World Health Organization
REGIONAL OFFICE FOR Europe

CLAIMS NEED EVIDENCE: THE REVIHAAP* PROJECT

* REVIEW OF EVIDENCE ON HEALTH ASPECTS OF AIR POLLUTION

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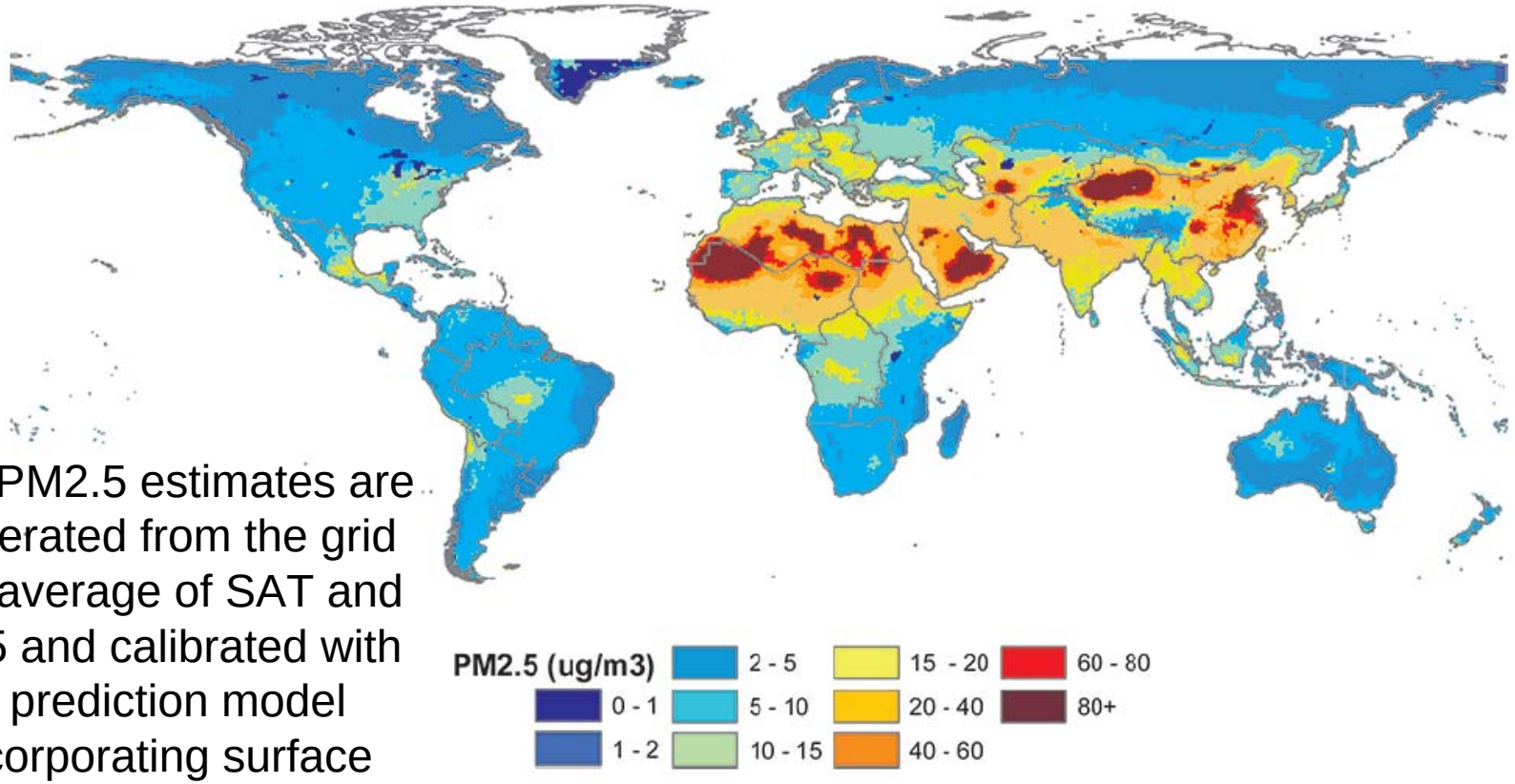
On behalf of REVIHAAP project team

Estimated 2005 annual average $PM_{2.5}$ concentrations used for GBD 2010 project

