



Exploring the relationships between percent highly annoyed and residents' judgments about the airport

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Noise policies related to airports and aviation noise have long been based in part on the extent to which noise exposed residents report themselves as “highly annoyed” with the aircraft noise. Results of such reports are traditionally presented as “dose-response” curves that plot percent highly annoyed versus a quantitative metric of the aircraft noise exposure at their homes. These plots show considerable scatter and an associated degree of uncertainty. This scatter is often hypothesized to arise from personal, community and other variables not accounted for by the quantitative metric and raises questions about how the curves should best be used for policy formulation. This paper tests some of the relationships of recently surveyed reports of high annoyance with a few personal variables not often examined: degree of trust in airport officials to work fairly with the community; belief that residents’ feelings about noise are or not understood by airport officials; judged importance of the airport to the local area; resident reported sensitivity to noise of all kinds. Using the available data – about 100 resident survey responses at each of three airports – a rather high degree of correlation is evident between percent highly annoyed and the tested variables.

1 INTRODUCTION – WHAT IS THE ISSUE

Anyone who has been concerned about or worked with problems of environmental noise is familiar with the term “Schultz curve.” Its original form is **Error! Reference source not found.**¹ The relationship was later revised using additional data and an alternative form of the derived equation, **Error! Reference source not found.**, and adopted as a basis for various federal policies.² The simplicity of the curves, however, does not reflect very well the scatter of

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the data which the curves represent. **Error! Reference source not found.** shows typical scatter of the data.³

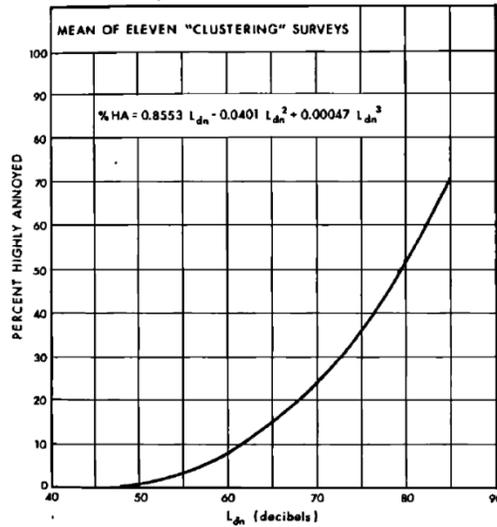


Fig. 1 - Schultz' original annoyance relationship derived from "clustering surveys" and the "best currently available estimate of public annoyance due to transportation noise of all kinds"

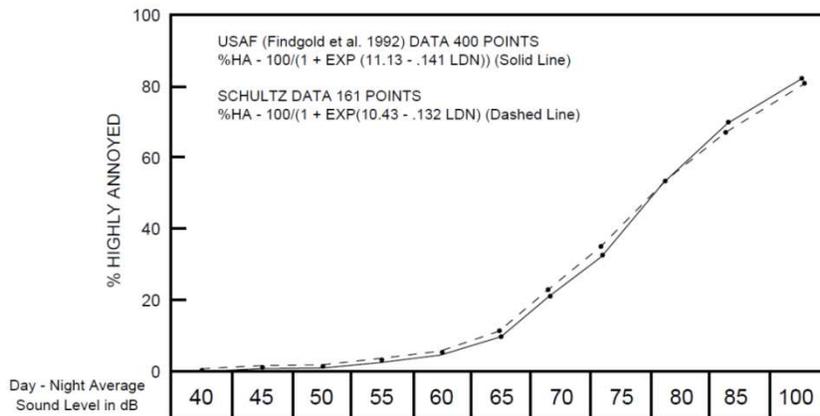


Fig. 2 - Comparison of logistic fits to original 161 data points of Schultz (1978) and USAF analysis with 400 points

The variability of the data compared to the derived curve has led to much conjecture about the causes of the scatter. Some have hypothesized "non-acoustic" variables such as fairness as perceived by the community in dealing with the airport, personal sensitivity to noise, or trust in airport officials. Another suggestion is that the data used for the curve are from many different airport communities and that communities in general have different degrees of "tolerance" for aircraft noise.³

