LAND USE REGRESSION MODELS OF PM_{10} AND NO_2 CONCENTRATIONS IN TAIPEI

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Background and Aims: This study developed land use regression models to assess long-term exposure to ambient particulate matters of PM_{10} and NO_2, in order to minimize the exposure misclassification and achieve better individual exposure assessment for the Taiwan cohorts of the ESCAPE study.

Methods: We used a population density based sampling strategy to select 40 locations as our NO_2 measurement sampling sites in Taipei, while PM_{10} measurements were conducted at 20 sites among them, and one additional background site for annual average adjustment. PM_{10} and NO_2 concentrations were monitored simultaneously by using Harvard Impactors and Ogawa passive samplers respectively for 2-week period in three seasons during 2009 and 2010. With collected land-use datasets, containing land-cover and traffic related data, we conducted the GIS analyses to obtain a series of potential predictor variables in concentric circle buffers with several radii ranging from 25 to 5000m of each monitoring site. Based on stochastic modeling techniques, we combined the average concentrations and values of predictor variables in stepwise procedure to develop the final LUR models for PM_{10} and NO_2.

Results: The adjusted annual concentrations were 48.6±5.9 • g/m^3 for PM_{10} and 26.0±6.5 ppb for NO_2. There were 3 predictors for the final model of PM_{10} (adjusted R^2=0.78), including major road length within 25m, industry areas within 1000m, and high density residential areas within 100m. And there were 4 predictors for the NO_2 model (adjusted R^2=0.66), including low density residential areas within 500m, major road length within 25m, urban green areas within 300m, semi-natural and forested areas within 500m.

Conclusions: Our study indicates that exposure to PM_{10} and NO_2 for subjects in Taiwan cohorts of the ESCAPE study can be well estimated by LUR models with 3-4 predictors.