Updated WHO Air Quality Guidelines

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http://www.euro.who.int/air

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This presentation:

- Summary of the Updated Guidelines for PM, O3, NO2 and SO2
- WHO Workshop “Health relevance of PM from various sources”

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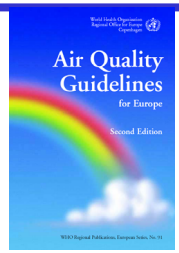
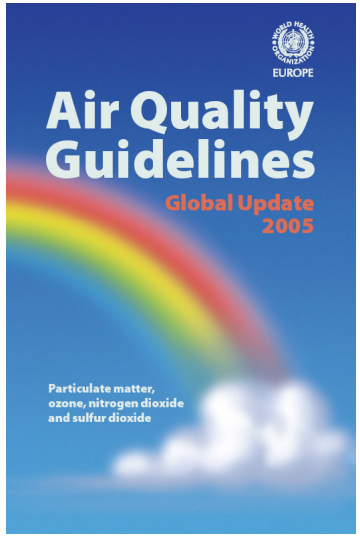
WHO AQG: Global update: the process

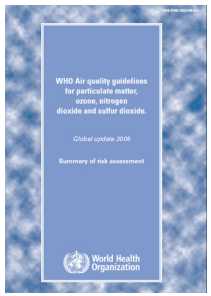
Basis: Air quality Guidelines for Europe, 2nd edition, WHO 2000



- Oct – Nov 2004: Steering Group established;
- Jan - Sept 2005: review of the evidence (ca 80 experts involved);
- 18-20 October 2005: WG meeting, Bonn (report published Feb 2006);
- 5 October 2006 – formal announcement of AQG
- WHO editing / printing ⇒ publication: April 2007



http://www.euro.who.int/InformationSources/Publications/Catalogue/20070323_1



http://www.who.int/phe/air/aqg2006execsum.pdf

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WHO AQG: Global update 2005: Table of contents & authors of 1st drafts

Chapter	Title	Authors
Part 1. Application of AQG for policy development and risk reduction		
1	Sources of air pollution	R. Harrison (UK)
2	Air pollution levels	B. Sivertsen (Norway)
3	Human exposure to air pollution	N. Janssen (The Netherlands), S. Mehta (US)
4	Health effects of air pollution	N. Gouveia (Brazil), M. Maisonet (PAHO/Chile)
5	Determinants of susceptibility	M. Utell (US), M. Frampton (US)
6	Environmental equity	P. Kinney (US), MS O'Neill (US)
7	Health impact assessment	B. Ostro (US)
8	Applications of guidelines in policy formulation	A. Fernandez (Mexico), M. Zuk (Mexico)
9	Indoor air quality: special issues in risk assessment and management	K. Balakrishnan (India), NG Bruce (UK)
Part 2. Risk assessment of selected pollutants		
10	Particulate matter	J. Samet (US), M. Brauer (Canada) R.Schlesinger (US)
11	Ozone	P. Saldiva (Brazil), N. Künzli (US / Switzerland)
12	Nitrogen dioxide	F. Forastiere (Italy), A. Peters (Germany) F. Kelly (UK), ST Holgate (UK)
13	Sulfur dioxide	M. Lippmann (US), K. Ito (US)

