longITools

HEALTH AND ENVIRONMENT DYNAMICS

Opportunities

Whilst this novel system is initially being developed to help **exposome** researchers to study how environmental exposures across the life-course contribute to the risk of developing cardiovascular disease, it could ultimately be developed for use by healthcare professionals, employers, or individuals.

The system is designed to be modular and enable the integration of additional exposures, sensors and AI models. Individual components of the system could also be developed for alternative applications, for example the hub and satellite sensors could be used to monitor and optimise the food transport chain.

> The human **exposome** refers to the total environmental exposures throughout life

The **LongITools Health Risk Assessment System** is being tested on 15 users for technical robustness, usability and acceptability; the health recommendations will not however be based on a real risk score. Once the proof-of-concept testing is completed, further work will be required to develop the system into a commercial product.

About LongITools

The LongITools project is studying how lifestyle and biological factors as well as exposure to air pollution, noise, and the built environment collectively contribute to the risk of developing cardiovascular and metabolic disease.

This holistic, or **exposome**, approach aims to define the disease pathways and the points at which to best intervene during the life-course to reduce the risks.

Find out more

Application
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MEMBER OF THE
European Human Exposome *NETWORK*

Novel tool to gather exposome data and assess risk for cardiovascular disease
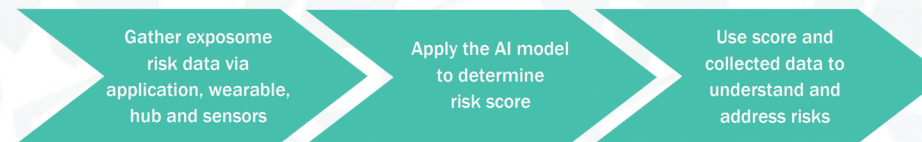
Time for a New Approach

Cardiovascular diseases are the leading cause of deaths in Europe, and metabolic diseases, such as type 2 diabetes and obesity, have reached epidemic proportions worldwide and continue to become more prevalent. Together, they affect the daily lives of millions of EU citizens and put significant strains on healthcare budgets and services. It is therefore essential that we gain a deeper understanding of what causes these diseases, in order to aid in developing policies and interventions to both prevent and reverse them.

The environment is estimated to account for almost **20%** of all deaths in the WHO European region[1]

1 in 3 school-aged children are living with pre-obesity or obesity in the European region[2]

400,000 premature deaths per year are due to air pollution[3]

61 million people in Europe have diabetes[4]

20% of Europe's population are exposed to long-term noise levels that are harmful to their health[5]

Cardiovascular disease accounts for **45%** of all deaths in Europe[6]

[1-6] See website for references

Health Risk Assessment System

LongITools researchers identified there was a need to develop an effective, practical tool to collect and integrate personal and environmental exposome data and are therefore designing and testing a proof-of-concept **LongITools Health Risk Assessment System**. This prototype is a personalised and precise monitoring system that integrates exposome-based data from users, environmental sensors and wearables to estimate an individual's risk of developing cardiovascular diseases.

Gather exposome risk data via application, wearable, hub and sensors → Apply the AI model to determine risk score → Use score and collected data to understand and address risks

The Health Risk Assessment System is comprised of three core components:

• A smartphone and a web application;
• An environmental hub and wearable sensors;
• An Artificial Intelligence (AI) prediction model.

SMARTPHONE AND WEB APPLICATION
An application (accessible via a smartphone or online) enables users to enter exposome data such as blood pressure and dietary intake. The application also integrates data from all devices and makes them available to the user in an easy to understand way. All data is stored in a secured database.

ENVIROMENTAL HUB AND WEARABLE SENSORS
The hub and Bluetooth® Low Energy connected satellite sensors gather exposure data and securely interface with the online database. Sensors are able to collect data for more than 20 different types of indoor and outdoor exposures. Users are able to easily install and manage the hub and sensors, which hold CE certification. An existing commercial wearable can also be connected to the application, enabling the collection of further exposome data (e.g., sleep, heart rate).

ARTIFICIAL INTELLIGENCE (AI) PREDICTION MODEL
An AI based predictive model extracts and temporarily uses anonymous data from the online database to determine an individual cardiovascular disease risk score. Users can access their risk score via the application.