.

f) *..does..*

Present tense; see c).

g) *..noise..*

The single word "noise" rather than the phrase "the noise" is used to avoid the implication that the present noise should be considered. "Noise" is used rather than a neutral word for the reasons given earlier.

h) *..from (noise source)..*

The name of the noise source is specified, not left unclear.

i) *..bother, disturb or annoy..*

These three words were judged to be necessary to convey the general impression of a negative reaction in English. In other languages, the general impression of a negative reaction could require less (or more) words.

j) *..you..*

Own reaction reinforced; see b).

k) *..not at all..*

This phrase was found to have the lowest annoyance intensity rating in several studies (see Reference [13]).

l) *slightly, moderately, very, extremely*

These four words were selected by the protocols contained in the empirical study described in Reference [8].

Note, that the order of presentation of the modifiers have been reversed compared with the original ICBen Team 6 recommendations described in Reference [8].

A.9 Choice of response descriptors in languages other than English

The translation of each question in each language should be performed by translation and back-translation. For languages other than English, the labels for the categories on the 5-point verbal scale and the endpoints for the 0-to-10 numerical scale should be chosen on the basis of empirical studies conducted using a standard technique in each language and not be simply translated from English. The studies should be conducted following the protocol presented in Reference [8] noting that the verbal categories will generally be evenly spaced if developed according to this protocol. See also Reference [16]. These types of studies have been carried out in the following seventeen languages: Chinese, Danish, Dutch, English, French, German, Hungarian, Japanese, Korean, Norwegian, Romanian, Portuguese-Brazilian, Polish, Spanish, Thai, Turkish and Vietnamese. The questions and answer categories in these languages are presented in [Annex B](#).

If an ISO Member Body doubts the correctness of the translations presented in [Annex B](#), it should initiate a replicate study to improve the translations as they stand now. Just changing the wording based on personal preference instead of based on empirical studies does not seem a fruitful approach.

A.10 Missing data responses

As with all questions in a questionnaire, there needs to be a provision for coding missing data responses such as “don't know”, “refusal” or “skipped in error”. It is recommended that the survey organizations include separate codes for such answers.

CAUTION — — These possible answers should not, however, be shown or read to respondents. They would not, therefore, appear in a mail questionnaire. One of the primary findings from question-wording experiments is that the number of “don't knows” is very much increased if the respondent sees or is offered this option.

Interviewers should use such a code only after having encouraged the respondent to choose one of the offered responses with a phrase, such as “Which of the answers comes closest to your view?”

A.11 Appropriate time period

The phrase “12 months or so” appears in parentheses in the questions because the length of the time period may need to be different for different surveys. The period that is asked about in the questionnaire should be a period for which the noise exposure can be estimated with sufficient accuracy. In general, a period of approximately one year is recommended to encourage respondents to give their general reactions to a stable acoustical environment and it is consistent with the WHO's time reference period for assessing the burden of disease for environmental noise (see Reference [17]). However, if there have been recent changes in the noise environment, or if the focus of the study is on a particular time, or if it is not possible to make sufficiently accurate estimates for a long time period, then some shorter period may need to be specified. Researchers should exclude (or at least treat as a sub-group) respondents from the analysis who have not lived in their home for the time-period being asked about e.g. having lived in their home for a lot less than 12 months for the '12 months or so' question but you may want to ask these people instead about their annoyance response for the time-period they have lived there e.g. for the past 3 months if they have lived in their home for that period of time. The '12 months or so' language is considered appropriate for describing a period covering at least 10 months. Changing the time-period of the question will also be relevant for studies examining the impact of an intervention on annoyance responses, which may involve a shorter follow-up period than '12 months or so'.

NOTE It is assumed that most social surveys of this type include a separate question about how long the resident has lived in the dwelling.

A.12 Abstraction level of noise source

If one of the purposes of a survey is to make comparisons (e.g. to compare noise annoyance in different areas, or noise annoyance over the years, or noise annoyance caused by different sources), the noise sources should be described on the same abstraction level e.g. compare general descriptors of the source such as road traffic noise or aircraft noise versus comparing general and specific descriptors, such as road traffic noise and lorry noise.

A.13 Written instructions for interviewers

A.13.1 General instructions for opinion questions

All opinion questions should be read exactly as written. They should not be paraphrased or explained by the interviewers. A great deal of care went into choosing each word in each question and each respondent should hear exactly these same words and not some additional words that an interviewer may add.