Full list of reviewers: WG Meeting Report & AQG book

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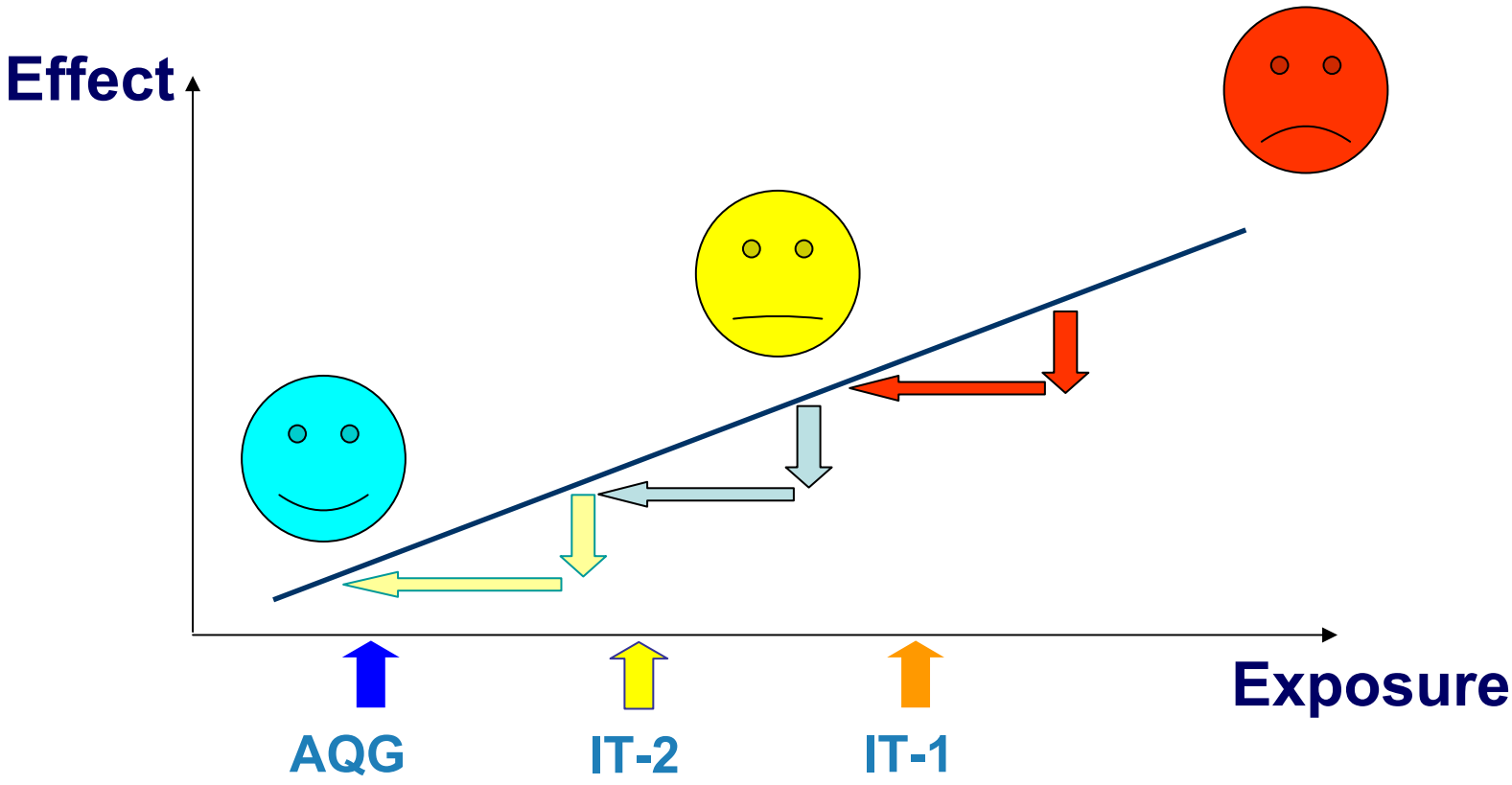
Passing interim targets on the way towards AQG



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WHO AQG: Global update: Particulate matter - annual mean

Annual mean level	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	Basis for the selected level
Interim target-1 (IT-1)	70	35	Levels associated with about 15% higher long-term mortality than at AQG
Interim target-2 (IT-2)	50	25	Risk of premature mortality decreased by approximately 6% compared to IT1
Interim target-3 (IT-3)	30	15	Mortality risk reduced by approximately 6% compared to IT2 levels.
Air quality guideline (AQG)	**20**	**10**	Lowest levels at which total, CP and LCA mortality have been shown to increase (Pope et al., 2002). The use of $PM_{2.5}$ guideline is preferred.

AQG 2000: no guideline value

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WHO AQG: Global update: Particulate matter: 24-h mean

24-hour mean level *)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	Basis for the selected level
Interim target-1 (IT-1)	150	75	About 5% increase of short-term mortality over AQG
Interim target-2 (IT-2)	100	50	About 2.5% increase of short-term mortality over AQG
Interim target-3 (IT-3)	75	37.5	About 1.2% increase in short-term mortality over AQG
Air quality guidelines (AQG)	**50**	**25**	Based on relation between 24-hour and annual PM levels

*) 99th percentile (3 days / year)

AQG 2000: no guideline value

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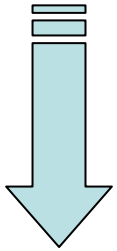
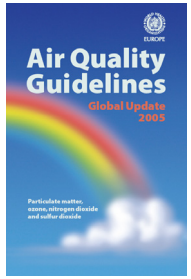
WHO AQG: Global update: The role of ultrafine particles

- There is considerable toxicological evidence of potential detrimental effects of UF particles on human health,

- The existing body of epidemiological evidence is insufficient to reach a conclusion on the exposure–response relationship of UF particles.





