

inter.noise 2000

*The 29th International Congress and Exhibition on Noise Control Engineering
27-30 August 2000, Nice, FRANCE*

I-INCE Classification: 0.0

TRAFFIC NOISE AND ANNOYANCE

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Keywords:

TRAFFIC NOISE, HEALTH EFFECTS, ANNOYANCE, SLEEP DISTURBANCE

ABSTRACT

To study the degree of annoyance related to traffic noise in residential settings a questionnaire regarding environmental related health effects was distributed to a random sample of 1000 individuals, 19-80 years old, in a municipality with busy traffic outside Stockholm. The response rate was 77%. The individual noise dose was estimated by a well-evaluated Nordic prediction model. With noise levels >50 dBA frequent annoyance was reported by 13%, and sometimes occurring difficulties falling asleep and awakening by 25%. Corresponding risk differences when comparing individuals exposed to traffic noise >50 dBA with those beneath were 13.3% (95%CI 7.9-15.3) and 12.5% (95%CI 5.7-19.4). A positive exposure- response relation was indicated for both annoyance and sleep disturbances.

1 - INTRODUCTION

It is well known that traffic noise can cause annoyance and sleep disturbance [1,2]. In a Swedish pilot study based on a postal questionnaire, including 631 persons from a municipality with a lot of through traffic, 15% reported frequent annoyance from road traffic among those living less than 100 meters from main roads compared to 4% at longer distances [3]. However the frequency of noise complaints in relation to different exposure levels has to be studied further. Our objective was to analyse the degree of general annoyance and sleep disturbance among the participators in the pilot study with estimation of individual exposure levels using geographic information system technique. Potential co-variables were taken into account and the individuals were separated into different exposure categories.

2 - STUDY POPULATION AND METHODS

2.1 - Study population

A questionnaire used in a countywide study of health effects due to various environmental factors was in April 1997 distributed to 1000 persons between 19-80 years living in a municipality north of Stockholm. One sample was drawn from buffert zones which were constructed using geographic information system and included 100 meters on each side of main roads and highways (n=365). Another sample was drawn from the remaining part of the municipality (n=635). People living within 100 meters on each side of the main railway were excluded from the analyses (n=135). The sampling was performed by Statistics Sweden by combining information for the study population, with the Real Estate Register, containing geographical co-ordinates for the individuals residences. To estimate the individual noise dose a well-evaluated Nordic prediction model for traffic noise was used [4]. The individuals were divided into 4 exposure categories with road traffic noise levels LAeq; 40-45 dBA, 45-50 dBA, 50-55 dBA and >55 dBA respectively.

2.2 - Questionnaire

The formula included 87 questions in all, mainly focusing on prevalence of allergic diseases. Data were also collected on general annoyance from traffic noise and air pollution, and noise-induced sleep disturbances. General annoyance and sleep disturbance (difficulty falling asleep and/or waking up due to noise) were defined as frequent when occurring at least once a week. In addition to general background factors (sex, age, ethnic background) the questionnaire provided information on education level, employment status and some living conditions.

Risk differences and 95% confidence intervals (95% CIs) were calculated using Stata 6.0.

2.3 - Results

Totally 759 persons answered the questionnaire but after exclusion of those living near the railway finally 667 persons were included in the study giving a response rate of 77%. A dichotomous comparison of individuals with traffic noise levels exceeding 50 dBA with those beneath yielded a risk difference for frequent annoyance of 13.3% (95%CI 7.9-15.3). Adjustment for age, gender, smoking, education level, duration and type of residence, satisfaction and the location of the sleeping room only brought about minor changes.

When analysing the four exposure categories a positive exposure response relation was indicated, for reported annoyance (sometimes or frequently) with a risk difference of 5.1%, 26.3% and 49.0% respectively compared to the reference group (40-45 dBA) (table 1).

dBA	n	Annoyance		Risk difference %	95%CI
		n	%		
40-45	169	17	10.1		
45-50	66	10	15.2	5.1	-4.7-14.9
50-55	341	124	36.4	26.3	19.5-33.1
>55	66	39	59.1	49.0	36.3-61.7

Table 1: Prevalence of annoyance (sometimes or frequently) with risk differences.

Frequently occurring sleep disturbances were reported only in 4.3% among those with exposure levels over 50 dBA and in 1.3 % among those with lower exposure levels. A dichotomous comparison regarding individuals with traffic noise levels exceeding 50 dBA with those beneath yielded a risk difference for sometimes or frequently occurring difficulty falling asleep or awakening of 12.5% (95%CI 5.7-19.4). There was also a positive exposure response relation indicated regarding the four exposure levels (table 2).

dBA	n	Sleep disturbance		Risk difference %	95%CI
		n	%		
40-45	111	13	11.7		
45-50	47	6	12.8	1.1	-10.2-12.3
50-55	295	64	21.7	10.0	2.4-17.6
>55	51	21	41.2	29.5	14.7-44.2

Table 2: Prevalence of sleep disturbance (sometimes or frequently) with risk differences.

3 - DISCUSSION

There was an increased risk for reporting annoyance associated with traffic noise already at exposure levels of at least 50 dBA, which is below the national guideline value for road traffic noise proposed by the Swedish government [5]. There was an obvious trend with increasing frequency of annoyance with higher exposure levels. Few people reported frequent sleep disturbances but several were occasionally disturbed. Laboratory studies have indicated that self-reported noise related sleep disturbance could give an underestimation of the physiological effect [2]. Thus even if many people only experience sleep disturbances occasionally it may indicate more serious influence on sleep quality. There was also an increased risk for some sleep disturbance at exposure levels of at least 50 dBA and there were indications for an exposure-response relationship which is in line with a causative relation.

Traffic noise is an important public health problem and the results from this study with indication of complaints already at lower noise levels and an obvious exposure response relationship may hopefully be useful, when deciding on future noise abatement.

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