



Assessment of Air Pollution Impacts on Human Health Using AirQ+

European Network on New Sensing Technologies for Air
Pollution Control and Environmental Sustainability -
EuNetAir

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Air pollution impacts on health: measurement issues and tools

This presentation is threefold:

- 1) what is related to the issue of exposure and real pollution conditions?
- 2) How to deal with the estimate of the magnitude of the most important effects of air pollution in a given population?
- 3) Which tools have been developed by WHO



From exposure to impacts

A simulation, built in netlogo, shows how space-time activity patterns can be measured (*).

Epidemiological studies have quantified the concentration-response functions that link single air pollutants to health (**)

(*) Mudu P., Terracini B., Martuzzi M. (2014) Human Health in Areas with Local Industrial Contamination.

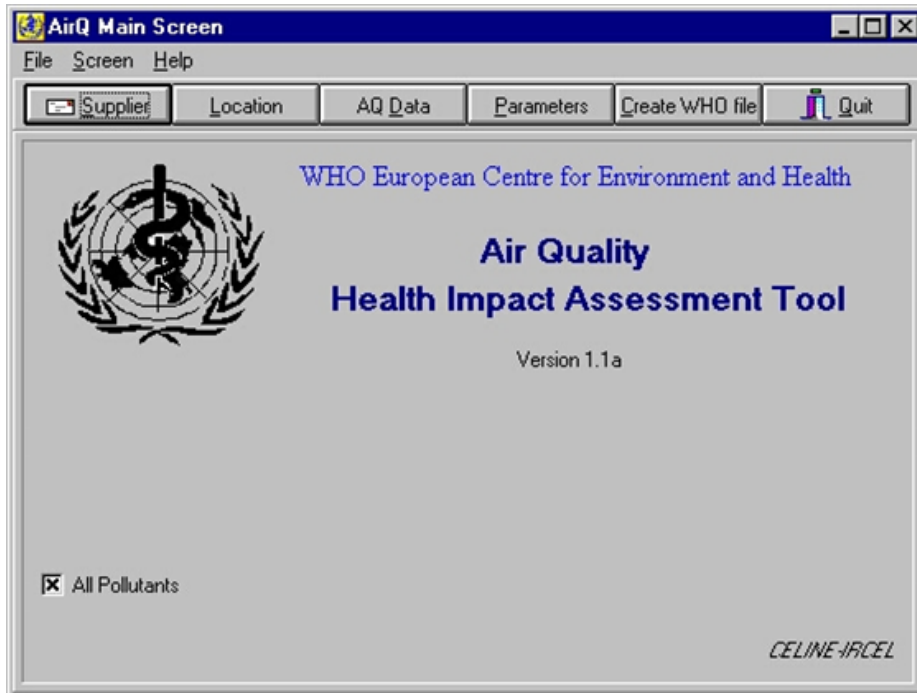
(www.euro.who.int/en/publications/abstracts/human-health-in-areas-with-industrial-contamination)

(**) World Health Organization (2006) Air quality guidelines: global update 2005: particulate matter, ozone, nitrogen dioxide, and sulfur dioxide. World Health Organization

(http://www.euro.who.int/data/assets/pdf_file/0005/78638/E90038.pdf?ua=1).