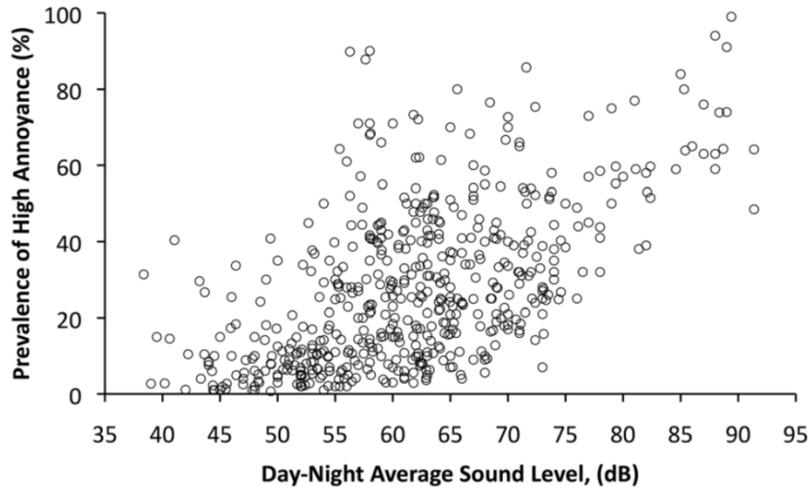


Fig. 3- Response data from single interview sites demonstrating the variability of annoyance responses as a function of DNL

This paper tests some of the relationships of recently surveyed reports of high annoyance with a few personal variables not often examined: degree of trust in airport officials to work fairly with the community; belief that residents’ feelings about noise are or not understood by airport officials; judged importance of the airport to the local area; resident reported sensitivity to noise of all kinds.

2 EXAMINING RELATIONSHIPS BETWEEN PERSONAL VARIABLES AND ANNOYANCE

A recent project sponsored by the Aviation Cooperative Research Program (ACRP) of the U.S. National Academies provides some initial data that can be explored for relationships between personal variables and annoyance.⁴ The project supported both mail and telephone surveys of communities surrounding three airports. Though the resulting data set was relatively small, responses to several of the questions in the telephone survey permit quantitative analysis of some non-acoustic personal variables. Approximately 100 useful telephone survey responses from each of the three airports were analyzed to explore the relationships between reports of annoyance and answers to four questions about personal opinions. The responses to four questions were examined:

2.1 Importance of the Airport

“How important do you think that [LOCAL AIRPORT] is for the [CITY NAME] area: Is [LOCAL AIRPORT] extremely important, very important, moderately important, slightly important or not at all important?”

2.2 Airport’s Understanding of Residents’ Feelings about Noise

“How well do you think [LOCAL AIRPORT] officials understand the community residents’ feelings about aircraft noise? Do you think the officials understand the residents’ feelings extremely well, very well, moderately well, slightly, or not at all?”

2.3 Trust in Airport Officials

“To what extent do you think that [LOCAL AIRPORT] officials can be trusted to fairly work with the community by following official, agreed-upon procedures and providing accurate information? Do you think the officials can be completely trusted, considerably trusted, moderately trusted, slightly trusted or not at all trusted?”

2.4 Sensitivity to Noise

“How sensitive are you generally to noise of all kinds: extremely sensitive, very sensitive, moderately sensitive, slightly sensitive, or not at all sensitive?”

3 RESULTS

For each question, responses were sorted into bins by the specific response (extremely important, very important, etc.) and the percent of respondents in each bin who said they were very or extremely annoyed by aircraft noise computed. Results are plotted, and weighted linear regression coefficients determined.

3.1 Importance of Airport

Figure 4 plots the percent of respondents reporting very or extreme annoyance with aircraft noise for each degree of judged importance of the airport. It also graphs the number of respondents in each degree of importance. The regression line is weighted for the number of respondents in each degree. The slope suggests for the three airports together, that people who believe the airport is very important are less likely to be annoyed by the noise. However, as demonstrated in Table 1, regressions for each airport are varied, particularly in the slopes.

