

Impacts of environment on human diseases: a web service for the human exposome

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The exposome is the totality of human environmental exposures from conception onwards. Identifying the contribution of the exposome to human diseases and health is a key issue in health research. Examples include the effect of air pollution exposure on cardiovascular diseases, the impact of disease vectors (mosquitos) and surface hydrology exposure on malaria, and the effect of fast food restaurant exposure on obesity. Essential to health research is to disentangle the effects of the exposome and genome on health. Ultimately this requires quantifying the totality of all human exposures, for each individual in the studied human population. This poses a massive challenge to geoscientists, as environmental data are required at a high spatial and temporal resolution, with a large spatial and temporal coverage representing the area inhabited by the population studied and the time span representing several decades. Then, these data need to be combined with space-time paths of individuals to calculate personal exposures for each individual in the population. The Global and Geo Health Data Centre is taking this challenge by providing a web service capable of enriching population data with exposome information. Our web service can generate environmental information either from archived national (up to 5 m spatial and 1 h temporal resolution) and global environmental information or generated on the fly using environmental models running as microservices. On top of these environmental data services runs an individual exposure service enabling health researchers to select different spatial and temporal aggregation methods and to upload space-time paths of individuals. These are then enriched with personal exposures and eventually returned to the user. We illustrate the service in an example of individual exposures to air pollutants calculated from hyper resolution air pollution data and various approaches to estimate space-time paths of individuals.