NOISE ANNOYANCE: A REVIEW OF RESEARCH CONDUCTED AT HEALTH CANADA'S ACOUSTIC DIVISION

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1. Background

The objectives of Health Canada's Acoustics Division include assisting in the reduction of noise-induced hearing loss and non-auditory health effects of noise. In order to meet these objectives, the Acoustics Division is involved in several research activities that include, but are not limited to, generating information on the health effects of noise that can be used by both the public and regulatory authorities for risk management. Recent research activities have included Canada-wide surveys on noise-induced annoyance and disturbance of daily activities. This paper provides a summary of the research done to date by the Acoustics Division on noise and annoyance.

2. Long-term High Annoyance as a Health Effect of Noise

Canadian federal, provincial and territorial governments have adopted the definitions of 'health', as put forth by the World Health Organization (WHO).[1]

These definitions are: ***'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'*** and, ***'the extent to which an individual or a group is able, on the one hand, to realise aspirations and to satisfy needs, and on the other, to change or cope with the environment'.***

Health Canada's regard for 'high annoyance' towards community noise as a measure of health impact, is not only consistent with these definitions of 'health', but also recognises that there is a reasonable causal relationship that exists between the percentage highly annoyed* by noise (%HAn) among an average community and long term, average sound levels. Not only is high annoyance indicative of an inability to cope with intruding noise, but there is some support that long-term high annoyance may be associated with the expression of other diagnosed or perceived health impacts.[3,4,5]

A recent WHO study on housing and health status, described the Large Analysis and Review of European Housing and Health Status (LARES), and showed that being highly annoyed towards traffic and general neighbourhood noise (i.e., neighbouring apartments, staircase and noise within the apartment) increased the relative risk for the prevalence of a variety of illnesses, as diagnosed by a physician.[3] As discussed below, the latest national survey commissioned by Health Canada also showed that self-reported high annoyance towards road traffic noise was more likely to be perceived as having a greater negative impact on one's health, compared to lower magnitudes of annoyance.[5]

**The term 'highly annoyed' was operationalised in the research done by Schultz[2] as reflecting the response to a social survey question on noise annoyance, with a response in the top 27% to 29% on an anchored numerical scale or, in the top two categories, on an adjectival, five point verbal scale.*

Interestingly, in that study there was no relationship between high annoyance and self-reported health status. One possible interpretation of this observation is that high annoyance may be expressed before other health effects are manifested.

The notion that high annoyance may be associated with other illnesses has been recently discussed in more detail in a review paper by Michaud et al.[6] This review explored whether a change in percentage highly annoyed with project noise could be used as a health effect for environmental assessment purposes. In particular, consideration was given to this endpoint as a basis for noise mitigation (reduction) recommendations.

The International Organization for Standardization (ISO) technical specification (ISO/TS 15666) includes two standardised questions for assessing noise annoyance in socio-acoustic research.[7,8] This facilitates comparisons between studies and circumvents ambiguity (uncertain conclusions) that might exist in deciphering variations in annoyance questions. The two ISO questions have been among those used in the national surveys commissioned by Health Canada as a way of understanding how Canadians view community noise.

3. National Surveys on Noise Annoyance in Canada

In the Spring of 2002, the acoustics division commissioned the first national survey specifically designed to develop a 'baseline' understanding of how annoyed Canadians were by environmental noise, in general,

and to identify the sources that were declared to be the most annoying.[9] This randomised telephone survey was conducted on a representative sample of 2,565 Canadians, 15 years of age and older. The results indicated that 8% of Canadians (~ 1.8 million) reported being highly annoyed by environmental noise in general and that road traffic noise was the source identified as being the most annoying. However, depending on how the data were grouped, neighbourhood noise could also be considered as one of the most annoying (combination of) noise sources. In order to better characterise the degree of annoyance towards road traffic noise, the acoustics division commissioned a second survey in the fall (autumn) of 2002 using the two ISO/TS 15666 recommended questions. This survey followed the same methodology as the previous survey. It was revealed that 6.7% of Canadians declared to be very (or extremely), i.e., highly annoyed by traffic noise when they were asked to respond on a five-point adjectival scale. This increased to 9.1% when highly annoyed was defined as responses on a numerical value of 7 and above on the 11-point numerical scale, where 0 was defined as 'not at all annoyed' and 10 was defined as 'extremely annoyed'. The national margin of error associated with the results of the study was plus or minus 1.9 percentage points, 19 times out of 20. The publication by Michaud et al[9] also includes a discussion of these results. Three years later, a third national survey was commissioned using the same methodology as the first two surveys.

The third national survey took place in autumn of 2005 and included questions designed to verify the road traffic noise annoyance results of the previous survey, assess interference with daily activities due to noise, subject concerns about noise and self-reported distance to a major road. The primary results showed that:

1. The %HAn towards road traffic noise was unchanged from three years earlier (i.e., 6.7%).

2. There was a significant relationship between self-reported distance to a heavily travelled major road** and the magnitude of annoyance and disturbance of a variety of daily activities attributed to road traffic noise.

3. The magnitude of annoyance was statistically related to the degree to which noise interfered with daily activities, including sleep disturbance.

4. As mentioned above, those who were highly annoyed by road traffic noise perceived their high annoyance to have a greater negative impact on their health compared to those who self-reported lower magnitudes of annoyance.

Other variables that had an influence on road traffic noise annoyance were sex, age, education level, community size and province. These results are discussed in more detail by Michaud et al.[5]

4. Concluding Remarks

Environmental noise is ubiquitous and the most common community response to it is annoyance. Health Canada specifically considers long-term high annoyance from noise to be a health effect. In support of this position, the Acoustics Division has recently published a review paper that provides a rationale for using a change in the %HAn[6] as one of the ways to assess noise impacts in environmental assessments. A recent complementary paper discusses how this approach can be used as a basis for deriving noise criteria for wind turbine projects.[10]

The nation-wide surveillance research conducted to date in Canada indicates that nearly two million Canadians are highly annoyed by environmental noise, most of them, by far, due to road traffic noise. There is also evidence from this research that shows Canadians perceive their annoyance towards road traffic noise to have a negative impact on their health. This provides further justification to developing noise mitigation strategies aimed specifically at reducing the increase in %HAn among Canadian populations exposed to noise.

***** A heavily travelled major road was defined as one with 4 or more lanes or one with a posted speed limit of 80 km/hour or greater. Self-reported distances were 30 metres or less, between 30 metres and 500 metres and greater than 500 metres.***

References

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