AirQ

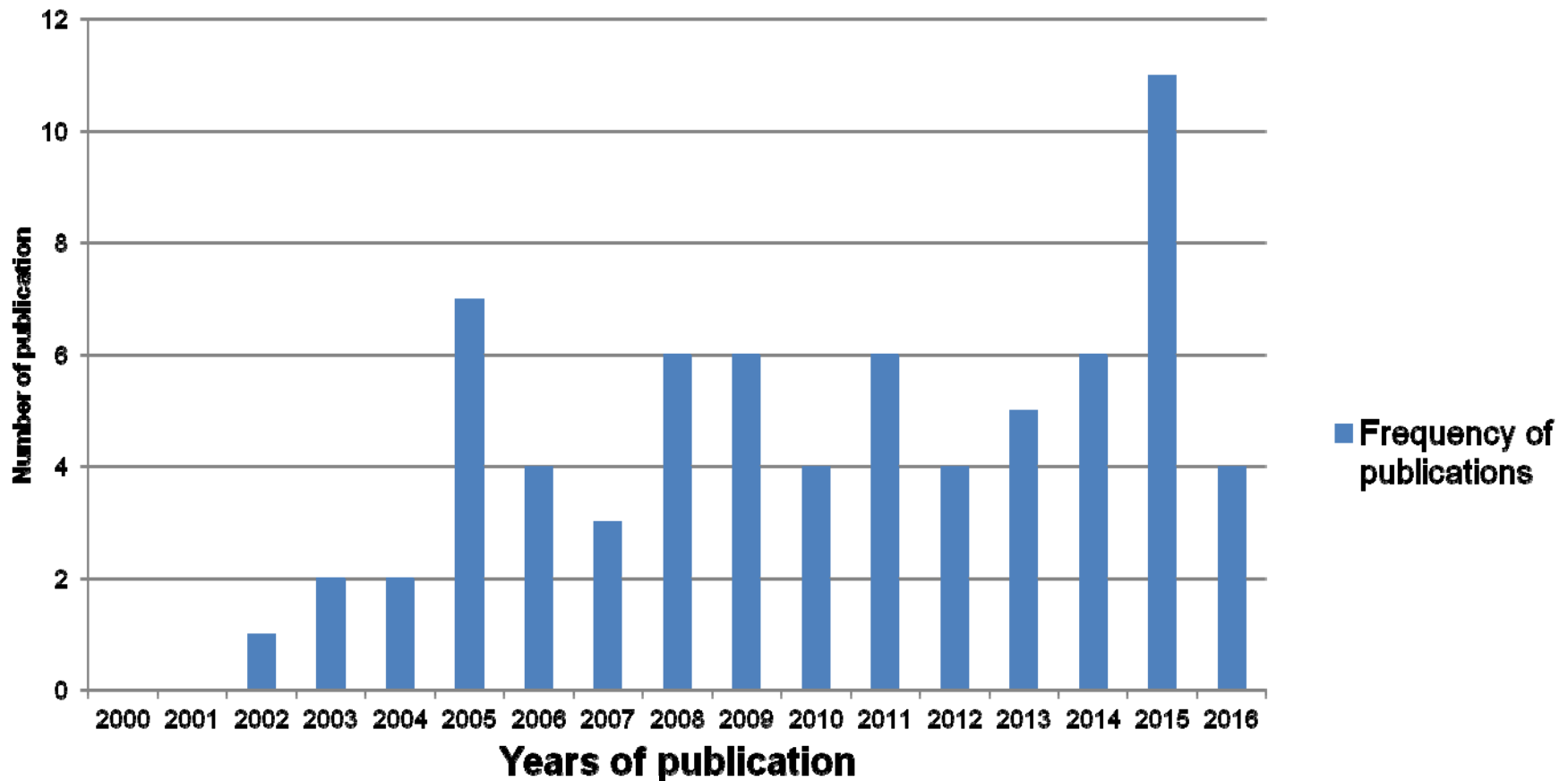
Developed between 1998 and 2004, online until 2016



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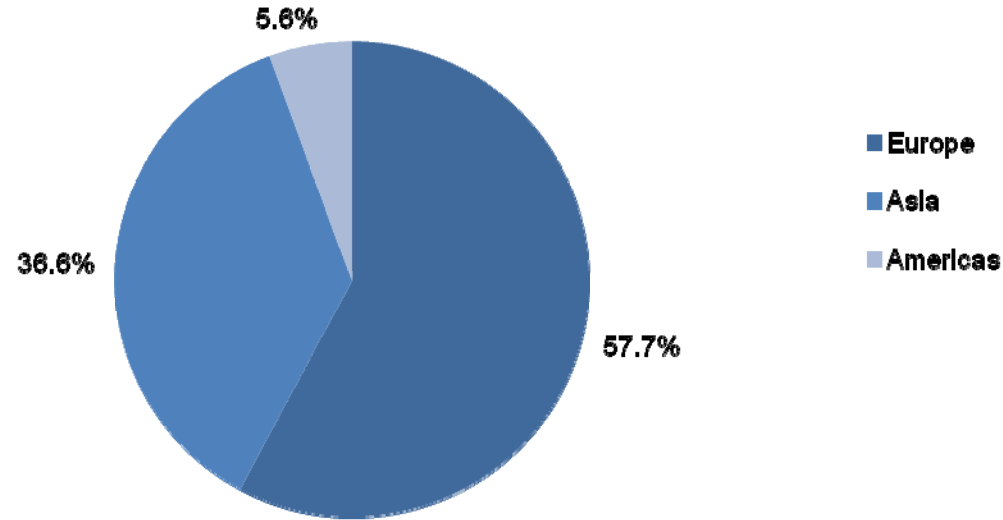
71 publications using AirQ for HIA identified between 2002 and 2016

- Type: 35 scientific journals study + 30 reports + 6 thesis



Language: English, Spanish, Italian, French, Hungarian, Persian

Location of AirQ use in 2000 – 2016



The analysis with AirQ was applied to a single city in most cases, except in 15 publications where the target area covered multiple cities. The average size of the target population was 2,558,493 people. Most analysis focused on population of more than 1 million people (57% of publications).

EU

- Italy
- Spain
- Hungary
- Germany
- Sweden
- Estonia
- Poland
- Croatia
- UK
- France
- + Aphea study in 23 countries

Asia

- Iran
- Korea
- Sri Lanka
- Taiwan
- Thailand
- Japan

South America

- Bolivia
- Peru

Pollutants assessed by AirQ 2000 – 2016

| Pollutants | Studies (frequency) | Studies (percentage) |
|-------------------|---------------------|----------------------|
| PM ₁₀ | 46 | 64.8 |
| PM _{2.5} | 20 | 28.2 |
| NO ₂ | 15 | 21.1 |
| O ₃ | 9 | 12.7 |
| SO ₂ | 8 | 11.3 |
| TSP | 3 | 4.2 |
| BS | 2 | 2.8 |
| CO | 1 | 1.4 |
| NO _x | 1 | 1.4 |
| TSP | 1 | 1.4 |



