COMMUNITY ANNOYANCE DUE TO TRANSPORTATION NOISE

L.S. Finegold & M. So Finegold
Finegold & So, Consultants, USA

Introduction The concept of "community annoyance" was developed to provide one term to use as a comprehensive description of the overall community response to noise from various transportation noise sources, including that from aircraft, road traffic and railways. It should be clear, however, that annoyance connotes more than a slight irritation – it can mean a significant degradation in the quality of life. In order to support government noise policy-making efforts, it is necessary to synthesize the very large amount of available published data to develop a useful exposure-response relationship using statistical meta-analysis techniques. As described below, various authors have attempted these ambitious efforts to date.

Historical Overview of Community Annoyance Prediction Curves

1. Schultz (1978). In his seminal article, Schultz [1] reviewed the published English language data from social surveys concerning the noise of aircraft, street and expressway traffic, and railroads. The results of 11 of the reviewed surveys showed a remarkable consistency – the so-called "clustering surveys". The average of these curves was proposed that as the best available relationship at that time for predicting community annoyance due to various transportation noise sources. In performing his analysis, Schultz used a third-order polynomial function to fit the 161 data points contained in his 11 "clustering" surveys. The methods used by Schultz were initially received with considerable controversy. Notwithstanding methodological questions, errors in measurement of both noise exposure and reported annoyance, data interpretation differences, and the problem of community response bias, Schultz's recommended relationship has historically been the most widely accepted interpretation of the literature on transportation noise-induced annoyance.

2. Fidell, Barber and Schultz (1991). A decade after publication of the Schultz curve, Fidell, Barber and Schultz [2] were commissioned to update the original Schultz curve. The result of this major database update was the inclusion of an additional 292 data points to the original 161 data points for a total of 453 data points comprising 29 data sets. This resulted in nearly tripling the size of the database available for predicting annoyance due to general transportation noise exposure as compared to the original Schultz curve. Fidell et al. [2] chose to use a least squares quadratic fitting function as the most parsimonious equation to describe the data, accounting for 44% of the variance in the database.

3. Finegold, Harris and von Gierke (1994). The Fidell et al. [2] expansion of the existing community annoyance database and their revised prediction curve provided a considerable extension of the original Schultz meta-analysis. However, because there were several debatable methodological issues involved in this update, Finegold et al. [3] reanalyzed the Fidell et al. data and published the results of this additional meta-analysis. Finegold et al. [3] recommended a logistic fit as the prediction curve of choice, based on a final set of 400 data points. This equation was adopted by the U.S. Federal Interagency Committee on Noise (FICON) for use by federal agencies in aircraft noise-related environmental impact analyses [4]. It was also adopted as part of the American National Standards Institute (ANSI) Standard on community responses to environmental noises [5].

4. Miedema and Vos (1993, 1998), Miedema and Oudshoorn (2001). Miedema and his colleagues at The Netherlands Organisation for Applied Scientific Research (TNO) Prevention

and Health in the Netherlands have been working for much of the past decade to compile the most comprehensive database of community annoyance data yet available, and several publications have resulted from their meta-analyses [6-8]. These researchers have created a large archival data set of variables widely used in different social surveys of community annoyance. The current complete TNO database contains a total of 55 constituent databases, with data from a total of 45 different surveys [7]. There are several versions of the formulas resulting from the TNO analysis, depending on various analytical decisions for which options exist. The TNO project is the largest of its kind to date.

Conclusion The sequence of various meta-analyses described above represents a continual growth in the data available relating transportation noise exposure and community annoyance, as well as an improvement in the sophistication of the meta-analyses techniques themselves. Overall, our understanding of community annoyance and the adequacy of the various prediction curves proposed speaks well for the growth of the environmental noise research community. However, this author believes that more open dialog and debate, along with freely sharing of data among researchers, would lead to the development of an international consensus on the various technical issues involved, and TNO needs to make their database freely available to external scientists for replication or extension of their analyses. A comprehensive description of the historical summary and analysis briefly described here was presented previously by Finegold & Finegold [9], including discussion of unresolved analytical issues. Differences between the TNO curves and earlier meta-analyses that require additional discussion include the following:

- The selection criteria for choosing which studies to include
- The form of curves fitting the data and the use of different curves for the noise sources
- Changing from DNL to DENL
- Changing from the percent "highly annoyed" (%HA) to the percent "annoyed" (%A)

References

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