

A Method for Source Apportionment of Health Risk from Ambient Particulate Matter (PM): Development and Validation

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The primary goal of air quality management is protecting public health. In this study, one health risk-based source apportionment method was proposed to identify source contributions to health risk from ambient particulate matter (PM). First, source apportionment of PM speciation data was conducted using Positive Matrix Factorization (PMF) model. Then the health risk from exposure to each source group was estimated as the sum of cancer and non-cancer risk of species in this source.

We have successfully applied the proposed method to apportion health risk from ambient PM₁₀ measured at seven air quality monitoring stations in Hong Kong between 2000 and 2011. Results show that vehicle exhaust was the dominant inhalation cancer risk (ICR) contributor (72%), whereas two dominant trace metals and vehicle exhaust sources contributed approximately 27% and 21% of PM₁₀ inhalation non-cancer risk (INCR), respectively. The results highlight the importance of health risk-based source apportionment in air quality management with protecting human health as the ultimate target.

The proposed method can be applied to apportion health risk associated with ambient PM speciation data measured at air quality monitoring stations in North Carolina and other regions in United States. The obtained results will provide insight for decision makers to formulate the risk reduction strategy more effectively.