

# Attitudes Toward Noise Barriers Before and After Construction

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To obtain the most reliable indication of the effectiveness of noise barriers in terms of the reactions of community residents to highway noise, comparable surveys should be conducted before and after barrier construction. Two questionnaires designed for this purpose are presented and discussed. The questionnaires are based on discussions held at the 1978 Conference on Highway Traffic Noise Mitigation and on additional field experience.

One of the concerns raised but not answered at the 1978 Conference on Highway Traffic Noise Mitigation in Los Angeles was the problem of how best to collect information on community opinion about noise-barrier effectiveness. At the conference, several state representatives reported on their experience and on the difficulties they encountered. Others voiced their concerns during formal or informal discussions. This paper attempts to summarize those concerns and, from them and our own field experiences, to suggest the most effective procedures for obtaining information on community opinion about noise barriers.

Florida experience (1) is a good example of the problems inherent in obtaining appropriate information about community attitudes when a noise barrier is built as part of the construction of a new roadway [type 1 project (2)]. In such cases, some residents may be dislocated by the construction, which makes follow-up interviews impossible. Residents who were there both before and after construction of the new road may confuse barrier and highway effects. In the worst case, they may rate the barrier negatively because the area is noisier after construction of the new road than it was before. The unavoidable difficulty is that they are being asked to compare a hypothetical situation (a new road with no barrier) with a new and possibly unpleasant situation (a new road with a barrier). In such a case, it is next to impossible to obtain valid information, since most people are not able to make such a hypothetical comparison realistically. As a result, the most practical suggestion for type 1 projects is to avoid attempting to evaluate the community's attitude toward the barrier in before-and-after terms.

For barriers built in locations where an existing highway already affects existing residences (type 2 projects), these difficulties do not exist, and it is an excellent idea to attempt to obtain information on community attitudes both before and after barrier construction. In Minnesota (3), the State Legislature has required such an evaluation of noise barriers.

The remainder of this paper deals with the problems of data collection for type 2 projects.

## DATA COLLECTION REQUIREMENTS

The underlying objective of a data collection effort such as that discussed in this paper is to obtain information that accurately describes the opinions of owners of abutting property on "the effectiveness and desirability of acoustical barriers" (3, pp. 60-61). On the basis of discussions at the Conference on Highway Traffic Noise Mitigation, five specific requirements were identified to ensure that this objective is met:

1. The data should be as representative of the af-

ected community as possible. This means that the data collection procedures should be constructed to ensure a high percentage of completed responses and that the procedures should try to minimize any bias that might be introduced by the way the questions are worded.

2. The first survey, at the inception of the project, should identify the severity of the problems caused by highway noise in the specific project areas and the potential for public participation during project design selection.

3. The second survey, after barrier completion, should obtain information that is as comparable as possible to that collected in the first survey.

4. The cost of collecting and processing the data should be kept to a minimum.

5. It should be possible to identify which person in a household answered the first survey so that the same individual can be interviewed in the second survey. This is strongly recommended, since otherwise the differences in the responses may distort the results.

In some respects, these requirements all lead to similar conclusions for the questionnaire. Keeping the questionnaire brief and asking only those questions that are essential help to keep costs low and response rates high. Personal questions, such as age, should be kept to the minimum necessary to meet requirement 5 above and should be asked only at the end of the questionnaire. Respondents sometimes refuse to participate when personal questions are asked first. When they know why such information is needed, they are more likely to provide it.

In other respects, these five requirements are contradictory or incompatible. With regard to the procedures for administering the questionnaire, requirements 1 and 4 conflict. Door-to-door interviewing is probably most effective for the first requirement, in terms of response rate, ability to control for male and female participation, and ability to recognize and overcome misunderstandings. It is, however, the most expensive approach. One way to reduce costs is to use people already on staff. For example, the New York State Department of Transportation (NYSDOT) was able to use office secretarial staff among others in their door-to-door interviewing. An added advantage of using these people is that the same personnel will usually be available for the follow-up surveys. There has sometimes been an increase in the number of refusals to participate when men have done the interviewing, although this may not be generalizable. The expense of door-to-door interviews is usually offset by the fact that they generally achieve close to an 80 percent response rate.

Other procedures rely on mailed questionnaires that are to be mailed back, or on a mailed notice followed by a telephone call in which the actual interview is conducted, or on a telephone call alone. If the mailings are followed up with a second request, they can also obtain better than a 70 percent response rate [based on Minnesota experience (3)]. A potential difficulty with a mailed survey, however, is its inability to overcome language or literacy problems. Telephone surveys overcome these problems and often produce almost as good a response rate as door-to-door surveys. The Urban

Figure 1. Suggested questionnaire for survey before construction of a noise barrier (instructions to interviewer in italics or brackets).

Hello. I am from the (state) Department of Transportation, which is concerned about problems that may be affecting people such as yourself who live near major highways. We are actively considering solutions to some of the problems in your neighborhood. We would very much appreciate a few minutes of your time to answer the following questions.

