Improving knowledge and communication on the impacts of urban atmospheric pollution in Europe, the example of the Aphekom project

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Since the 1990s, new epidemiological studies have shown that urban atmospheric pollution has continued to have a significant sanitary impact despite the reduction in concentrations of pollutants. In Europe, public health institutions, air quality surveillance associations and universities have set up networks around this theme. Their objective is to provide decision-makers and citizens with reliable, comparable information about air quality in European cities, to share their scientific methods and good practices and in fine to promote protective value limits for health. The Apheis project has contributed to the debate on the new air quality directives in Europe and to the Grenelle environment forum plan for the reduction of particles (article 32).

Despite this scientific progress, the present reference values are considered too high by epidemiologists, particularly for particles. The Aphekom project was set up following the Apheis project in order to produce new knowledge of the impact of air pollution, but also to improve communication of the scientific results produced to the stakeholders in the hope that they would be better taken into account when drawing up European policies. The stakeholders include, among others, the political decision-makers, the administrators, scientists of other disciplines, NGOs and the population.

This project brings together six teams of scientists from 12 European countries with a strong inter-disciplinary dimension, in order to present recommendations for improvement to measurement of exposure, the health impact assessment (HIA) of pollution and the evaluation of the sanitary consequences of political measures implemented with the aim of reducing pollution.

Aphekom's first objective in the 25 cities taking part was to update and share simple tools to make short and long-term health impact assessment (HIA) of the impact of urban atmospheric pollution. Short-term effects appear a few days after exposure to pollution. The long-term effects can be defined as the participation of exposure in the development of chronic pathologies which can lead to death. The Aphekom HIA estimated the importance of the exposure to particles in suspension and to ozone in mortality and cardiac and respiratory hospital cases in each city, by comparing the sanitary situation observed with what it could have been if the level of fine particles and ozone had been in line with the guideline values recommended by the World Health Organisation (WHO). Using these HIAs, the impact of urban atmospheric pollution on a population can be quantified. It follows a standardized method linking health and environmental data, through the application of concentration-response correlations born of epidemiological studies. The results can be translated into economic terms by using an approach based on the cost of illness (hospitalisation and sick leave) for hospitalisations or statistical life value derived from European surveys and which represent what individuals are prepared to pay to avoid the risk of premature death, for mortality. The benefits expected from the different scenarios of evolution of atmospheric pollution can also be put into perspective. They make it possible to compare the efficacy of different strategies in bringing elements of information to the stakeholders in order to orient decisions which can have an influence on the air quality.

For the period 2004-2006, of the 25 European cities, i.e. 39 million inhabitants, only Stockholm respected the WHO's guideline value (10 µg/m^3 yearly mean) for fine particles ($PM_{2.5}$, particles of an aerodynamic diameter under 2.5 µm). If the mean annual levels of $PM_{2,5}$ were brought down to the limit of 10 µg/m^3, the average gain in life expectancy at the age of 30 would be 8 months, varying from 0 in Stockholm, to 22 months in Bucarest. In other words, exceeding the guideline value recommended by the WHO for the $PM_{2,5}$ leads to nearly 19,000 premature deaths, including 15,000 caused by cardio-vascular disease. Compliance with this WHO guideline value would give rise to savings of 31.5 billion euros each year by decreasing health spending, absenteeism and the costs associated with the loss of well-being and quality of life and life expectancy.

The project has also developed a method to study the impact of living near streets and roads with heavy traffic. More and more studies exist, showing that living close to one of these roads could have significant repercussions on health, particularly by fostering the development of chronic diseases. The method applied to 10 cities shows that on average more than 50% of the population of these cities lived less than 150 metres from streets used by more than 10,000 vehicles a day. Living close to one of these busy roads could be responsible for more than 15% of new cases of asthma in children and for 15 to 13% of asthma attacks in children. Associated costs could exceed 300 million euros each year.

The project also underlines the importance of European policies, by showing that in 20 cities legislation to reduce sulphur levels in fuel had caused a marked and lasting reduction in sulphur dioxide (SO_2) levels in the ambient air. This reduction prevented some 2,200 premature deaths each year and saved 192 million euros each year.

These different assessments are subject to several sources of uncertainty : the transposition of the concentration-risk correlation from one population to another, the representativeness of the measures of air pollution, comparability of data concerning deaths. The experience of previous projects on air pollution (Aphena project, Apheis) showed that these uncertainties can be viewed very differently by scientists (for example, recognising the uncertainties marks the transparency and rigour of the results) and by the other stakeholders (for example, uncertainty is an obstacle to decision-making). Aphekom thus tested several tools to help scientists deepen their qualitative assessment of uncertainties, so that for each source of uncertainty they could distinguish the part linked to measurements, to underlying hypotheses, to the HIA method and to the interest in terms of policy. For example, in several countries the $PM_{2.5}$ are not measured directly but are estimated from PM_{10} readings. Reinforcing measurement networks would lead to a better assessment of exposure and so of the impact on the cities concerned.

The project also tested a tool to help in discussion, to structure exchanges between scientists decision-makers and other stakeholders. This tool can put forward and discuss several criteria in order to evaluate, prioritise and share the needs, and to choose the actions which best meet the objectives and priorities of those concerned. Further to two pilot studies (the revision of the regional air quality plan in Ile-de-France and the development of an air action plan in Brussels), a guide to the use of the tool was drawn up.

If the HIA results highlight the advantages of implementing European policies on atmospheric pollution, Aphekom's experience of communication and discussion shows efforts still needing to be made to produce reliable scientific information which answers the concerns of the population and the decision-makers and contributes usefully to the complex debate on air quality regulations. It also shows that building an inter-disciplinary project requires a great deal of time as everyone needs to understand the basis of the methods and vocabulary of other disciplines before being able to share efficiently.

The reports and tools belonging to the project are available in English on the site www.aphekom.org.