Land Use Regression Model for Exposure Assessment to PM2.5 and PM10 in Rio de Janeiro, Brazil

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Background:
Air pollution is a major public health problem. The latest data from World Health Organization show that 9 out of 10 people breathe air containing high levels of pollutants and that about 4.2 million deaths were caused by exposure to fine particles in 2016. Therefore, the aim of our study was to elaborate a model for long-term exposure assessment to air pollution.

Methods:
This study was developed in Rio de Janeiro city, it has 1,200.255 km^2 large, about 6.7 million residents and located in the southeastern region of Brazil. The information of PM2.5, PM10 and predictor variables were obtained from government agencies. The potential predictor variables have been used: temperature, relative humidity, vehicular traffic base, Census, altitude databases, vegetation cover, land use, rock masses, hydrographic and hydrographic sub-basins, urban zoning and road network. For the development of Land Use Regression models, linear regression models were specified using the supervised stepwise procedure. Cook D statistics were used to detect influential observations. The overall model performance was evaluated by leave-one-out cross validation (LOOCV).

Results:
The annual mean of PM2.5 and PM10 was 11.73 (SD = ± 4.84) and 35.57 (SD = ± 8.91) μg·m−3, respectively. The R2 value in the final model for PM2.5 was 0.3812 and p-value: 0.0907. The

performance evaluated by LOOCV was not also good, the RMSE was 0.2920, with R2 value of 0.1820. The R2 value in the final model for PM10 was 0.73, p-value: 0.001. The performance evaluated by LOOCV was also good, the RMSE was 0.1386, with R2 value of 0.5832.

Conclusions:

The model could be applied in areas where there is no monitoring of air quality, thus, enabling the evaluation of the health impact of exposed populations, providing support for decision-making and development of public and investments policies, medium impact and long-term, more targeted in the following areas: health, environment, transportation and urban planning.

Key messages:

- Oswaldo Cruz Foundation.
- Universidade do Estado do Rio de Janeiro.