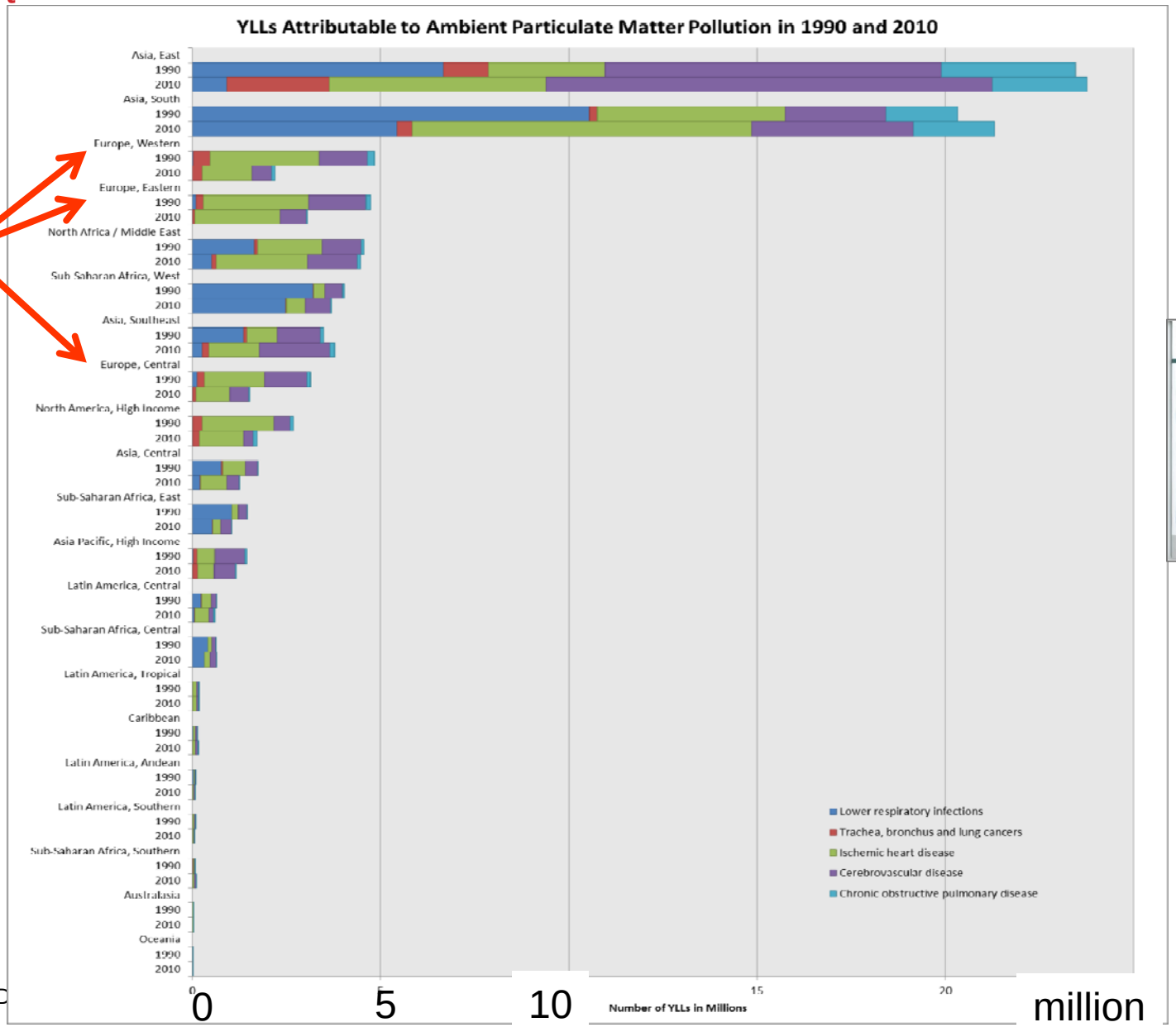


The PM2.5 estimates are generated from the grid cell average of SAT and TM5 and calibrated with a prediction model incorporating surface measurements.

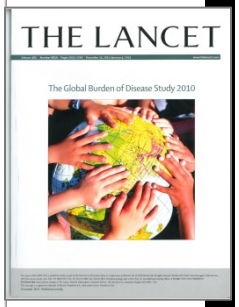
Brauer et al, Atm Sc & Tech 2011

Years of life lost due to PM – GBD 2010 project

Europe



million



Lim S et al. Lancet 2012

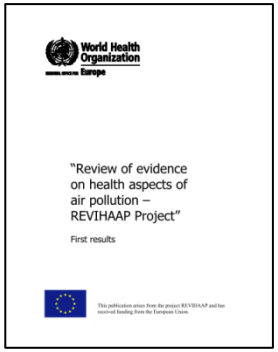
About REVIHAAP

- WHO project jointly financed by WHO and EC, managed by WHO/ECEH (Marie-Eve Heroux)
- Evidence review in response to 24 key policy questions from the EC
- Timing: 18 months, Sept 2011 – April 2013
- Followed by a sister project: “Health risks of air pollution in Europe – HRAPIE” (health risk assessment, emerging issues)
- Steering Advisory Committee (8 experts, 2 meetings, multiple TCs)
- Review of evidence and drafting the answers: 29 experts
- External review: 30 experts
- Two expert meetings (21-23.08.2012 & 15-17.01.2013)

About REVIHAAP, cont.

