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THE ASSOCIATION BETWEEN AIR QUALITY AND RESPIRATORY AND CARDIOVASCULAR HEALTH USING A SUB-CITY SCALE APPROACH

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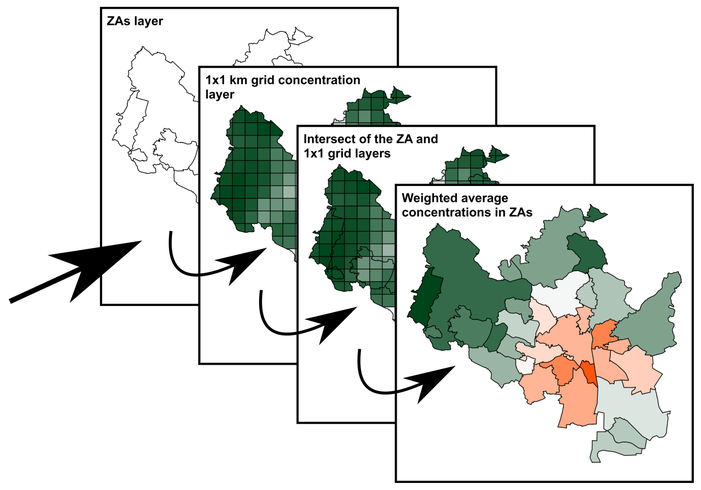
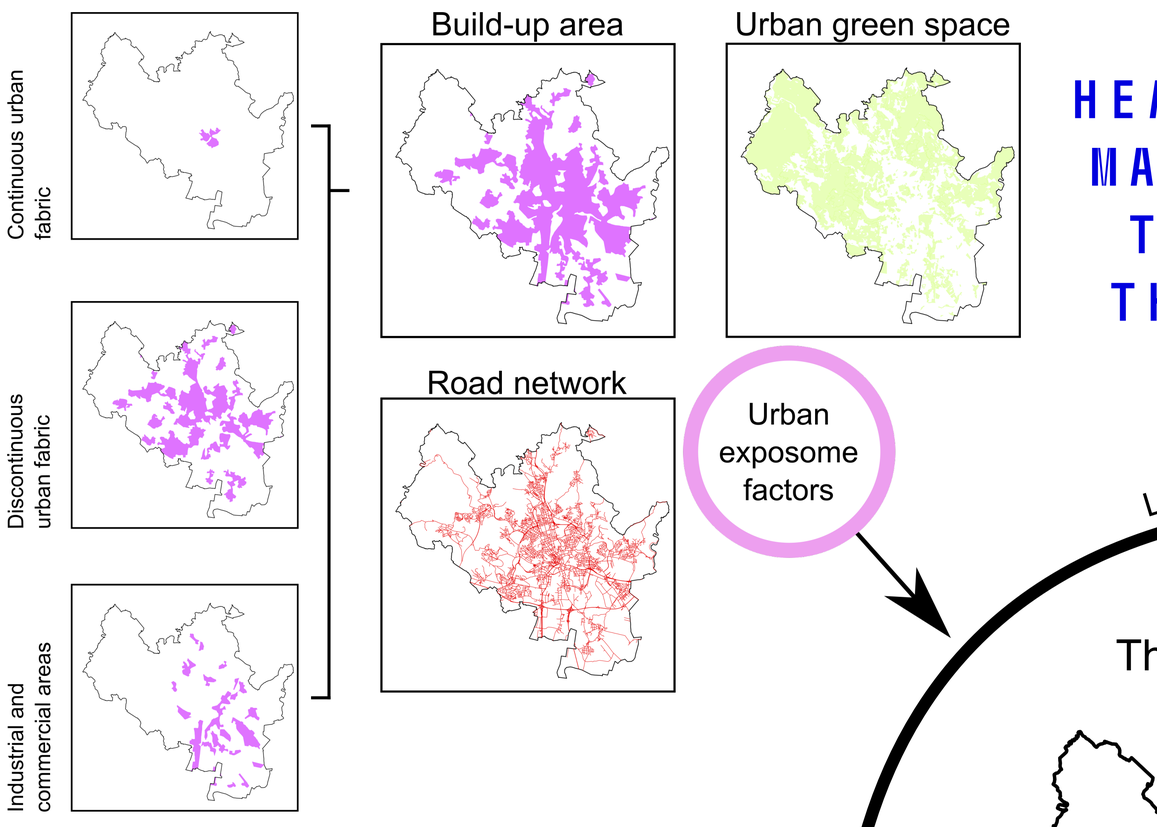
