

Environmental noise and children's sleep and health – using the MoBa cohort

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Summary

Traffic noise is adversely affecting an increasing number of people. Traffic noise is associated with several negative health outcomes and social differences. To date, however, little is known about how children's sleep and health is affected by nocturnal road traffic noise. The present study is an ongoing project that investigates the relationship between nocturnal road traffic noise and children's sleep, cognition and BMI by using questionnaire data on sleep duration and height and weight from The Norwegian Mother and Child Cohort Study (MoBa) and cognition data from HELIX. Noise exposure is estimated outside children's dwellings using a GIS framework.

1. Introduction

Traffic noise is an increasing health problem [1], and is associated with sleep problems [2], annoyance, impaired cognitive performance, and elevated stress reactions in children [3]. More than 25% of all children in Norway, and more than 35% of all children in Oslo are exposed to higher traffic noise levels than the WHO recommended limit (Lden 55 dB), and the number of children exposed to noise above this level is increasing [4]. In addition, noise exposure is found to be inversely related to socioeconomic status (SES) variables such as family income [5]. Low SES is associated with less optimal outcomes in health, cognition and socioemotional aspects in children [6]. Given that nocturnal noise is also associated with several negative health effects, differences in noise exposure may increase the differences between high- and low-SES children.

Despite this, few studies have investigated the association between nocturnal road traffic noise on one side, and children's sleep, cognition and BMI on the other. The mediating role of sleep in the latter two associations has rarely been addressed, and is of interest since sleep is associated with cognitive functioning [7] and BMI [8] in children.

2. Hypothesis:

- (1) Nocturnal road traffic noise outside children's dwellings is associated with reduced sleep duration.
- (2) Nocturnal road traffic noise outside children's dwellings is associated with impaired performance on cognitive tests of attention and working memory. This association is mediated by sleep.
- (3) Nocturnal road traffic noise outside children's dwellings is associated with increased body mass index (BMI). This association is mediated by sleep.

3. Method:

The study population is Oslo children up to 8 years of age included in The Norwegian Mother and Child Cohort Study (MoBa; [9]) (N≈8000). For the analyses of hypotheses (1) and (3), questionnaire data from MoBa will be used along with data from the Medical Birth Registry of Norway (i.e., birth weight, gestational age, age of parents, year of birth) and Statistics Norway (socio-economy, ethnicity). These data will also be used for analyses of hypothesis (2), and in addition, we will use data from a MoBa sub-population (n≈300) participating in the EU project HELIX (Human Early-Life Exposome; [10]). These data include

cognitive test results on attention and working memory and a sleep interview conducted with the children. Modelled data on road traffic noise exposure for the outside of each child's dwelling will be used in this study. The noise exposure is estimated using spatial models and input data on traffic in a GIS framework. Cooperating with SINTEF ICT, inside and outside bedroom noise exposure will be measured with iPods for about 20 children. The noise measurements are used for assessing uncertainty in the estimated noise exposures. These children will also have their sleep assessed with actigraphs.

The project is approved by the Regional Committee for Medical and Health Research Ethics in Norway.

4. Results:

We received our main dataset from MoBa in December, and have recently begun analyzing the data. We are still waiting for data on socioeconomic variables and ethnicity from Statistics Norway, modelled data on noise exposure from the City of Oslo, and cognitive test results from HELIX.

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