

MEASURING PERSONAL EXPOSURE TO BLACK CARBON: THE IMPORTANCE OF BEING IN OR NEAR TRAFFIC

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Background and aims: To determine personal exposure, most epidemiological studies use proximity measures (e.g. distance of residence to a busy road) or concentrations measured by the nearest fixed AQ monitoring station; or develop land use regression models to determine the concentration at the home address. Unfortunately these exposure estimates provide only an indication of true personal exposure, since a large part of exposure during the day is not encountered outdoors at the place of residence. To improve on this, daily mobility and time-activity patterns should be taken into account, especially for air pollutants with a high temporal and spatial variability.

Methods: Real-time monitoring of personal exposure to black carbon, gives us an insight into the main drivers or activities responsible for human exposure to traffic related air pollution. The results presented here originate from two measurement campaigns monitoring weeklong personal exposure of participants using 12 portable μ -aethalometers and electronic diaries. There were 16 participants in summer 2010 and 46 participants in winter 2010-2011 resulting in over 12,000h of annotated BC measurements.

Results: In-vehicle concentrations were 5 times higher than the average concentration inside residences. Concentrations on trains, and during walking or cycling trips are lower, but still a factor of 2 higher than in the residence. Concentrations in buses were highest. For an average individual the transport microenvironment was one of the most important contributors to personal exposure: 6% of time is spent in transport but contributes over 20% of exposure. Proper transport mode or route choice, or changes to the activity pattern that reduce the total time in transport can lower exposure and will mitigate possible health effects.

Conclusions: Integrated personal exposure to black carbon is dominated by exposure in transport. Not taking into account daily mobility will thus significantly increase exposure misclassification in epidemiological studies.