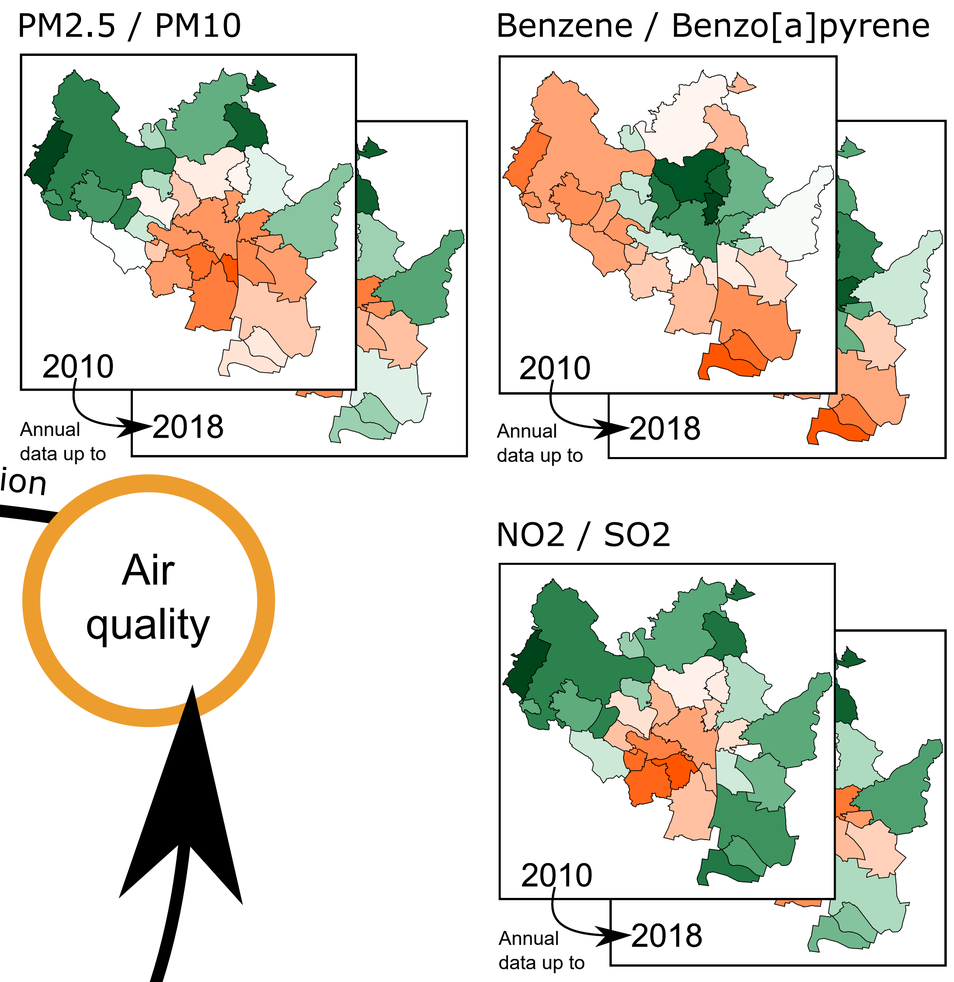
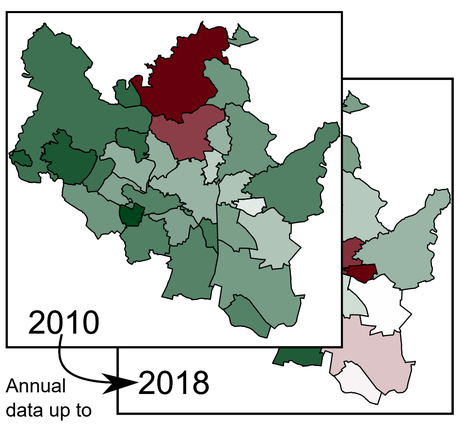
The impact of the urban environment on human health is a contemporary subject of environmental research. Air pollution is often considered a leading environmental driver. However, a plethora of other factors within the urban exposome may be involved.