Occasionally a respondent may decline to choose one of the answer categories, or may reply with a long qualified statement that does not fit within one of the pre-coded categories. In either case, the interviewer should just repeat the question and, if necessary, add the phrase “And so, which of these answers comes *closest* to your own?” If the respondent still finds it impossible to answer or choose, then a “Not Answered” response should be filled in.

A.13.2 Instructions specific to a matrix question

NOTE The question QX, presented later, is just an example.

Question QX uses the same answer scale for all nine noise sources mentioned. Be sure to read the full question, including the answers, about the first noise source, road traffic, and then, after road traffic is rated, about aircraft. For most respondents it will not be necessary to read the entire question again. Instead the phrase “And how about noise from (trains)?” can be repeated each time and will be sufficient. If there is a digression or any discussion between items, be sure to reread the complete question and all five alternatives again. If the respondent hesitates or appears to be confused at any point, read all five alternatives again.

Circle the respondent’s answer. Only circle NA (Not Answered) if the respondent replies “do not know”, or refuses, or the question is skipped in error. In this example, these options are all combined into NA: however, researchers may wish to code these responses separately to examine non-response in more detail. Such decisions depend on research aims, ease of data collection and associated costs. The decision taken and the rationale for doing so should be reported in order to avoid inaccurate assumptions about the data.

QX *Thinking about the last 12 months or so, when you are here at home, how much does noise from (road traffic) bother, disturb, or annoy you: not at all, slightly, moderately, very or extremely?*

	NOT AT ALL	SLIGHTLY	MODERATELY	VERY	EXTREMELY	NA
Road traffic	NOT	SLIGHT	MOD	VERY	EXT	NA
Aircraft	NOT	SLIGHT	MOD	VERY	EXT	NA
Trains	NOT	SLIGHT	MOD	VERY	EXT	NA
Factories or machinery	NOT	SLIGHT	MOD	VERY	EXT	NA
Construction work	NOT	SLIGHT	MOD	VERY	EXT	NA
Animals outside	NOT	SLIGHT	MOD	VERY	EXT	NA
Children outside	NOT	SLIGHT	MOD	VERY	EXT	NA
Other people outside	NOT	SLIGHT	MOD	VERY	EXT	NA
Any other noises (specify)	NOT	SLIGHT	MOD	VERY	EXT	NA

A.13.3 If pretests indicate that the questions are perceived as repetitious

If the questions are not placed early in the questionnaire, potential interviewer or respondent discomfort with apparently repetitious questions can be solved with introductions to the questions similar to the following.

- a) *Now we return to the noise from (source) and take everything we have discussed into account. Thinking about the last... {insert recommended questions}.*
- b) *People in other surveys have answered this next question to tell us how they feel about noise. Now you can use it for the noise here. Thinking about the last... {insert recommended questions}.*
- c) *Even though all of the questions are slightly different, I know a few of them can seem similar. If any seem repetitious for you, just give me a quick answer and I will move right along to other questions.*

Annex B (informative)

Wording in seventeen languages of questions on annoyance

B.1 Introduction

The use of either a verbal and/or a numerical scale is necessary with the questions as formulated in [Clause 4](#). The questions, and especially the verbal scale, will be used in as many languages as possible. It is not enough to merely translate the questions and labels of the verbal scale from English into any other language, because a literal translation can lead to slightly different meanings (connotations) of words.

The International Commission on Biological Effects of Noise (ICBEN) has recognized this problem and initiated an international study designed to accomplish translations that would have the same meaning in each country. The results are presented in this annex. More details of the study can be found in Reference [8]. A difference between the ICBEN study and this document is that here the order of the answer categories of the verbal scale has been reversed and is ordered from 'not at all' to 'extremely', aligning with the ranking order (i.e., not at all to extremely) of the 11-point numerical scale. See also Reference [16] for further information.

NOTE Questions in languages other than the three official ISO languages (English, French and Russian) are published under the responsibility of the member bodies of the countries concerned. The standardized verbal scale ordering is from "not at all" to "extremely". Users of the standard check this ordering for languages others than the official ISO languages.

B.2 English

QV *Thinking about the last (12 months or so), when you are here at home, how much does noise from (noise source) bother, disturb or annoy you: not at all, slightly, moderately, very, or extremely?*

QN Next is a 0-to-10 opinion scale for how much (source) noise bothers, disturbs or annoys you when you are here at home. If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between choose a number between 0 and 10.

Thinking about the last (12 months or so), when you are here at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by (source) noise?