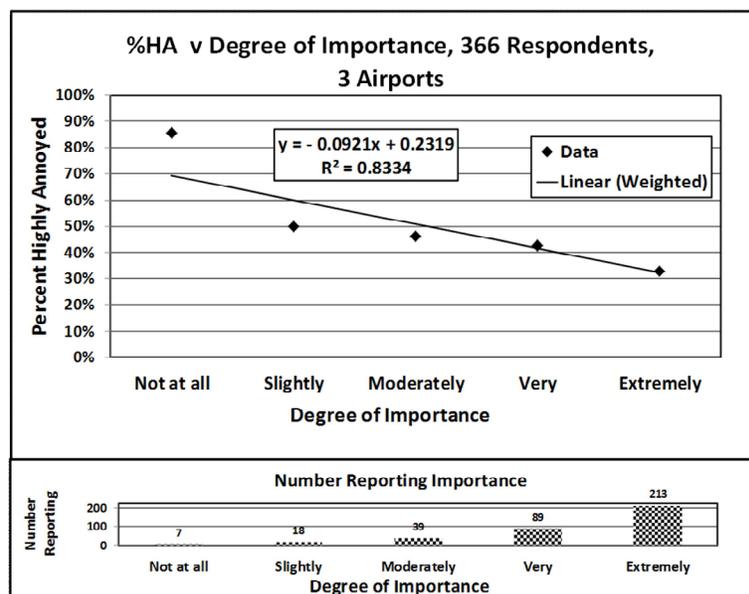


Fig. 4- Relationship between annoyance and judged importance of airport

Table 1 Regression results, all airports, percent highly annoyed versus judged importance of airport

Importance: Regression Results				
	Slope	Intercept	R ²	n
3 Airports	-0.0921	0.2319	0.8334	366
Airport 1	-0.1059	0.2495	0.8112	111
Airport 2	0.0141	0.3683	0.1853	142
Airport 3	-0.1409	0.1610	0.9066	113

3.2 Understanding Residents' Feelings

Figure 5 and Table 2 present regression results based on the responses to the question about how well they think the airport understands their feelings about noise. From Table 2 there appears to be general consistency across the airport communities in their responses to this question and the reported annoyance.

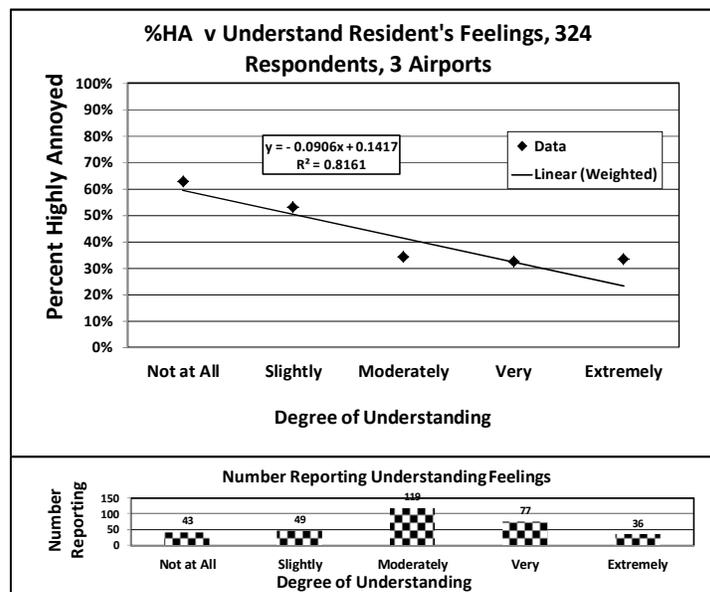


Figure 5 Relationship between annoyance and judged understanding of residents' feelings about noise

Table 2 Regression results, all airports, percent highly annoyed and judged understanding of residents' feelings about noise

Understanding: Regression Results				
	Slope	Intercept	R ²	n
3 Airports	-0.0906	0.1417	0.8161	366
Airport 1	-0.0890	0.2336	0.6649	111
Airport 2	-0.0834	0.1553	0.4112	142
Airport 3	-0.1059	0.1621	0.7234	113

3.3 Trust in Airport Officials

Figure 6 and Table 3 show the results for the trust question responses. The different airport communities vary significantly in how annoyance and trust relate.

