PhD Position: Exposomic Risk of Non-Communicable Disease In Europe

(Within the EMIR and ENACT projects)

Background:

The exposome covers all environmental exposures across life — from air pollution, noise, temperature, green space, and light, to socioeconomic factors such as income, education, and social cohesion. Understanding the exposome is key to preventing non-communicable diseases (NCDs) such as cardiovascular and respiratory diseases, cancer, and diabetes, many of which are linked to where people live and work. This research forms the foundation for large-scale initiatives like EMIR and ENACT, which aim to transform our understanding of environmental health risks and translate findings into actionable prevention strategies.

EMIR (Exposomic Myocardial Infarction Risk, launched 2019) investigates the relationship between environmental and socioeconomic exposures and acute coronary syndrome (ACS) in Belgium. It combines national hospital admission data (2012–2021) with high-resolution environmental modelling at patient residences. A first paper from this work is expected in September 2025.

ENACT (Environmental Effect on Health Care and Wellbeing and Active Interventions, EU4Health, 2025–2029) expands this approach to ~30 acute and chronic NCDs across Europe, involving 21 partners from 10 countries.

- Retrospective phase: Use health and environmental data from five pilot countries to develop and validate an EU-wide environmental NCD risk score using statistical and ML methods.
- Prospective phase: Use wearable environmental and physiological sensors to track exposures and health parameters in healthy volunteers, translating the population-level risk score into individualized preclinical disease prediction.

VUB-UZ Brussel leads clinical and methodological development for environmental risk modelling and validation, while VUB-ETRO develops ML models and sensors.

Role of the PhD Candidate

The successful candidate will play a central role in advancing the EMIR and ENACT projects by integrating epidemiological, environmental, and clinical data to quantify and model exposomic risks for NCDs. This will involve:

- Spatial analysis: Mapping and modelling environmental exposures at fine spatial resolution using GIS tools, geographically weighted regression, and spatial clustering techniques to identify high-risk areas.
- Temporal analysis: Applying time-series methods, and case-crossover designs to examine short- and long-term effects of environmental factors (e.g., heat waves, cold spells) on acute coronary events and other NCDs.
- Statistical modelling: Conducting advanced inferential analyses in R, leveraging packages for epidemiology (e.g., survival, Epi, mgcv), spatial statistics (sp, sf, gstat), and causal inference (dagitty, MatchIt).

- Prospective study coordination: Managing recruitment, data collection, and clinical assessments for healthy volunteers, integrating wearable sensor data with environmental datasets.
- Translation of findings: Converting population-level risk scores into individualized predictions to inform public health interventions and clinical decision-making.

This role offers a unique opportunity to work at the intersection of spatial epidemiology, environmental health, and AI-driven clinical research, using state-of-the-art datasets and analytical tools.

Requirements

- Master's degree in biomedical sciences, medicine, or related field, with technical interest.
- Team-oriented, independent, and structured work ethic.
- Experience or willingness to learn R and Python for statistical analysis.
- Proficiency in English; working knowledge of Dutch and French for participant interaction.

Offer

- Four-year PhD position (possible extension) at VUB with annual contracts subject to yearly evaluation, starting immediately.
- Dynamic, interdisciplinary team at UZ Brussel with travel to partners sites.
- PhD Fellowship with benefits (insurance, public transport).
- Access to advanced training in Belgium and abroad.

About UZ Brussel & Partners

UZ Brussel is a leading university hospital recognized nationally and internationally. The Environmental Cardiology unit, led by Prof. Jean-François Argacha, collaborates closely with VUB-ETRO, a core imec member specializing in microelectronics, signal processing, and AI for health.

Application deadline: 30 September 2025

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More info: https://enact-he.eu/consortium/

Video: https://www.youtube.com/watch?v=cu6DFf3oahA