

London Air Quality Network Seminar, King's College London, 19 January 2007

# WHO Air Quality Guidelines Update 2005

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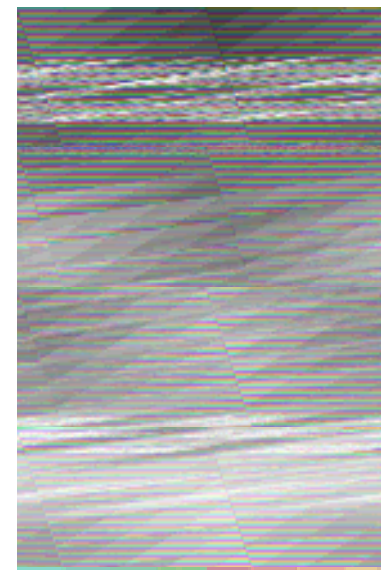
# This presentation:

- Process of WHO AQG Update;
- Summary of the Updated Guidelines for PM, O<sub>3</sub>, NO<sub>2</sub> and SO<sub>2</sub>
- WHO activities in 2007

# WHO AQG: Global update: the process

- “Systematic review...” – update of WHO AQG, 2nd ed. recommended
- Oct – Nov 2004: Steering Group established;
- January 2005: Steering Group: scope & structure; authors;
- July – Sept 2005: review of the 1st draft;
- **18-20 October 2005: WG meeting, Bonn** (report published Feb 2006);
- Dec 2005 – June 2006: finalization of background materials based on reviewer’s comments (drafts 2-4);
- **5 October 2006 – formal announcement of AQG**
- WHO editing / printing ⇒ publication: early 2007

<http://www.euro.who.int/Document/E87950.pdf>



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

# WHO AQG: Global update 2005: Steering Group

- RH Anderson (UK)
- B. Brunekreef (The Netherlands)
- B. Chen (China)
- A. Cohen (USA)
- R. Maynard (UK)
- I. Romieu (Mexico)
- KR. Smith (USA)
- S. Wangwongwatana (Thailand)

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

Chapter	Title	Authors
<b>Part 1. Application of AQG for policy development and risk reduction</b>		
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)
<b>Part 2. Risk assessment of selected pollutants</b>		
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**



# WHO AQG: Global update: Main results

## Guideline values for PM, ozone, NO<sub>2</sub> and SO<sub>2</sub>:

- the epidemiological evidence indicates that the possibility of adverse effects remains, even if the guideline value is achieved;
- some countries might select even lower concentrations for their standards.