- Answers presented at the EC/HEI/WHO meeting in Brussels, 30-31.01.2013 http://www.healtheffects.org/Workshops/Brussels2013/brussels2013-agenda.htm

- Answers published on-line http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap



- Full rationales to be published in April 2013

REVIHAAP: selected conclusions on PM (A1)

The scientific conclusions of the 2005 WHO Guidelines about the evidence for a causal link between $PM_{2.5}$ and adverse health outcomes in humans have been confirmed and strengthened and, thus, clearly remain valid.

- New studies on short- and long-term effects;
- Long-term exposure to $PM_{2.5}$ are a cause of cardiovascular mortality and morbidity;
- More insight on physiological effects and plausible biological mechanisms linking short- and long-term $PM_{2.5}$ exposure with mortality and morbidity;
- Studies linking long-term exposure to $PM_{2.5}$ to several new health outcomes (e.g. atherosclerosis, adverse birth outcomes, childhood respiratory disease)

REVIHAAP: selected conclusions on PM (A2)

- Black carbon, secondary organic aerosols, and secondary inorganic aerosols may provide valuable metrics for the effects of mixtures of pollutants from a variety of sources. (A2)

- Short-term exposures to coarse particles (including crustal material) are associated with adverse respiratory and cardiovascular health effects, including premature mortality. (A2)

REVIHAAP: selected conclusions on PM, cont.

- Both short term (such as 24-hour average) and long term (annual means) exposure to $PM_{2.5}$ affect health. (A3)

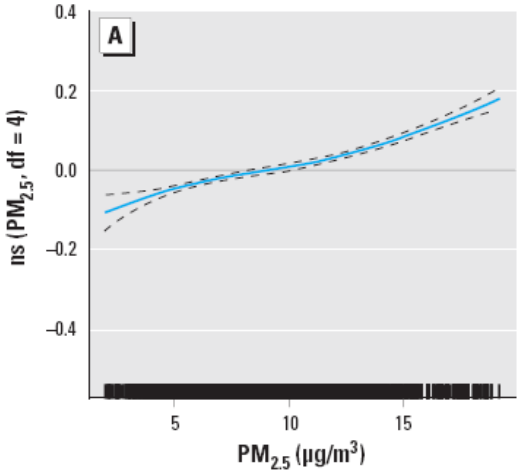
- Maintaining independent short-term and long-term limit values for ambient PM_{10} in addition to $PM_{2.5}$ to protect against the health effects of both fine and coarse particles is well supported. (A4)

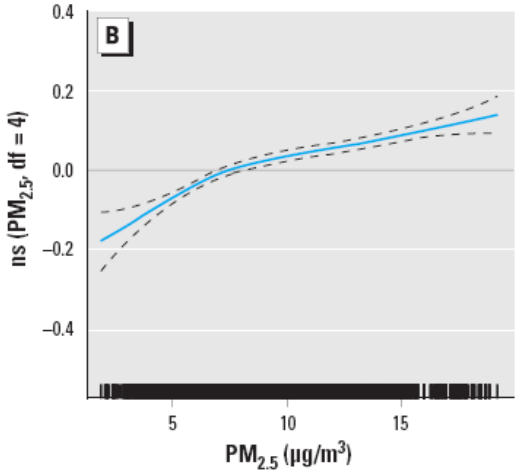
- In the absence of a threshold and in light of linear or supra-linear risk functions, public health benefits will result from any reduction of $PM_{2.5}$ concentrations whether or not the current levels are above or below the limit values. (A5)

Mortality and long-term PM2.5 exposure

Results of a Canadian cohort study (2.1 million adults, 1991-2001)

