



Source-specific traffic noise exposure and cardiovascular mortality in Switzerland

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Summary

It is unclear which noise exposure patterns and exposure windows are most detrimental for health. Within the framework of SiRENE, for "Short and Long Term Effects of Traffic Noise Exposure", we aim to investigate the association between source-specific noise exposure and cardiovascular mortality in the Swiss population. Exposure for year 2011, estimated at façade points for all buildings in Switzerland, is linked by dwelling unit and floor to participants in the Swiss National Cohort (SNC). We use Cox proportional hazards models to investigate the association between mortality from cardiovascular endpoints and noise exposure from the year 2000 to the end of follow-up in 2008.

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1. Introduction

Despite growing evidence of the non-auditory effects of environmental noise exposure on public health, including effects on the cardiovascular system [1-3], less is known about how acute and short-term noise effects translate into long-term health consequences. In particular, it is unclear which acoustical characteristics of noise from different transportation sources are most detrimental for human health and wellbeing. Specifically, it is unclear which exposure patterns (degree of intermittence of noise events, diurnal distributions) and exposure windows (day, night, early morning, etc.) are most relevant.

Within the framework of SiRENE, Short and Long Term Effects of Traffic Noise Exposure, one aim is to investigate the association between source-specific noise exposure and cardiovascular mortality in the Swiss population.

2. Methods

SiRENE implements a comprehensive, nationwide assessment of noise exposure from road, rail and aircraft transportation, designed to identify the most health relevant noise exposure patterns. It includes a novel acoustical parameter to quantify traffic noise intermittence – ‘Intermittency Ratio (IR)’ which is a measure of event-based sound intensity. Exposure for year 2011, estimated at façade points for all buildings in Switzerland [4], has been linked by dwelling unit and floor to participants in the Swiss National Cohort (SNC).

The SNC is a population-based cohort, based on a probabilistic linkage between the censuses and mortality records [5]. Participation in the censuses (years 1990, 2000 and 2010) was mandatory and enumeration is near complete. The database is continuously updated with mortality and migration data, and the fully linked SNC includes an individual record for each person in Switzerland, a household record, and a building record with exact geocodes for the home address. The SNC also includes exposure-relevant information including type of the housing (e.g. detached house, apartment), what floor the persons live on in

multi-story buildings, and age of the building or date of the last renovation.

Following linkage with exposure information, we use Cox proportional hazards models with age as the underlying timescale to investigate the association between mortality from cardiovascular endpoints and noise exposure (day and night Leq and event ratio) from the year 2000 to the end of follow-up (2008).

3. Results

Using available geocodes in the SNC to facilitate the exposure assessment, we assigned 7.9 million inhabitants, representing the entire Swiss population, to distinct façade points on dwelling units within buildings. Figure 1 shows the population exposure distribution based on the highest Leq value for a dwelling [4].

The population at risk at baseline in year 2000 included ~5.1 million adults aged 30 years and older. During the study period 2000-2008, there were ~140,000 cardiovascular deaths in adults: 18% by acute myocardial infarction (ICD10: I21); 44% by other ischemic heart diseases (ICD10: I20, I22-I24); 24% by stroke (I60-I64); and 14% by hypertensive diseases (I10-I15).

4. Conclusions

Preliminary results for the association between road, rail and aircraft noise exposure and these cardiovascular endpoints will be reported, including insights into potential source-specific exposure-response functions.

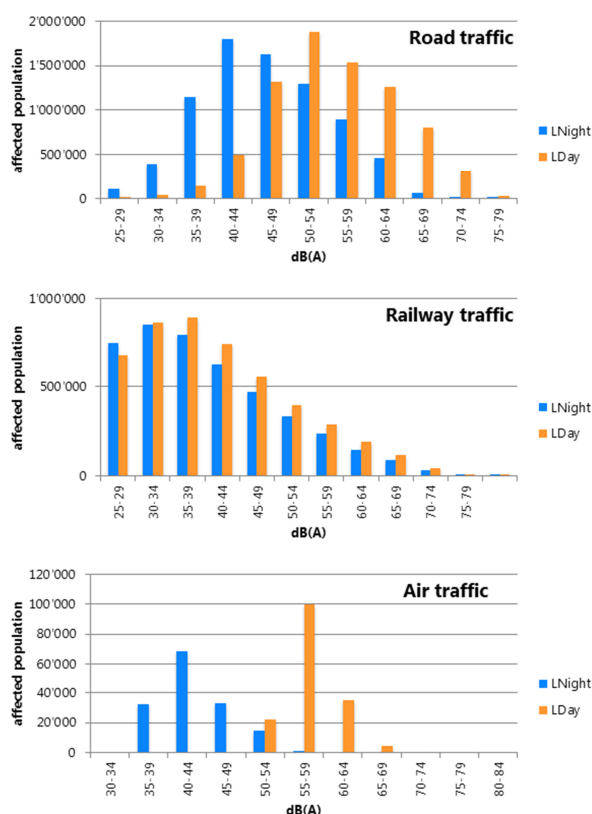


Figure 1. Distribution of the Swiss population exposure in 2011 to road, railway and air traffic noise, LNight and LDay [see reference 4].

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