Universität Basel

Research Project

Novel methods for investigating acute and long term effects of transportation noise on health

Third-party funded project

Project title Novel methods for investigating acute and long term effects of transportation noise on health
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Noise from road, railways and aircraft traffic is one of the most widespread sources of environmental stress and discomfort in everyday life. However, previous research has been fragmented, in particular in children and adolescents. As a consequence little is known about the relevance of exposure duration, noise characteristics and the effects in adolescents. Aims: The overall aim is to obtain a thorough understanding on how transportation noise affects human health. In particular, the following research questions will be addressed:1.From triggering events to chronic exposure effects: Which time scale is most relevant for cardiovascular mortality? Are cardiovascular risks reversible after noise exposure reduction?2.Role of noise characteristics for cardiovascular mortality: How relevant is eventfulness of noise and duration of quiet phases between events? How crucial is noise exposure at different times during day and night (diurnal variation)?3.Effects of noise exposure on adolescents' cognitive performance, behaviour and quality of life: How relevant is noise exposure at home vs. school? What is the role of sleep on health effects?Methods: Research will be based on the existing Swiss National Cohort (SNC) and adolescent HERMES cohort study. Nationwide models to predict road, railway and aircraft traffic noise and NO2 exposure at each address in Switzerland for 2001 and 2011 will be individually linked to study participants. For HERMES participants, a longitudinal analysis will be conducted to evaluate the effects of noise exposure at school and home on changes in cognitive function, behaviour and health related quality of life within one year of follow-up. Full residential history available after 2010 for the SNC will be used to elucidate the effects of a sudden change of exposure on cardiovascular mortality. A case-crossover analysis on the triggering effects of aircraft noise on acute coronary events will be conducted taking advantage of the daily distribution and variation of noise exposure, which is heavily influenced by meteorological conditions around Zürich airport.Significance: Rigorous scientific methods will be applied to address numerous novel and highly innovative aspects in noise research: i) case-crossover design for acute aircraft noise effects, ii) evaluation of sudden exposure changes due to moving residence or changing flight schemes, iii) focus on noise characteristics in addition to levels, iv) rigorous evaluation of mutual effects of noise and air pollution, v) estimation of indoor noise levels, vi) comprehensive appraisal of effects in adolescents. A better understanding of noise health effects can have far reaching impacts beyond Switzerland and Europe for both science and policy. Future research will profit from the new exposure assessment and analytical methods addressing long and short term exposure windows. The research is highly relevant for prevention of various diseases and contributes to efficient regulation of different types of environmental noise sources beyond transportation noise. Research insights will become even more important in future with growing urbanisation and the on-going trend in the direction of a 24h society.

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