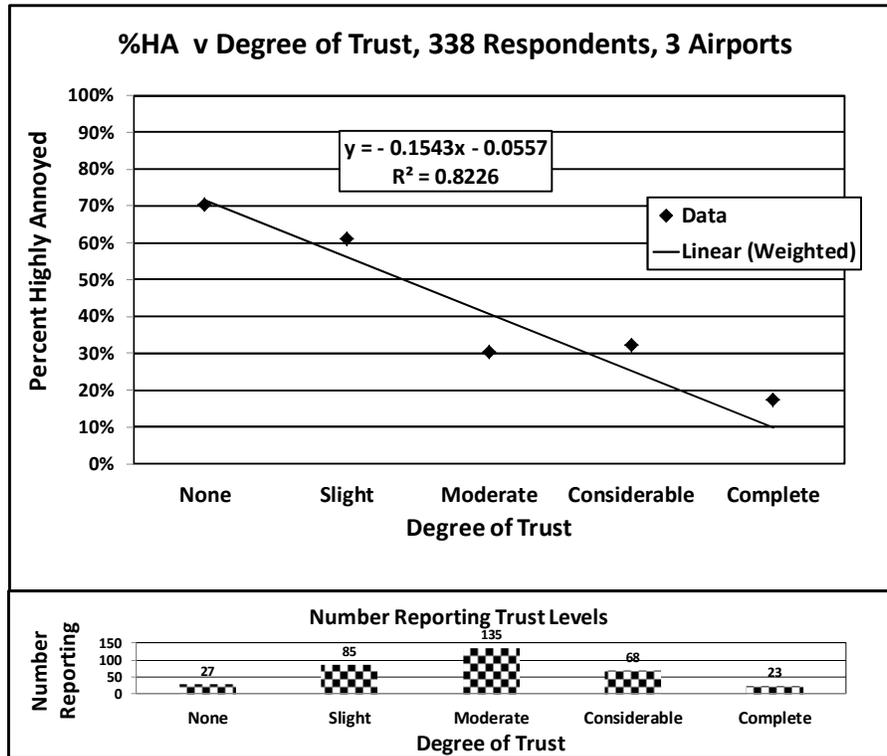


Figure 6 Relationship between annoyance and trust in airport officials

Table 3 Regression results, all airports, percent highly annoyed and trust in airport officials

Trust in Airport Officials: Regression Results				
	Slope	Intercept	R ²	n
3 Airports	-0.1543	-0.0557	0.8226	338
Airport 1	-0.2283	-0.267	0.9367	107
Airport 2	-0.0832	0.1438	0.3429	127
Airport 3	-0.1290	0.0057	0.6656	104

3.4 Sensitivity to Noise

Figure 7 and Table 4 show the relationships between reported annoyance and self-reports of sensitivity to noise.