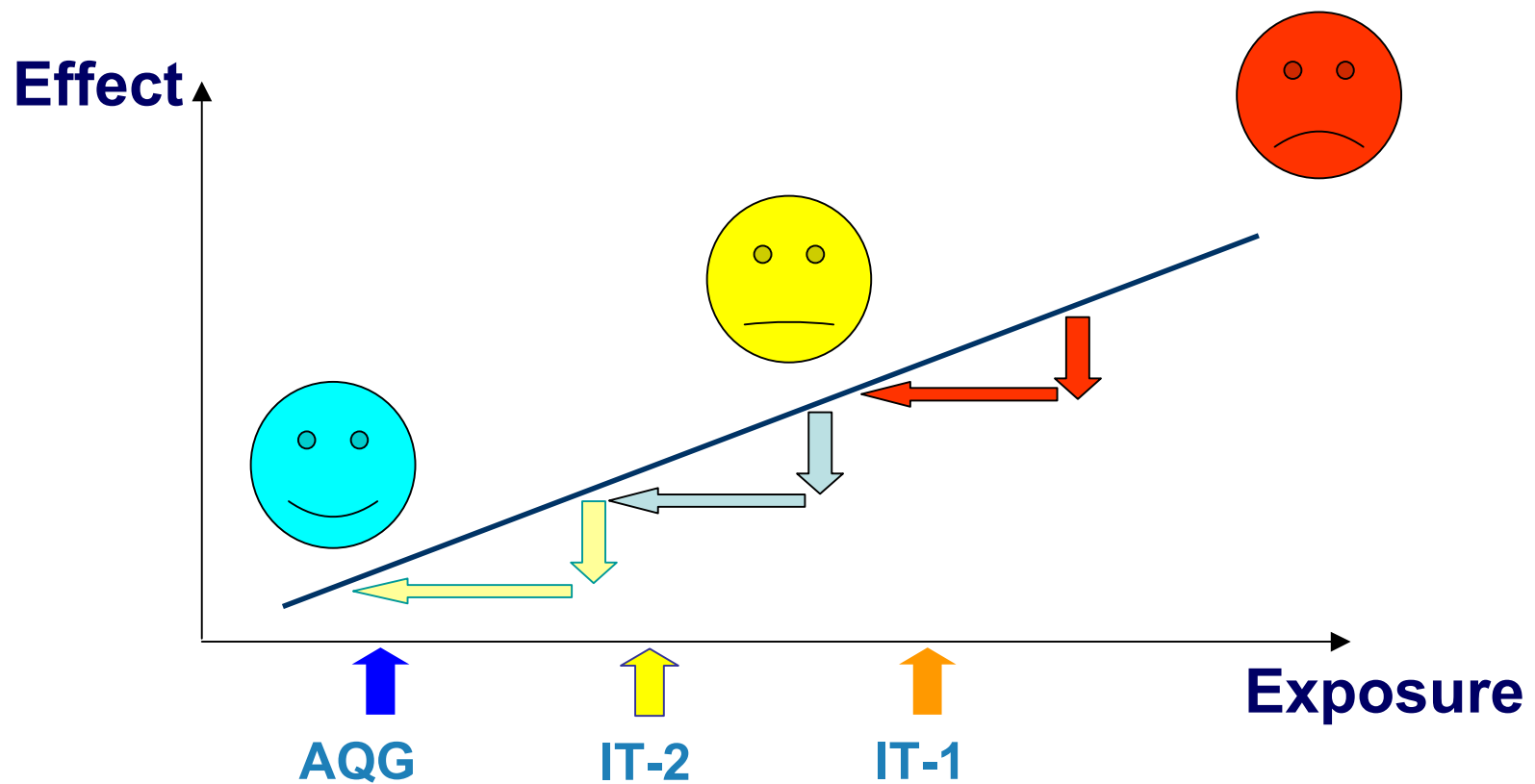
## Interim targets for each pollutant:

- define steps in a progressive reduction of air pollution in more polluted areas;
- promote a shift from concentrations with acute, serious health consequences to concentrations that, if achieved, would result in significant reductions in risks for acute and chronic effects.

## WHO AQG: Global update: Particulate matter - annual mean

Annual mean level	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	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.
<b>Air quality guideline (AQG)</b>	<b>20</b>	<b>10</b>	Lowest levels at which total, CP and LCA mortality have been shown to increase (Pope et al., 2002). The use of PM <sub>2.5</sub> guideline is preferred.