In this ecological study, we utilized generalized linear models to find the associations between health conditions and air quality in the city of Brno. We were able to achieve a high spatial resolution of our data due to collaboration with The Institute of Health Information and Statistics of the Czech Republic. Air quality data were subsequently transformed to be applicable to the zip code areas and match health data spatial resolution. Thus, we divided the city of Brno into 29 areas (27 populated) for each of which we have had available health and air quality data. The study period spanned from 2010 to 2018 and each populated zip code area was taken into consideration. Indicators of green space, built-up area, and road network were also included in the analysis to better get the picture of the urban exposome.









As such it can serve as the starting point for continuous, long-term observation of these parameters with the future inclusion of other important data.

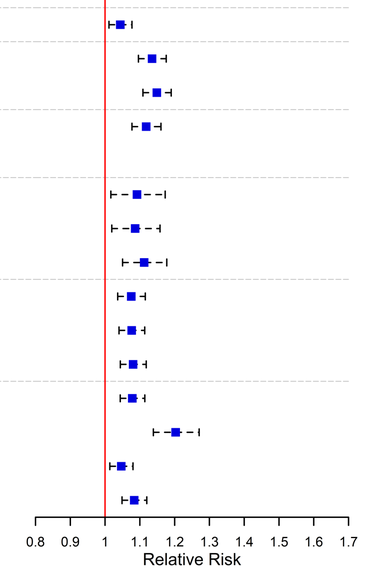
Forest plot - Generalized Linear Models

Univariate models

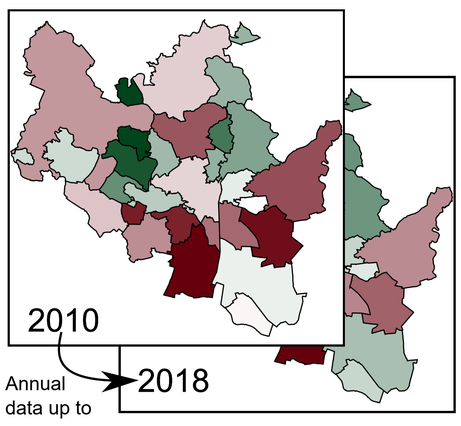
Health condition	Pollutant	RR	Signif.
Bronchitis (20+)	Benzene	1.433	****
Bronchitis (20+)	PM2.5	1.298	****
Bronchitis (20+)	SO2	1.145	*
Resp. hosp. (all ages)	Benzene	1.044	*
CVD hosp. (all ages)	Benzene	1.135	****
CVD hosp. (all ages)	NO2	1.149	****
CVD hosp. (65+)	NO2	1.118	****

Adjusted multivariate models

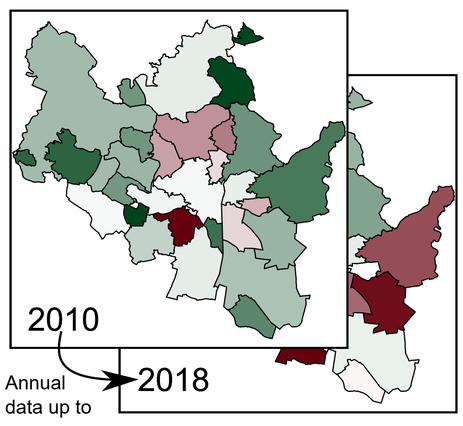
Asthma attack (0-19)	Benzene	1.092	*
Asthma attack (0-19)	Benzo[a]pyrene	1.087	*
Asthma attack (0-19)	PM2.5	1.112	**
CVD hosp. (all ages)	Benzo[a]pyrene	1.075	***
CVD hosp. (all ages)	PM2.5	1.077	***
CVD hosp. (all ages)	SO2	1.081	***
CVD hosp. (65+)	Benzo[a]pyrene	1.078	****
CVD hosp. (65+)	NO2	1.203	****
CVD hosp. (65+)	PM2.5	1.046	*
CVD hosp. (65+)	SO2	1.084	****



Respiratory diseases-related hospital admissions



Cardiovascular diseases-related hospital admissions



We found multiple significant associations between air quality parameters and respiratory and cardiovascular health conditions. The most pronounced associations were observed between bronchitis and benzene, and cardiovascular hospitalizations and NO2.

Our findings are highly statistically significant and are in line with current literature on the adverse effects of air pollution on the human population but also bring new information, especially regarding benzene exposure. Further research involving other variables is an essential step towards understanding the complex urban exposome and its implications for human health. An increase in data spatial resolution is especially important in this respect as well as for improving city health risk management. This is the pilot study on the health of the urban population and air pollution in the city of Brno.

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