

WHO's Ambient Air Pollution database – Update 2014

Description of methods and disclaimer

Description

The database contains measured outdoor air pollution levels relevant for estimating mean annual exposures of the urban population to fine particulate matter. The database is of global scope, and aims to provide data at national and city levels.

Data sources

Primary source of data are official national/subnational reports, national/ subnational web sites containing measurements of PM_{10} or $PM_{2.5}$ and the relevant national agencies. Furthermore, measurements reported by the following regional networks were used: the Asian Clean Air Initiative (1) for Asia, and Airbase (2) for Europe. In the absence of data from the previous sources, data from (a) UN Agencies, (b) Development agencies and (c) articles from peer reviewed journals were used.

Type of data used

Included in the database were annual mean concentrations of particulate matter (PM_{10} or $PM_{2.5}$) based on daily measurements, or data which could be aggregated into annual means. In the absence of annual means, measurements covering a more limited period of the year were exceptionally used.

In order to present air quality that is largely representative for human exposure, urban measurement characterized as urban background, residential areas, commercial and mixed areas were used. Stations characterized as particular "hot spots" or exclusively industrial areas were not included, unless they were contained in reported city means and could not be dissociated. This selection is in line with the aim of capturing representative values for human exposure. The location of hot spots, often measured for the purpose of capturing the cities' maximum values, and industrial areas, were deemed less likely to be representative for the mean exposure of a significant part of a city's population. "Hot spots" were either designated as such by the original reports, or were qualified as such due to their exceptional nature (e.g. exceptionally busy roads etc.). Omitting them may have led to an underestimation of the mean air pollution levels of a city.

Where the data from various sources were available for a city, only the latest data and most reliable sources were used. Only data measured since the year 2008 were included in the database.

It was not possible to retrieve or use all publicly available data of interest. Reasons included language barriers, or incomplete information on the data (such as missing year of reference). Data were used as presented in their original sources. The indicated numbers of monitors do not necessarily correspond to the number of existing or operational stations in the cities, but the numbers of stations used for the indicated city means.

Search strategy

The search strategy included the following approaches:

1. Screening of the web sites of the Ministries of Environment, Health, and Statistics Offices.
2. Web searches with the terms "air quality", "air pollution", "suspended particles", "monitoring", "PM10", "PM2.5"

Languages used: English, French, Spanish, Portuguese, Italian, German.

Data processing and reporting

Where available, city or country means reported by the original sources are included in the database. Where no country means were available, a city population-weighted mean was estimated based on the reported air quality data and available population data. Where no city mean was available, the eligible city data were averaged, which is not necessarily representative of the city's mean air pollution.

Population data used for weighting and for estimating the share of urban population covered were either based on (a) UN Population Statistics when available for all cities covered, or (b) Census data from National Statistical Offices.

For completeness, annual mean PM_{10} data were estimated, when not available, on the basis of $PM_{2.5}$ with a conversion factor of 0.6 for the ratio $PM_{2.5}/PM_{10}$ (3-6) for the United States of America, and Australia, and around 0.3-0.4 for Canada (based on stations where both $PM_{2.5}$ and PM_{10} were available). As the conversion factor $PM_{2.5}/PM_{10}$ may vary according to location, the converted PM_{10} value for individual cities may deviate from the actual value (generally between 0.4 and 0.8), and should be considered as approximate only.

For cities with PM_{10} reported as the only monitored PM parameter, $PM_{2.5}$ concentration was calculated from PM_{10} using national conversion factors ($PM_{2.5}/PM_{10}$ ratio) estimated as population-weighted averages of city-specific conversion factors for the country. City-specific conversion factors were estimated as the mean ratio of $PM_{2.5}$ to PM_{10} of stations for the same year, and alternatively as the ratio of city values if the values by station were not provided. If national conversion factors were not available, regional ones were used, which were obtained by averaging country-specific conversion factors.

The temporal coverage represents the number of days per year covered by measurements, or any alternative qualification as provided in the original sources. If data from several monitoring stations in one city were available, their average temporal coverage was used for the city average. Temporal coverage of cities were averaged to obtain country averages. Information on temporal coverage was not always available, however reporting agencies do often have their own reporting threshold for the number of days covered before reporting on a station's measurement value, or using it for estimating the city mean.

Limitations

Data from different countries are of limited comparability because of

- a) Different location of measurement stations;
- b) Different measurement methods;
- c) Different temporal coverage of certain measurements; if only part of the year was covered, the measurement may significantly deviate from the annual mean due to seasonal variability;
- d) Possible inclusion of data which were not eligible for this database due to insufficient information to ensure compliance;
- e) Differences in sizes of cities covered: for certain countries, only measurements for larger cities were found, whereas for others also cities with just a few thousand inhabitants were available. However, the inclusion of cities with less than 100,000 inhabitants did usually not significantly modify the country mean as compared to considering only cities larger than 100,000 inhabitants;
- f) Heterogeneous quality of measurements;
- g) Omission of data which are known to exist, but which could not yet be accessed due to language issues or limited accessibility.

Feedback, update and improvement of the database

Countries, municipalities or their agencies with relevant measurement data are welcome to provide more recent or complete data in order to update or improve the database. Please contact us by writing to ebdassessment@who.int.

Disclaimer

The data presented do not necessarily reflect the views or position of the World Health Organization. All reasonable precautions have been taken by the World Health Organization to verify the information contained in this database. However, the published material is being made available without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use. Countries may have more recent, complete and accurate data.

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References

1. Clean Air Initiative - Asia. CitiesACT database. [accessed 24 July 2013]; Available from: <http://citiesact.org/>
2. European Environment Agency. AirBase: The European air quality database; [accessed 2 February 2013]; Available from: <http://www.eea.europa.eu/data-and-maps/data/airbase-the-european-air-quality-database-7>.
3. CSIRO. Australia State of Environment Report 2001. Canberra: 2001.
4. Brook J, Dann T. Contribution of Nitrate and Carbonaceous Species to PM₁₀ and PM_{2.5} Observed in Canadian Cities. Journal of Air and Waste Management 1999;49:193-199.
5. USEPA. US Environmental Protection Agency. Particulate Matter. Air quality statistics by city, 2005. [accessed 2 May 2011]; Available from: www.epa.gov/airtrends/factbook.html
6. Cohen AJ, Ross Anderson H, Ostro B, Pandey KD, Krzyzanowski M, Künzli N, Gutschmidt K, Pope A, Romieu I, Samet JM, Smith K. The global burden of disease due to outdoor air pollution. J Toxicol Environ Health, Part A 2005;68:1301-1307.

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