SEASONAL EFFECT OF $PM_{2.5}$ ON MORTALITY: A CASE-CROSSOVER ANALYSIS IN NINE FRENCH CITIES

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Background and aims: Short-term effects of airborne particulate matter on mortality have been consistently reported, especially for fine particles ($PM_{2.5}$), which are thought to contain the most harmful components. Recently, several studies in Europe and North America have suggested that the greatest effect of particles was observed during warm seasons. We examined the seasonal changes in the effects of $PM_{2.5}$ on mortality in nine French cities during the 2000-2006 period.
Methods: Data from urban air monitoring stations measuring $PM_{2.5}$ with TEOM were used to compute daily means of $PM_{2.5}$. For each city, we analysed by season the association between daily $PM_{2.5}$ and daily number of non-accidental deaths, using a time-stratified case-crossover design, adjusting on daily mean temperature at lags 0 and 1-7.
We also used a temperature-stratified case-crossover design to assess changes in the association by temperature quartiles. Analyses were carried out with and without adjustment on daily 8h-maximum levels of ozone. City specific results were combined using random effect models.
Results: Mean levels of $PM_{2.5}$ varied from 13.4 to 18.5 µg/m^3 across the cities. During the study period, a 10 µg/m^3 increase in $PM_{2.5}$ was associated with an estimated increase of 4% in the daily number of deaths [95% confidence interval: -0.3, 8.6] during summer, +0.5% [-0.7, 1.8] during fall, -1.4% [-2.6, -0.2] during winter and -0.4% [-1.8, 1.0] during spring. The association between $PM_{2.5}$ and mortality was also clearly stronger in the warmest days (Tmean>75th percentile of the temperature distribution). Adjustment on ozone did not modify substantially these results.
Conclusions: This study suggests that the effect of $PM_{2.5}$ on mortality increases during summer, especially on days with high temperatures. Seasonal differences in particulate matter composition and in individual's exposure could explain these variations.