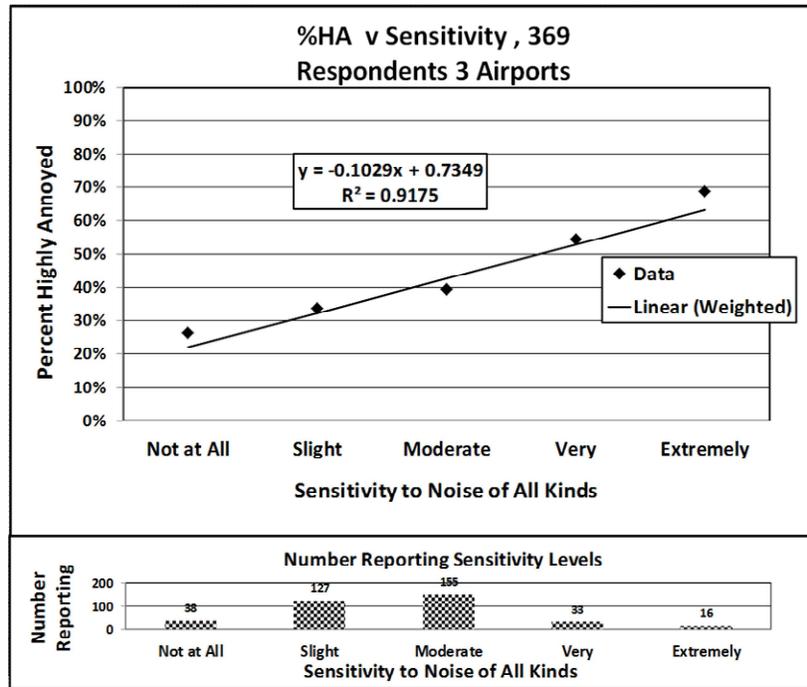


Figure 7 Relationship between annoyance and self-reports of sensitivity to all types of noises

Table 4 Regression results, all airports, percent highly annoyed and sensitivity to noise

Noise Sensitivity: Regression Results				
	Slope	Intercept	R ²	n
3 Airports	0.1029	0.7349	0.9175	369
Airport 1	0.0602	0.7161	0.4984	112
Airport 2	0.1197	0.7535	0.8499	143
Airport 3	0.1549	0.8362	0.9834	114

4 DISCUSSION AND CONCLUSIONS

The analyses suggest what might be expected: judged importance of airports, understanding by airport officials and trust in airport officials correlates with decreased annoyance. Sensitivity to noise has long been identified as correlated with higher degrees of annoyance.^{5,6} Correlation, of course, does not necessarily indicate cause and effect. Accordingly, answering two research questions could be useful for formulation of policy.

1. The ACRP project that supported the three airport survey was designed as preparation for a national survey of twenty U.S. airport communities.⁷ The same survey instruments will be used for the national survey. The statistical analysis of the results could examine whether the responses to these questions, when included as variables, help explain some of the variance in the annoyance / noise exposure dose-response data. If so, further analysis could examine whether inclusion of these responses helps explain differences between airport dose-response relationships.

If these personal variables prove to be important in reducing variance and / or differentiating between airports, then a different type of survey approach - cognitive interviews - might be used to address the next important research question.

2. The cognitive interview focuses on the cognitive processes that respondents use to answer survey questions. “Why did you answer that you trusted the airport very much?” “Did you have any experiences with the airport that produced this trust?” Do respondents make their judgments of the airport officials largely because of their experiences with the airport, or are the judgments spontaneous and more a result of personal predilections to trust or to not trust, to empathize or not? If the judgments are not of the spontaneous type, but based on experiences (positive or negative) with the airport, then policy decisions might include greater emphasis on developing effective methods for interacting with the surrounding communities, keeping them informed and fundamentally, building trusting relationships.

6 REFERENCES

1. Schultz, T.J. (1978). “Synthesis of social surveys on noise annoyance,” J.Acoust.Soc.Am, vol. 64, No. 2, pp. 377-405, Figure 3
2. Federal Interagency Committee on Noise, “Federal Agency Review of Selected Airport Noise Analysis Issues,” August 1992, Figure 3.1
3. Fidell, S., et al, “A first-principles model for estimating the prevalence of annoyance with aircraft noise exposure,” J.Acoust.Soc.Am, vol. 130, (2), pp. 791-806, Figure 1
4. The project description and full final report, including survey instruments may be accessed at: <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3037>
5. Miedema, H. M. E. and Vos, H. 1999. Demographic and Attitudinal Factors That Modify Annoyance From Transportation Noise. J.Acoust.Soc.Am., vol. 105, 6, pp. 3336–3344
6. Miedema, H. M. E. and Vos, H. 2003. Noise Sensitivity and Reactions to Noise and Other Environmental Conditions. J.Acoust.Soc.Am., vol. 113, 3, pp. 1492–1504
7. A paper delivered at ICBEN 2014 describing the ACRP study and its relationship to the national survey may be found at http://www.hmmh.com/cmsdocuments/NicholasMiller_ICBEN2014.pdf or, the full ICBEN conference proceedings are available at <http://www.icben.org/Proceedings.html>.