Assessing bidirectional relationships between noise annoyance and health: A cross-lagged panel analysis

Lion Cassens, Faculty of Technology, Policy and Management (TPM) - TU Delft

Abstract of an ongoing study

Noise pollution, often caused by transportation, causes severe health implications, including hearing loss, insomnia, and cardiovascular diseases. Many of these health effects are mediated through increased annoyance and stress levels. With an estimated 22 million cases of high and chronic noise annoyance in Europe, the relationship between noise annoyance and health becomes even more important. While it is often assumed that noise annoyance leads to health implications, some studies indicated that health implications may also increase our sensitivity to noise. Due to this increase in noise sensitivity, deteriorating health conditions may lead to increased self-reported noise annoyance. Yet, estimations of health effects from noise almost exclusively rely on cross-sectional data, which cannot account for this possible reverse causality.

This ***ongoing*** study assesses potential bidirectional relationships between noise annoyance and health outcomes using random intercept cross-lagged panel models (RI-CLPM) on LISS panel data. RI-CLPMs are structural equation models specifically designed to analyse panel data regarding the influence that multiple variables have on each other over time. This makes them well suited for an analysis of the bidirectional relationships between noise annoyance and health outcomes. The LISS panel consists of a representative sample of Dutch households and surveys, among others, the health of household members and their housing conditions, including self-reported noise annoyance from neighbours, aviation, and street traffic. By analysing this data, we clarify to what extent health implications affect noise annoyance over time and vice versa.

Our preliminary analysis of the last 4 waves of the LISS panel data (2018-2022) shows that the primary cause of noise annoyance for Dutch households is noise from the neighbours (22% of participants are confronted with this source of noise annoyance), followed by noise from traffic and other street noises (12%). 6% of participants are confronted with noise annoyance from aviation. The order of noise annoyance sources in the LISS panel differs from other studies which consistently find traffic to be the most common source of noise annoyance. Our analysis of the effects from noise on health over time (and vice versa) is not yet completed. First results indicate that changes in noise annoyance influence high blood pressure and sleeping problems in the following wave (e.g., noise annoyance in 1 result in high-blood pressure in year 2). The estimation of possible effects of high blood pressure and sleeping problems on reported annoyance levels is still inconclusive.

The binary nature of observed variables (yes/no questions) proofs difficult for a modelling of their interactions, which requires us to switch to different estimation method. We expect to complete this ongoing study before the TRAIL PhD Congress.