

Implementation and Validation of a Modeling Framework to Assess Personal Exposure to Black Carbon

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In order to estimate exposure to air pollution of individuals in a population more accurately, we developed a personal exposure modeling framework. Because people tend to move from one place to another during the day, their exposure will be determined by the concentration at each location combined with the exposure encountered in traffic. The modeling framework is built and validated for Black Carbon (BC) in Flanders (Belgium), but could be applied to other pollutants and study areas when providing the right input data. Exposure to BC in different 'fixed' microenvironments is assessed by using hourly land use regression models, combined with an indoor/outdoor factor for exposure in indoor environments. To estimate BC exposure in transport, we developed a separate model taking into account transport mode, timing of the trip and degree of urbanization (Dons et al., 2013). An activity-based traffic model was used to model the whereabouts of individual agents. The modeling framework is validated using weeklong time-activity diaries and BC exposure as revealed from a personal monitoring campaign with 62 participants (Dons et al., 2011, 2012). Because we wanted to validate the complete chain including the activity-based model, we did not simply use the revealed diaries for the validation. For each participant in the monitoring campaign, we made up a synthetic population of 100 model-agents with all agents having the same characteristics as each real-life agent (age, gender, work status, number of children in the household, number of cars in the household, subzone of the home address, etc.). When these model-agents pass through every stage of the modeling framework; this results in a distribution of potential exposures for each individual. Results of this validation will be presented. We want to use the modeling framework in the future to assess exposure of the Flemish population, or subgroups of the population, e.g. low socio-economic class vs. high socio-economic class, women vs. men.