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Detection and estimation trends linked to air quality and mortality on French Riviera over the 1990-2005 period to develop a prediction model of an aggregate risk index

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There is a profound relation between human health and well being from the one side and air pollution levels from the other. Air quality in South of France and more specifically in Nice, is known to be bad, especially in summer. The main objectives are to establish correlations between air pollution, exposure of people and reactivity of these people to this aggression, to validate a risk index built from air quality and pollen data in the area of Nice and to construct a prediction model of this sanitary index. The spatial extent of the experiment will be mainly the territory of "Alpes Maritimes". All the tasks are performed in collaboration with the "Heath-Environment Network" of the "Centre Hospitalier Universitaire" of Nice. The development of an adequate tool for observation (health index and/or indices per pathology) to understand impacts of pollution levels in an area is of utmost importance. These indexes should take into account the possible adverse effects associated with the coexistence of all the pollutants and environmental parameters. This tool must be able to inform the citizens about the levels of pollution in an adequate and understandable way but also to be used by relevant authorities to take a series of predetermined measures to protect the health of the population.

This paper describes the first step to construct a prediction model of this sanitary index with a confidence interval 99% (and 95%): detection and estimation trends observed in concentrations of pollutants, emissions and mortality over the 1990-2005 period in the "Alpes Maritimes" area. The non-parametric Mann-Kendall test has been developed for detecting and estimating monotonic trends in the time series and applied in our study at annual values of pollutants air concentrations. An important objective of many environmental monitoring programs is to detect changes or trends in pollution levels over time.

Over the period 1990-2005, concerning the emissions of the main pollutants, we obtained significant decreasing trends. Between 1994 and 2005, from the SO_2 concentrations, decreasing trends of 1.2 %.year^{-1} (urban stations) and of 5.4 %.year^{-1} (traffic stations) were calculated. Over the same period, we obtained a decreasing trend of 1.3 %.year^{-1} for the NO_2 concentrations (urban stations) and of 3.1 %.year^{-1} for the traffic stations. In addition, a decreasing trend of 0.5 %.year^{-1} was calculated for the suburban stations over the 1998-2005 period. Globally, the concentration of the major pollutants showed a clear downward trend and those main reductions have reflected the reduction policy of the emissions over twenty years. By considering the ozone mean values in urban areas over the 1997-2005 period, an increasing of 3.0 %.year^{-1} was obtained with annual averages and 3.9 %.year^{-1} with median values. Over the 1990-2005 period, we obtained significant decreasing trends concerning the "ischemic heart diseases" (- 1.20 %.year^{-1}) and "asthma" (- 4.03 %.year^{-1}) categories. No significant sex-related difference was identified for these groups. An annual change rate of + 0.31 %.year^{-1} for the "airway diseases" and of + 2.50%.year-1 for the "unknown causes" were identified. For these categories, we noted a sex-related difference. In fact, we obtained for males a decreasing trend contrary to females.