No recommendations can be provided as to guideline concentrations of UF particles at this point in time.

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WHO AQG: Global update: Ozone: daily maximum 8-h mean

	Daily maximum 8-hour mean	Effects at the selected ozone level
High level	240 µg/m^3	Significant health effects, substantial proportion of vulnerable population affected.
Interim target-1 (IT-1)	160 µg/m^3	Important health effects, an intermediate target for populations with ozone concentrations above this level. Does not provide adequate protection of public health.
Air quality guideline (AQG)	**100 µg/m^3**	This concentration will provide adequate protection of public health, though some health effects may occur below this level.

AQG 2000: 120 µg/m3

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WHO AQG: Global update: Nitrogen dioxide

The guideline values remain unchanged at the following levels:

40 µg/m3 for annual mean;

200 µg/m3 for 1-hour mean.

Rationale:

- Experimental data: NO2 toxic above 200 µg/m3
- Epi studies: NO2 – marker of mixture of combustion related pollution
- Precursor of ozone and PM2.5

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WHO AQG: Global update: Sulfur dioxide

	24-hour average SO_2	**10-minute average SO_2**
Interim target-1 (IT-1) (2000 AQG level)	125 µg/m^3	-
Interim target-2 (IT-2)	50 µg/m^3 Intermediate goal based on controlling either (1) motor vehicle (2) industrial emissions and/or (3) power production; feasible goal to be achieved leading to significant health improvements that would justify further improvements	-
Air quality guidelines (AQG)	**20 µg/m^3**	**500 µg/m^3**

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WHO AQG: Global update: Summary of updated AQG values

AQG levels recommended to be achieved everywhere in order to significantly reduce the adverse health effects of pollution

Pollutant	Averaging time	AQG value
Particulate matter		
$PM_{2.5}$	1 year	10 µg/m^3
	24 hour (99th percentile)	25 µg/m^3
PM_{10}	1 year	20 µg/m^3
	24 hour (99th percentile)	50 µg/m^3
Ozone, O_3	8 hour, daily maximum	100 µg/m^3
Nitrogen dioxide, NO_2	1 year	40 µg/m^3
	1 hour	200 µg/m^3
Sulfur dioxide, SO_2	24 hour	20 µg/m^3
	10 minute	500 µg/m^3

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Health relevance of PM from various sources
WHO Workshop, Bonn, Germany, 26-17 March 2007

Main conclusions:

• The attribution of health effects to specific PM characteristics limited due to the scarcity of relevant exposure data (from monitoring or modelling).

• Some results suggested:
  - differential toxicity among PM components for a health endpoint
  - differences in the affected health endpoints.

• Coarse particles might preferentially affect airways and lungs and fine particles the cardiovascular system.

• Ultrafine particles (UFP) might migrate via the lung to other locations, including the liver, spleen, brain, placenta and foetus. Health implications of this observation are to be established.

http://www.euro.who.int/Document/E90672.pdf

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Main conclusions (cont):

• Different chemical characteristics seemed to have different relative risks based on the partcile mass.

• Although secondary inorganic aerosols have less toxic activity in laboratory conditions, epidemiological studies showed the impact of sulfates and nitrates on various health outcomes. In ambient air, this fraction might act as a carrier for other components or as a surrogate for PM emitted from combustion of fuels containing sulphur.

•Targeted research combining source-specific AQ information, epidemiology and toxicological analysis needed in Europe

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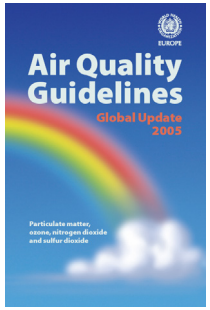
Conclusions



- AQG provide challenging targets for air pollution control
- Reduction of health risks: focus on primary PM, PM precursors and NOx
- Further research:
  - improved exposure characterization
  - combination of epidemiology, exposure assessment and toxicology
  - accountability studies evaluating effects of interventions

Thank you

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