B.3 Danish

QV *Hvis du tænker på de seneste (ca. 12 måneder), hvor forstyrret eller generet er du så af støj fra (støjkilde), når du er herhjemme? - Slet ikke generet, Lettere generet, Moderat generet, Kraftigt generet, - eller Ekstremt generet?*

QN I det følgende/i det næste spørgsmål benyttes en skala fra 0 til 10 for, hvor meget støj generer dig, når du er herhjemme. Hvis du slet ikke føler dig generet, vælg 0; hvis du føler dig ekstremt generet, vælg 10; hvis du ligger et sted der imellem, vælg et tal mellem 0 og 10.

Hvis du tænker på de seneste (ca. 12 måneder), hvor meget føler du dig så generet af støj fra (kilde), når du er herhjemme?

B.4 Chinese (Pinin)

QV *Hui xiang guo qu (12 ge yue zuo you) de shi jian li, dang nin zai jia zhong shi, (mou zhong) zao sheng zai duo da cheng du shang da rao, gan rao huo fan rao nin:te bie, xiang dang, bi jiao, hao xiang you dian, yi dian ye bu?*

QN *Xia mian cong 0 dao 10 de shu zi chi du yong yu biao shi dang nin zai jia zhong shi, (mou zhong) zao sheng da rao, gan rao huo fan rao nin de cheng du. Ru guo nin yi dian ye bu gan dao fan rao jiu xuan ze 0, ru guo nin gan dao te bie fan rao jiu xuan ze 10, ru guo nin de gan jue zai liang zhe zhi jian jiu cong 0 dao 10 de shu zi zhong xuan ze yi ge qia dang de shu zi lai biao shi nin shou fan rao de cheng du. Hui xiang guo qu (12 ge yue zuo you) de shi jian li, na ge shu zi neng zui hao di biao shi dang nin zai jia zhong shi, (mou zhong) zao sheng da rao, gan rao huo fan rao nin de cheng du?*

B.5 Dutch (including Flemish)

QV *Als u denkt aan de afgelopen (12 maanden of zo), in welke mate ergert, stoort of hindert geluid van (geluidbron) u als u hier thuis bent?: helemaal niet, een beetje, tamelijk, erg, of extreem?*

QN *Hier is een schaal van nul tot tien waarop u kunt aangeven in welke mate geluid u hindert, stoort of ergert als u hier thuis bent. Als u helemaal niet gehinderd wordt kiest u de nul, als u extreem gehinderd wordt kiest u de tien. Als u daar ergens tussenin zit, kiest u een getal tussen nul en tien.*

Als u denkt aan de afgelopen (12 maanden of zo), welk getal van nul tot tien geeft het beste aan in welke mate u geërgerd, gestoord of gehinderd wordt door geluid van (geluidbron) als u hier thuis bent?

B.6 French

QV *Si vous pensez aux douze derniers mois, quand vous êtes ici, chez vous, le bruit de (citez la source) vous gêne-t-il: pas du tout, légèrement, moyennement, beaucoup, ou extrêmement?*

QN *Voici une échelle d'opinion graduée de zéro à dix. Vous devez noter sur cette échelle la façon dont le bruit de (citez la source) vous gêne lorsque vous êtes ici, chez vous: notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.*

Maintenant, si vous pensez aux douze derniers mois, quand vous êtes ici, chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit de (citez la source) vous gêne?

B.7 German

QV *Wenn Sie einmal an die letzten (12 Monate) hier bei Ihnen denken, wie stark haben Sie sich durch Lärm von (Quelle) insgesamt gestört oder belästigt gefühlt: überhaupt nicht, etwas, mittelmäßig, stark, oder äußerst?*

QN *Jetzt kommt eine Messlatte von Null bis Zehn, auf der Sie angeben können, wie sehr Sie der Lärm von (Quelle) insgesamt gestört oder belästigt hat. Wenn Sie sich äußerst gestört oder belästigt fühlten, wählen Sie die Zehn, wenn Sie sich überhaupt nicht gestört oder belästigt fühlten, geben Sie bitte die Null an, und wenn Sie irgendwo dazwischen liegen, wählen Sie bitte eine Zahl zwischen Null und Zehn.*

Wenn Sie nun an die letzten 12 Monate hier bei Ihnen denken, welche Zahl zwischen Null und Zehn gibt am besten an, wie stark Sie sich durch den Lärm von (Quelle) insgesamt gestört oder belästigt fühlten?