

Research on environmental exposure to noise and risk of cardiometabolic diseases (type 2 diabetes, hypertension, cardiovascular diseases) through devices connected to the E3N-E4N cohort in Île-de-France and Auvergne Rhône-Alpes (2000-2018) – France –

Elodie FAURE¹, Anne-Sophie EVRARD², Bruno Vincent³, Fanny Mietlicki⁴, Guy FAGHERAZZI¹, Gianluca SEVERI¹

- 1- Université Paris-Saclay, UVSQ, Univ. Paris-Sud, Inserm, Gustave Roussy, Équipe "Exposome et Hérité", CESP, 94805, Villejuif, France
- 2- Université de Lyon, Université Gustave Eiffel, IFSTTAR, Université Lyon 1, Umrestte, UMR T9405, Bron, France
- 3- Aoucité, Sound Environment Observatory of the Lyon Metropolis, Lyon, France
- 4- Bruitparif, Noise Observatory in Ile de France, Paris, France.

Extended Abstract

Noise has consequences for health and well-being. In 2018, the WHO Regional Office for Europe developed environmental noise guidelines to protect human health from exposure to noise from different environmental sources: transport (road, rail or air traffic), wind turbines and recreation. The health issues relating to noise pollution concern sleep disturbance, cardiovascular diseases and, more recently, diabetes. In France in 2014, 14 million people were affected by a chronic disease, including 3.5 million by diabetes (T2D) and nearly 12.2 million people are undergoing treatment for high blood pressure (HBP). The known risk factors and lifestyle alone does not completely explain the occurrence of these diseases. Consequently, there is a need to better understand the contribution of so-called "non-traditional" risk factors, which are increasingly suspected of playing a role, such as exposure to noise. Noise generates stress that can disrupt the cardio-metabolic functioning of individuals.

The overall objective of the study (funded in October 2020) is to investigate whether there is an association between exposure to transport noise and the risk of T2D, HBP, myocardial infarction (MI) and stroke. We propose to address two specific objectives and the BROUHAHA study will be divided into two parts.

The first component A (C^A) aims to estimate the association between exposure to transport noise and the risk of cardio-metabolic diseases (T2D, HBP, MI and stroke) in a sub-cohort of 35,000 women of the E3N cohort who resided in Ile de France (IdF) or Auvergne Rhône-Alpes (Aura) over the period 2000-2018.

- The first sub-objective of C^A is to describe the evolution of the noise exposure from different sources (2000-2018) and to investigate the relationship between noise exposure and T2D, HBP, MI and stroke over time.
- The second sub-objective is to study the role of factors related to the hormonal status of the participants in the relationship between noise exposure and risk of hypertension.

The second component B (C^B) is a pilot study whose objective is to observe the effects of short-term noise exposure on intermediate cardio-metabolic markers such as blood pressure or blood sugar among 120 participants of the E4N cohort residing in IdF or Aura. Intermediate cardio metabolic markers will be measured with an e-health device.

- The first sub-objective of C^B is to compare two noise measurement methods and to verify the acceptability of such a protocol of individual noise and physiological measurements by connected devices for one week.

- The second sub-objective of C^B aims to explore the mediation effect of sleep disturbances due to noise in the relationships between noise levels and T2D or BHP.

The BROUHAHA study will contribute to improve current knowledge on the associations between exposure to transport noise and the risk of chronic diseases such as T2D, HBP, stroke and MI, which have a major societal impact. This study will also contribute to a better understanding of the role of sleep disturbances that may mediate the associations between noise exposure and the risk of these diseases, and of the hormonal status of the participants that may explain the difference in risk of HPB between men and women related to noise exposure.

In addition, C^B will provide information on the estimation of noise exposure from acoustic measurements using different methods and on the variations of cardio metabolic parameters during the day as a function of environmental noise. If this pilot study is well accepted, it could be considered to extend it in order to finely characterize exposure to transport noise with the most appropriate noise measurement tool and to improve further the scientific knowledge. Finally, the results of the study may provide scientific data useful for decision-makers to support public policies aimed at reducing the population's exposure to noise.