1. What are the most important things you dislike about living in this area?  
*Write down the exact thing(s) said, for later coding. Probe slightly: "Is there anything else you dislike?" Focus on the residential environment of a few surrounding blocks. Whether or not road-related problems are mentioned, use the following transition phrase to move to the next question: "The Department of Transportation is particularly interested in things you dislike that may be related to living near a highway."*

2. Here is a list of problems other people have mentioned. Please rate each of them with regard to how great a problem it is for you and your family while you are at home.  
*Read question stem at left and each response as written.*

	not a problem at all	a minor problem	a moderate problem	a major problem or	an extremely bad problem?
Is highway dust and dirt	_____	_____	_____	_____	_____
Is headlight glare	_____	_____	_____	_____	_____
Is litter from vehicles	_____	_____	_____	_____	_____
Is highway noise	_____	_____	_____	_____	_____
Is vibration from the road	_____	_____	_____	_____	_____
Are fumes from the road	_____	_____	_____	_____	_____
Are there any other road-related problems? Name? Severity?	_____	_____	_____	_____	_____

3. How often does the noise from the road interrupt you during any of the following activities?

	never	only occasionally	several times per week	several times per day	almost all the time
Conversation indoors	_____	_____	_____	_____	_____
Conversation outdoors	_____	_____	_____	_____	_____
Use of telephone	_____	_____	_____	_____	_____
Watching television	_____	_____	_____	_____	_____
Relaxing indoors	_____	_____	_____	_____	_____
Relaxing outdoors	_____	_____	_____	_____	_____
Sleeping	_____	_____	_____	_____	_____

4. How often do you or members of your family use your yard for relaxing or playing during warm weather?  
 \_\_\_\_\_ every day                      \_\_\_\_\_ once or twice a week  
 \_\_\_\_\_ several times a week        \_\_\_\_\_ less than once a week

5. a. Have you regularly been forced to close your windows because of traffic noise?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 b. [If yes] How often would you say this happens?  
 \_\_\_\_\_ once or twice a month        \_\_\_\_\_ several times a week  
 \_\_\_\_\_ once a week                      \_\_\_\_\_ most of the time

6. Have you made any modifications to your house or yard because of the traffic noise?  
 Yes \_\_\_\_\_ No \_\_\_\_\_ [If yes] What? \_\_\_\_\_

7. Are there any other problems associated with living near the highway that you would like to mention? Yes \_\_\_\_\_ No \_\_\_\_\_  
*List responses.*

8. How long have you lived at this address? \_\_\_\_\_

9. Would you or other members of your household be interested in attending a public meeting about possible solutions to some of the problems mentioned earlier?  
 Yes \_\_\_\_\_ No \_\_\_\_\_

10. And now, a few questions about yourself, to assist us in contacting you personally for a possible follow-up survey.  
*If name is offered by respondent at this point, write it down, and do not ask remaining items.*

a. Sex [Do not ask.] male \_\_\_\_\_ female \_\_\_\_\_  
 b. How old are you? \_\_\_\_\_ years  
 c. What is your main occupation (that is, what sort of work do you do)? \_\_\_\_\_

Thank you for your assistance.

Noise Survey (4, p. 71), for example, reports a 70 percent overall completion rate in its telephone survey. In the two cities where both the telephone and door-to-door methods were used, neither was obviously better. Los Angeles gave a 10 percent better completion rate for door-to-door; Boston, a 1 percent worse rate. To select the appropriate approach in each project, a decision must be made as to what problems are likely to be encountered and what costs (in personnel time) are reasonable to overcome them.

Another way in which the requirements are contradictory becomes apparent when the first three requirements are taken together. Obviously, after barrier construction the community will be very much aware of traffic noise. For the two surveys to be comparable, the people should be equally aware of the traffic noise during the first survey. Yet to ensure such an awareness at that time would probably bias their responses to the first survey with respect to requirement 2 (identifying the severity of highway noise before construction). This difficulty can be overcome to some extent by using door-to-door or telephone interviewing, since the respondent does not need to know the final focus of the questionnaire at the start of it. Unfortunately, the mailed survey cannot overcome this problem because it cannot be assumed that people answer the questions in order. Thus, the first question in the questionnaire shown in Figure 1 should be omitted in a mailed survey. It should also be omitted in the follow-up surveys taken after barrier construction.

#### PROPOSED QUESTIONNAIRES

The questionnaires presented here contain a central core of questions suitable for use both before and after barrier construction. A comparison of the answers at the two times should serve as the best obtainable indicator of the barrier's effect on people. The after survey also includes some questions used in the Minnesota survey

(3) that ask directly about the barrier.

The introductory paragraph for the preconstruction questionnaire (Figure 1) is kept quite brief, as would be the case for a door-to-door or telephone survey. For a mailed survey, a separate, more detailed letter of introduction should replace the introductory paragraph. For the second survey, after construction (see Figure 2), the introductory paragraph should also be brief. The first task of the introduction to the second survey is to identify the appropriate person to interview—namely, the same individual spoken to in the first survey. The second task is to introduce the survey in a manner similar to that in which the first one was introduced.