# Passing interim targets on the way towards AQG

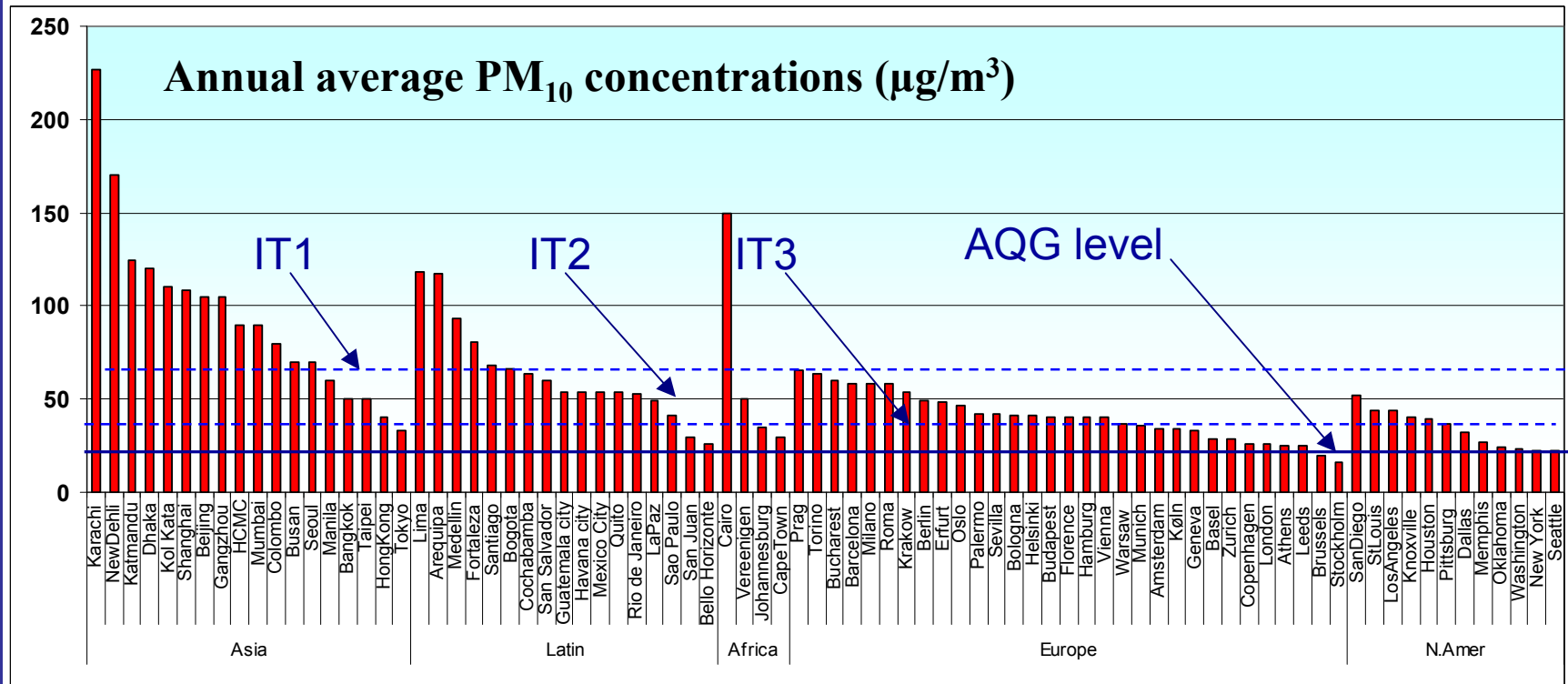




## WHO AQG: Global update: PM: rationale for the annual mean guideline value

- Robust associations between PM<sub>2.5</sub> and mortality in several studies with PM<sub>2.5</sub> in the range 9-33 µg/m<sup>3</sup>;
- No apparent thresholds but statistical uncertainty at PM<sub>2.5</sub> below 13 µg/m<sup>3</sup>;
- Annual mean of 10 µg/m<sup>3</sup> should be below the mean for most likely effects;
- Although adverse effects on health cannot be entirely ruled out below 10 µg/m<sup>3</sup>, its attainment is expected to significantly reduce the health risks;
- AQG and IT-s for PM<sub>10</sub> recommended in addition to PM<sub>2.5</sub> guidelines in recognition of harmful effects of coarse PM (fraction between 2.5 and 10 µm).

# Annual average PM<sub>10</sub> concentrations observed in selected cities worldwide



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

24-hour mean level *)	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	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
<b>Air quality guidelines (AQG)</b>	<b>50</b>	<b>25</b>	Based on relation between 24-hour and annual PM levels

\*) 99th percentile (3 days / year)

## WHO AQG: Global update: Particulate matter: rationale for the 24-h guidelines

- The annual average is recommended to take precedence over the 24-h mean since there is less concern about remaining episodic excursions at low PM levels;
- Meeting the 24-h AQG should protect against peaks of pollution leading to substantial excess morbidity or mortality;
- Immediate action recommended in case of exceeding 24-h guidelines

# WHO AQG: Global update: Nitrogen dioxide

The guideline values remain unchanged at the following levels:

**40  $\mu\text{g}/\text{m}^3$  for annual mean;**

**200  $\mu\text{g}/\text{m}^3$  for 1-hour mean.**

Rationale:

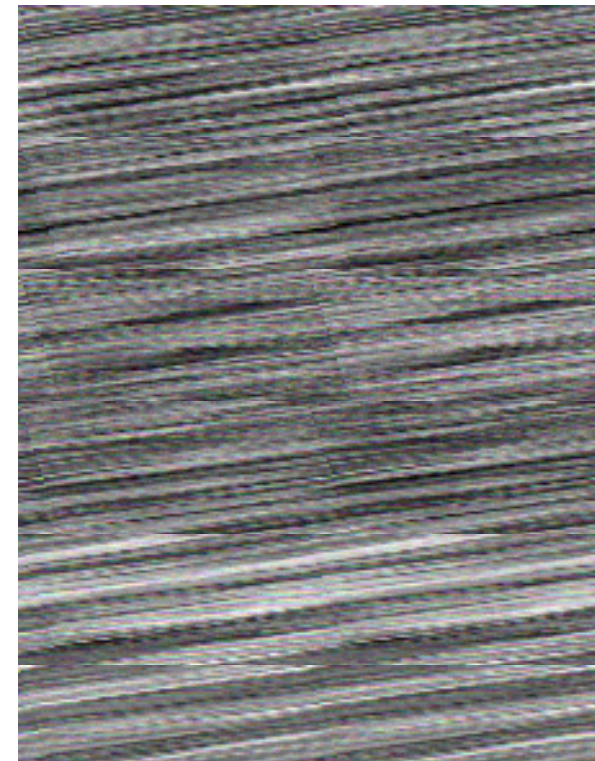
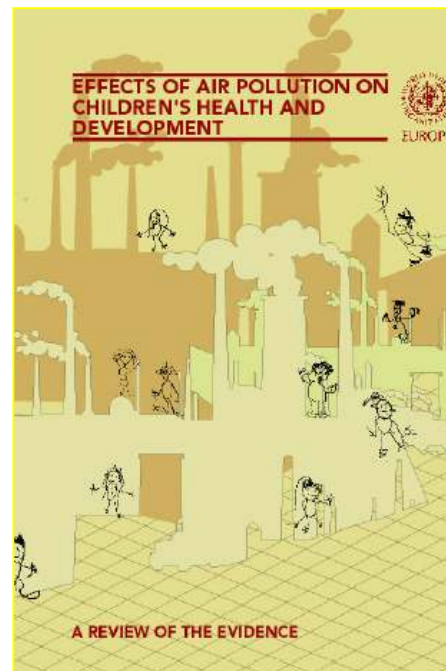
- Experimental data: NO<sub>2</sub> toxic above 200  $\mu\text{g}/\text{m}^3$
- Epi studies: NO<sub>2</sub> – marker of mixture of combustion related pollution
- Precursor of ozone and PM<sub>2.5</sub>

# 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
<b>Particulate matter</b> <b>PM<sub>2.5</sub></b>	1 year	10 µg/m <sup>3</sup>
	24 hour (99 <sup>th</sup> percentile)	25 µg/m <sup>3</sup>
<b>PM<sub>10</sub></b>	1 year	20 µg/m <sup>3</sup>
	24 hour (99 <sup>th</sup> percentile)	50 µg/m <sup>3</sup>
<b>Ozone, O<sub>3</sub></b>	8 hour, daily maximum	100 µg/m <sup>3</sup>
<b>Nitrogen dioxide, NO<sub>2</sub></b>	1 year	40 µg/m <sup>3</sup>
	1 hour	200 µg/m <sup>3</sup>
<b>Sulfur dioxide, SO<sub>2</sub></b>	24 hour	20 µg/m <sup>3</sup>
	10 minute	500 µg/m <sup>3</sup>

# Recent WHO assessment reports (2005-6)



## Further research needed...:

- Pollutant (exposure) \* outcome (mechanism) \* susceptibility
- Effects of pollution mixture
  - is “our” mixture toxic?
  - role of individual components of the mixture;
  - effects of interventions.
- Power of local evidence for triggering (& focusing) actions



# WHO activities on AQ & Health in 2007

- **Health relevance of PM from various sources** – WHO workshop, Bonn, 26-27 March 2007 (followed by 10th TFH meeting on 28 March)
- **WHO Guidelines for indoor air quality**
  - Pollutants specific guidelines
    - Formaldehyde
    - Benzene
    - Naphthalene
    - Nitrogen dioxide (NO<sub>2</sub>)
    - Carbon monoxide (CO)
    - Radon (Rn)
    - Particulate matter<sup>1</sup>
    - Halogenated compounds
    - PAH, especially BaP
  - Dampness and mould; Ventilation; Allergens (from HDM, pets)
  - Indoor combustion
    - Stove venting;
    - Household ventilation
    - Combustion quality;
    - Fuels
- **Health-relevant AQ monitoring in EECCA**



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Thank you



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