THE EFFECTS OF PARTICULATE MATTER SOURCES ON DAILY MORTALITY IN BARCELONA, SPAIN

Bart Ostro, *Centre for Research in Environmental Epidemiology, Barcelona, Spain*
Aurelio Tobias, *Institute of Environmental Assessment and Water Research, Spanish Research Council (IDAEA-CSIC), Barcelona, Spain*
Xavier Querol, *IDAEA-CSIC*
Andrés Alastuey, *IDAEA-CSIC*
Fulvio Amato, *IDAEA-CSIC*
Jorge Pey, *IDAEA-CSIC*
Noemí Pérez, *IDAEA-CSIC*
Jordi Sunyer, *Centre for Research in Environmental Epidemiology, Barcelona, Spain*

Background and Aims: Dozens of studies link acute exposure to particulate matter (PM) air pollution to premature mortality but questions remain about which species and sources in the PM mixture are responsible. While a few studies exist on the effects of species and sources in U.S. cities, European cities, which have a higher proportion of diesel engines and denser urban populations, are not well characterized. Information on the effects of specific sources could aid in targeting pollution control and in articulating the biological mechanisms of PM. Our study examines the effects of various sources on daily mortality in Barcelona, a densely populated city in the northeast corner of Spain.
Methods: Source apportionment using positive matrix factorization was developed for both PM2.5 and PM10 (PM less than 2.5 and 10 microns in diameter, respectively) from 2003 to 2007 and eight different factors were identified. A ninth factor measuring overall traffic was also formed by adding several of the other factors. Case-crossover regression analysis was used to determine the independent effects of daily exposure to each factor on both all-cause and cardiovascular mortality. We also examined multi-source models.
Results: T he results indicate that several sources of PM2.5 including vehicle exhaust, fuel oil combustion, secondary nitrate/organics, minerals, secondary sulfate and road dust were associated with all-cause and cardiovascular mortality. In the multi-source model, traffic (the sum of vehicle exhaust, road dust and 70% of nitrate), minerals and sulfate were all associated with these outcomes.
Conclusions: These results suggest that mobile sources, re-entrained dust, fossil fuel combustion and urban dust (construction/demolition, unpaved areas etc.) are important contributors of the observed adverse health linked to PM. Also, in some cases. the risks for the respective interquartile range in the concentrations were higher for specific sources than for PM2.5 mass.