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# Timescale dependent effects in the relationship between air-pollution and mortality

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We used wavelet analysis and generalized additive models (GAM) to study timescale effects in the relationship between mortality and air-pollution. Daily averages of measured NO2 concentrations in the city of Paris are used as surrogates of human exposure from 2000 to 2004. The NO2 time series was decomposed with wavelet analysis to six independent variables representing different durations of exposure. We used these variables as predictors in a mortality regression model and compared the coefficients estimated for the different timescales. We found a strong dependency of the exposure-response function on the duration of the air-pollution event. In contrast to previous studies that showed a monotone increase of the mortality rate from shorter to longer timescales our results suggest a non-linear relationship: for timescales shorter than 15 days risk estimates fall down to null as the air-pollution event becomes longer whereas for medium timescales (15-60 days) increased exposure is related to higher death rates. This non-linear response reflects a short-term depletion of the population group at high death risk for the short timescales followed by a refill of this pool at longer exposures.