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Health endpoint frequency

| Health end points | Studies (frequency) | Studies (percentage) |
|--|---------------------|----------------------|
| Total mortality | 41 | 57.7 |
| Hospital admission due to respiratory disease | 35 | 49.3 |
| Cardiovascular mortality | 32 | 45.1 |
| Respiratory mortality | 31 | 43.7 |
| Life table analysis | 30 | 42.3 |
| Hospital admission due to cardiovascular disease | 27 | 38.0 |
| Chronic obstructive pulmonary disease | 16 | 22.5 |
| Acute respiratory infection | 3 | 4.2 |
| Asthma | 3 | 4.2 |
| Acute myocardial infection | 3 | 4.2 |
| Years Lost due to Disability | 1 | 1.4 |
| Lung cancer mortality | 1 | 1.4 |
| Disability-Adjusted Life Year | 1 | 1.4 |
| Cardiopulmonary mortality | 1 | 1.4 |
| Acute bronchitis | 1 | 1.4 |



What is AirQ+?

A user-friendly software
to estimate the magnitude
of the most important and best recognized
effects of air pollution in a given population



What is AirQ+ for?

For calculating **estimates**
that support **decision-makers**
to develop appropriate **actions**
to protect **public health**



AirQ+ uses

AirQ+ is designed to calculate:

- How much of a particular health effect is attributable to selected air pollutants?
- Compared to the current scenario, what would be the change in health effects if air pollution levels changed in the future?



AirQ+ target users

AirQ+ is designed for
public health or environmental specialists

with minimum knowledge of
atmospheric modelling, statistical methods,
epidemiology or GIS



AirQ+ estimates

- Burden of disease from long-term exposure to air pollution at current levels
- Burden of disease associated to changes in air pollution levels (both decreases and increases)
- Health impacts attributable to changes in short-term exposure to air pollution
- Years of Life Lost (YLLs) due to air pollution exposure



AirQ+ is downloadable online


Link:

<http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/activities/airq-software-tool-for-health-risk-assessment-of-air-pollution>




AirQ+ welcome screen

AirQ+ - Do NOT distribute or quote!



World Health Organization

AirQ+
(Do NOT distribute or quote!)



Glossary
Disclaimer

Projects Overview

- Long-term Effects
 - CountryData LT
 - New Life Table Evaluation
 - New Life Table Evaluation
 - CityData (PM2.5)
 - AAP PM2.5 long-term adult mortality
 - AAP PM2.5 adults mortality IER (1)
 - New Location (PM2.5) [converted]
 - New Impact Evaluation
 - CityData
 - CityData (PM2.5)
 - AAP PM2.5 adults mortality IER (2)
 - Ozone (O3)
 - New Impact Evaluation
 - Solid Fuel test (Solid Fuel Use)
 - ALRI for children
- Short-term Effects
 - CityData (PM2.5)
 - New Impact Evaluation

Menu

Welcome to AirQ+

Start new analysis or select an existing analysis from the list on the left.

What is AirQ+?

Documentation

Getting started

Acknowledgments

+ Create new Analysis

Start analysis



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Example of analysis: impacts from long-term exposure to PM_{2.5} on adult mortality

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AirQ+
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Impact Evaluation Detailed Results

Impact Evaluation (PM2.5)

Evaluation Name: AAP PM2.5 long-term adult mortality

Health Endpoint

Health Endpoint: Mortality, all (natural) causes (adults age 30+ years)

Incidence (per 100 000 per year): 939.7300000000001 Pop. at risk (14.53%): 160620

Calculation Parameters

Calculation Method: log-linear Formula: $RR(X) = e^{B(X - X_0)}$

Relative Risk: 1.062 Lower: 1.04 Upper: 1.083

Cut-off Value X_0 (see formula): 10

Mean Concentration X: 27.95

Advanced

Calculate

Results (last calculation 2016-04-25 13:17:16)

| | Central | Lower | Upper |
|--|---------|-------|--------|
| Estimate Attributable Proportion | 10.24% | 6.8% | 13.34% |
| Estimated # of Attributable Cases | 154 | 103 | 201 |
| Estimated # of Attributable Cases per 100 000 Population at Risk | 96.18 | 63.88 | 125.32 |

Comments



AirQ+ :

Pre-loaded vs user-supplied data

Pre-loaded datasets

- Relative Risks (RRs) for selected pollutant health end-points pairs
- conversion factors between PM2.5 and PM10 at the national level
- worldwide solid fuel use statistics at the national level.

Data to be supplied by the users

- Air pollution
(e.g., average levels or frequency of days with specific levels)
- Population exposed (e.g., number of adults aged ≥ 30 years)
- Health (e.g., baseline rates of health outcomes)



AirQ+ :

Pre-loaded vs user-supplied data

Users can also:

- change default RRs or
- load their own data for pollutants not included in AirQ+ if RRs are available.



THANK YOU VERY MUCH FOR YOUR ATTENTION

Contacts

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Web sites

Air quality and health: euro.who.int/air

Environment and health: euro.who.int/envhealth

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