5.017 Development of National Land Use Regression Model and Estimation of PM2.5-related Premature Deaths in China.

Early Career Scientist

Presenting Author:
Jin Li, School of Environment, Tsinghua University, Beijing 100084, China., j-l15@mails.tsinghua.edu.cn

Co-Authors:
Huan Liu, State Key Joint Laboratory of Environment Simulation and Pollution Control, School of Environment, Tsinghua University, Beijing 100084, China.
Zhaofeng Lv, State Key Joint Laboratory of Environment Simulation and Pollution Control, School of Environment, Tsinghua University, Beijing 100084, China.
Chufan Wang, School of Environment, Tsinghua University, Beijing 100084, China.
Mengshuang Shi, State Key Joint Laboratory of Environment Simulation and Pollution Control, School of Environment, Tsinghua University, Beijing 100084, China.
Anqi Qin , School of Environment, Tsinghua University, Beijing 100084, China.

Abstract:

Accurate estimation of $PM_{2.5}$ related mortality is important but previous studies showed diverse results mainly caused by different selections of methods for $PM_{2.5}$ exposure assessment. National Land Use Regression (LUR) model can predict long-term air pollution exposure at finer spatial scale over large geographic area but it has not yet been reported in China. In this study, we utilized $PM_{2.5}$ data from Chinese national monitoring network and several classes of predictor factors to develop a national LUR model and generate Chinese $PM_{2.5}$ exposure mapping in 2013-2015 at the resolution of 1km×1km. Our model has relatively better performance with cross-validation R^2 0.70 than other national LUR for $PM_{2.5}$ due to extensive monitoring network and wide selection of predictor variables. Population-weight concentration in China declined from 72.52 μg/m^3 in 2013 to 57.18 μg/m^3 in 2015.
C-R function is also another important progress in healthy effect assessment. Most previous studies used IER function which could yeild sensible results in the risk analysis over the range of concentrations that prevail in China. In this study, we adopted a new SCHIF function developed from a national cohort of 189,793 Chinese men to estimate the PM2.5-related premature deaths in China. Results shows that almost 2.19 million (2013), 1.94 million (2013), 1.65 million (2014) premature deaths were attributable to PM2.5 long-term exposure and the propotion for specific desease is 53.2% for stroke, 20.5% for ischemic heart disease, 16.8% for chronic obstructive pulmonary disease and 9.5% for lung cancer. We also adopted IER function and the comparison indicates IER obviously underestimates the $PM_{2.5}$ related premature deaths, especially in high concentration interval. Our study take advantage of national LUR-based $PM_{2.5}$ exposure at fine

resolution and Chinese cohort-based C-R function to renew the health burden attributable to $PM_{2.5}$ in China.