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

(Within the EMIR and BEE projects)

Background:

The *exposome* encompasses the totality of environmental exposures experienced 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 critical for addressing the rising burden of non-communicable diseases (NCDs) such as cardiovascular and respiratory disease, cancer, and diabetes, many of which are linked to where people live, work, and age. By integrating environmental, socioeconomic, and clinical outcome data, exposome research provides a holistic framework for identifying preventable risk factors and guiding targeted public health interventions. This scientific approach underpins both the **EMIR** and **BEE** projects, which aim to transform our understanding of environmental health risks and deliver actionable prevention strategies.

EMIR (*Exposomic Myocardial Infarction Risk*, launched 2019) investigates links 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.

BEE (*Brussels Environmental Exposome Project*, Innoviris Research Platforms 2025–2029) builds on EMIR to study multiple NCDs across the Brussels Capital Region. It is a collaboration between VUB (including UZB and VUB ETRO), Université Libre de Bruxelles (ULB), and Sciensano. A central innovation is the **BEE server** — a secure, pseudonymized infrastructure enabling geocoding and linkage of environmental and socioeconomic exposures to health data while ensuring GDPR compliance and patient confidentiality.

Role of the PhD Candidate

The successful candidate will be a key contributor to the EMIR and BEE projects, working at the interface of environmental epidemiology, digital infrastructure, and advanced analytics. The role will involve:

- Spatial and temporal analysis: Applying geospatial methods (GIS mapping, geographically weighted regression, spatial clustering) and temporal approaches (time-series analysis, distributed lag models, case-crossover designs) to study environmental exposures, especially heat waves and cold spells, in relation to ACS and other NCDs.
- Data infrastructure development: Collaborating with technical partners to design, implement, and test the BEE server, a GDPR-compliant, pseudonymized platform for secure geocoding and linkage of environmental and health datasets.
- Statistical modelling in R: Using advanced statistical packages for environmental epidemiology (Epi, survival, sf, gstat, mgcv) and causal inference (dagitty, MatchIt), as well as contributing to reproducible, scalable data pipelines.
- Machine learning integration: Exploring ML approaches to enhance prediction and complement traditional epidemiological models.

- Interdisciplinary coordination: Liaising between clinical and technical teams to ensure data quality, interoperability, and alignment with public health priorities.
- Knowledge dissemination: Publishing high-impact research, presenting at international conferences, and contributing to public-facing deliverables.

This position offers a unique opportunity to gain expertise in privacy-preserving data infrastructures, spatial epidemiology, and AI-enhanced public health research, while working in close collaboration with top academic, clinical, and technical partners.

Requirements

- Master's degree in Biomedical Sciences, Epidemiology, Bioinformatics, Data Science, Engineering, or related field, with a clinical interest.
- Experience or strong interest in R and/or Python for data analysis, including time-series analysis, case-crossover designs, geographically weighted regression, and causal diagrams.
- Understanding of, or willingness to learn, GDPR-compliant data infrastructure, data security, and privacy-preserving record linkage.
- Ability to work both independently and as part of a multidisciplinary team.
- Strong communication skills in English; knowledge of Dutch and/or French is an advantage.
- Motivation to develop expertise in environmental epidemiology, spatial analytics, and digital health infrastructure.

Offer

- Four-year PhD position (possible extension) with annual contracts subject to yearly evaluation, starting immediately.
- Dynamic, interdisciplinary team at UZ Brussel (Laarbeeklaan 101, 1090 Jette) with visits to partner institutions.
- Competitive salary with benefits (holiday pay, insurance, public transport).
- Access to advanced training in Belgium and abroad.
- Opportunity to work in an international research network with high-impact publication potential..

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: 15 November 2025

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