In administering the questionnaire face to face or over the telephone, it is extremely important that the same wording be used all the time, by all the interviewers, so that answers to the same exact question have been received from all respondents.

The structure of both questionnaires moves from the general to the specific. This approach has been advocated for a number of years (5) and is one that we have used quite successfully in our own work on noise effects. The first question is valuable in the before survey to ascertain how often traffic noise is volunteered as a major problem. It does not make sense to ask this question in the second survey, since people's attention will have been drawn to the highway noise by the construction of a barrier and so answers will not be comparable.

For questions 2-5 to be strictly comparable before and after construction, it is essential that both surveys be conducted at the same time of year. In the drafting of the questionnaire, those times of year when windows are normally open (when heating or air conditioning is not in use) were assumed. It is at these times of year that external noises are generally most noticeable and the barrier's effectiveness can best be judged. If the interviews are administered at some other time of year, some questions may have to be reworded. In the same way, question 4 is worded for the northern half of the

Figure 2. Suggested questionnaire for survey after construction of a noise barrier (instructions to interviewer in italics or brackets).

Hello. I am from the (state) Department of Transportation. Last year we spoke to a person in your household about problems that may be affecting people who live near highways. The person we spoke to was (*describe, from question 10 data*). Is he/she available?  
*If the appropriate person is not available, try to find the best time to call back when he/she will be available.*

Now that we have completed our work on the project in this area, we would like to know how the highway is affecting people here.

1. Here is a list of problems that were mentioned in last year's survey. Please rate each of them with regard to how great a problem it is now for you and your family while you are at home.  
*Read question stem at left and each response as written.*

	not a problem at all	a minor problem	a moderate problem	a major problem	an extremely bad problem?
Is highway dust and dirt	___	___	___	___	___
Is headlight glare	___	___	___	___	___
Is litter from vehicles	___	___	___	___	___
Is high way noise	___	___	___	___	___
Is vibration from the road	___	___	___	___	___
Are fumes from the road	___	___	___	___	___
Are there any other road-related problems? Name? Severity?	___	___	___	___	___

2. How often does the noise from the road interrupt you during any of the following activities?

	never	only occasionally	several times per week	several times per day	almost all the time
Conversation indoors	___	___	___	___	___
Conversation outdoors	___	___	___	___	___
Use of telephone	___	___	___	___	___
Watching television	___	___	___	___	___
Relaxing indoors	___	___	___	___	___
Relaxing outdoors	___	___	___	___	___
Sleeping	___	___	___	___	___

3. How often do you or members of your family use your yard for relaxing or playing during warm weather?  
 \_\_\_ every day      \_\_\_ once or twice a week  
 \_\_\_ several times a week      \_\_\_ less than once a week

4. a. Have you regularly been forced to close your windows because of traffic noise?  
 Yes \_\_\_ No \_\_\_

b. [If yes] How often would you say this happens?  
 \_\_\_ once or twice a month      \_\_\_ several times a week  
 \_\_\_ once a week      \_\_\_ most of the time

5. What effect do you think the noise barrier has had on the traffic noise you hear while you are at home?  
 considerable reduction    moderate reduction    slight reduction    no effect    slight increase    moderate increase    considerable increase

6. What effect do you feel the barrier and its associated landscaping have had on the general appearance of this residential area?  
 considerable improvement    moderate improvement    slight improvement    no effect    slight deterioration    moderate deterioration    considerable deterioration

7. Are there any suggestions you have regarding noise barriers we may build in the future in other areas, to improve their appearance or effectiveness?  
 \_\_\_

Thank you for your assistance.

continent and may require rewording for the extreme south.

Questions 9 and 10 are also necessary only in the preconstruction survey. Question 9 provides information that should be of use in ensuring good participation at community meetings to plan the barrier. Question 10 provides information essential to identifying the same individual for the second survey. Based on our own experience, these three pieces of information (sex, age, and occupation) are adequate to identify the same individual for the follow-up survey. If, when the question is introduced, the respondent offers his or her name, that, of course, is adequate.

The questionnaire for the second survey (Figure 2) opens with the same four questions about the effects of the road that were asked in the first survey. In addition, three questions have been added about the barrier itself, including a final open-ended question, which can often be very helpful in identifying attitudes the other questions have missed.

The results of these two questionnaires, analyzed together, permit a thorough description of the perceived effectiveness of the noise barrier, both directly (from the last questions of the postconstruction survey), and indirectly (through changes in the degree of problems reported in the other four questions). If only the after-construction survey is used, the only kind of information that can be obtained is of the direct type, which, of course, relies on people remembering how bad the noise was before the barrier was constructed. The indirect measures of the actual effects of noise before and after construction provide a more reliable indicator of the barrier's effectiveness. If no preconstruction survey is conducted, these measures can never be obtained. A small expenditure in the early stages of the project can produce large returns later, when the effectiveness of the barrier is evaluated.

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