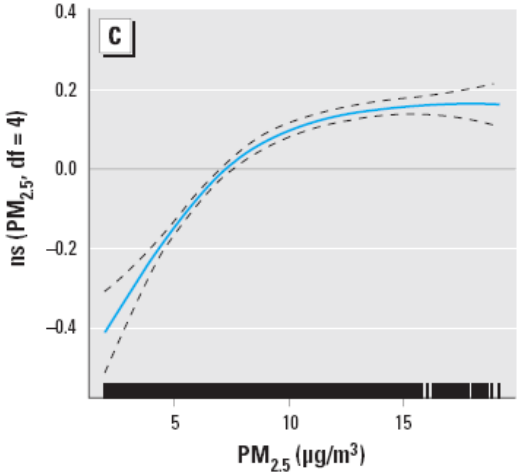
All non-accidental

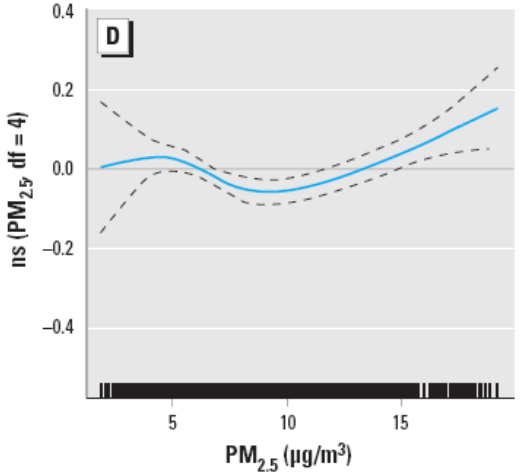




Cardiovascular

Ischemic heart disease





Cerebrovascular

Crouse et al, EHP 2012

REVIHAAP: selected conclusions on ozone (B1)

- **New evidence for an effect of long-term exposure to ozone on:**
  - respiratory (and cardiorespiratory) mortality (ACS study);
  - mortality among persons with potentially predisposing conditions (COPD, diabetes, congestive heart failure, and myocardial infarction);
  - asthma incidence, asthma severity, hospital care for asthma and lung function growth.

REVIHAAP:
selected conclusions on ozone, cont.

- **Adverse effects of exposure to daily ozone concentrations (maximum daily 1-hr or 8-hr mean) on:**
  - all-cause, cardiovascular and respiratory mortality;
  - respiratory and cardiovascular hospital admissions, after adjustment for the effects of particles (PM_{10}).

- **The evidence for a threshold for short term exposure is not consistent, but where a threshold is observed, it is likely to lie below 45 ppb (90 µg/m³) (max 1-hr). (B2)**

REVIHAAP:
selected conclusions on NO_2 (C2-3 D1)

- New studies document associations between day-to-day variations in NO_2 and variations in mortality, hospital admissions, and respiratory symptoms;
- New studies showing associations between long-term exposure to NO_2 and mortality and morbidity;
- Both short- and long-term studies have found these adverse associations at concentrations that were at or below the current EU LV (= WHO AQG);
- The associations between NO2 and short-term health effects in many studies remain after adjustment for other pollutants (including PM_{10}, $PM_{2.5}$, black smoke).
- **… it is reasonable to infer that NO_2 has some direct effects**.
- No evidence to suggest changing the averaging time for the short-term EU limit value (1-hour) (D1)

REVIHAAP: selected conclusions on health risks of proximity to roads (C1):

- Elevated health risks associated with living in close proximity to roads is unlikely to be explained by $PM_{2.5}$ mass;
- Current evidence does not allow discernment of the pollutants or pollutant combinations that are related to different health outcomes although association with tail pipe primary PM is increasingly identified;
- Toxicological research indicates that non-exhaust pollutants could be responsible for some of the observed health effects.

REVIHAAP: Critical data gaps (A7/C9) – selected conclusions on exposure assessment

- More collaboration is needed between health and atmospheric science both for complex monitoring and modeling, especially for exposure of complex mixtures with strong spatial and temporal variability.
- More monitoring is needed, both in regular way and into projects in coordination with health specialists. The use of supersites to perform simultaneous studies using the same monitoring and health evaluation approaches across Europe is strongly suggested. These studies should be done with a multi-pollutant approach.

REVIHAAP Conclusions

Considerable amount of new scientific information on health effects of PM, O_3 and NO_2 observed at levels commonly present in Europe, has been published in the recent years. It:

•supports the scientific conclusions of the WHO Air Quality Guidelines updated in 2005;

•indicates that the effects can occur at air pollution concentrations lower than those serving to establish the 2005 Guidelines;

•povides scientific arguments for the decisive actions to improve air quality and reduce the burden of disease associated with air pollution in Europe.

Thank you