GLOBAL BURDEN OF DISEASE FROM AIR POLLUTION

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On behalf of the GBD Ambient Air Pollution Expert Group and GBD 2010 Collaboration
Global Burden of Disease from Air Pollution

- What is the GBD project?
- How has the disease burden of air pollution been estimated?
- What was found?
- Value of GBD and possibilities for future work
Global Burden of Disease 2010

• **Underlying aim:** to inform public health policy and the design of health care systems

• **Project aim:** to quantify systematically the comparative size of health loss due to diseases, injuries and risk factors

• **Funded** by Bill and Melinda Gates Foundation. **Led** by Christopher Murray at University of Washington

• **Collaboration** of 488 researchers at 303 institutions in 50 countries

• **Outcome metric:** **DISABILITY ADJUSTED LIFE YEAR (DALY)** = 1 lost year of healthy life (not age weighted or discounted)

• **Scope:** 291 diseases and injuries, 1,160 sequelae of these diseases and injuries, and 67 risk factors or clusters of risk factors
  
  – Presented by region (21), country (187), age (20 groups) and sex, for 1990 and 2010
GBD Method for Ambient Air Pollution

- Exposure to Outdoor Air Pollution
- Worldwide Health Evidence
- Concentration –Response Relationships
- Baseline Incidence
- Country-Specific Mortality, Disease
- Global Burden, DALYs, Mortality

Evidence of worldwide health effects due to exposure to outdoor air pollution, with specific mortality and disease rates, leading to global burden and mortality statistics.
PM$_{2.5}$ (from all sources) at 0.1° resolution (~11km x 11km).

Average of satellite and chemistry transport model estimates, calibrated to surface monitor measurements

2005 population-weighted regional estimated average PM$_{2.5}$

Distributions of selected regional 2005 estimated PM$_{2.5}$ by urban and rural areas

Figure 2. Brauer M, et al Env Sci Technol 2012
Disease outcomes and concentration response functions

• Disease specific outcomes
  – Ischaemic heart disease
  – Cerebrovascular disease
  – Chronic obstructive lung disease
  – Acute lower respiratory tract infections <5yrs
  – (Pre-term birth and term low birthweight)
  – (Asthma)

• Integrated Exposure-Response Function for each outcome.
Global DALYS attributable to risk factors 2010

Percent of Global DALYs, 2010

- Dietary risks
- High blood pressure
- Smoking
- Household air pollution
- Alcohol use
- High body-mass index
- High fasting plasma glucose
- Childhood underweight
- Ambient PM pollution
- Physical inactivity
- Occupational risks
- Iron deficiency
- Suboptimal breastfeeding
- High total cholesterol
- Drug use

Legend:
- War & disaster
- Intentional injuries
- Unintentional injuries
- Transport injuries
- Other non-communicable
- Musculoskeletal disorders
- Diabetes/esogen/bloodendo
- Mental & behavioral disorders
- Neurological disorders
- Digestive diseases
- Cirrhosis
- Chronic respiratory diseases
- Cancer
- Other communicable
- Nutritional deficiencies
- Neonatal disorders
- Maternal disorders
- NTD & malaria
- Diarrhea/LRI/other infectious
- HIV/AIDS & tuberculosis
Rankings of global DALYS 1990-2010
Geographical and temporal variations in burden

- Baseline rates of diseases affected by air pollution
- Size and age/sex-structure of population
- Concentrations of ambient air pollution

% DALYs from non-communicable diseases in 2010.
GBD of outdoor air pollution: summary

– Ranks 9th overall amongst 67 risk factors
– Varies regionally and over time depending on demography, baseline risk and levels of pollution
– Both Europe and Asia are ranked under 10
– Shows little overall trend in ranking 1990 to 2010
– Ranks lower than indoor air pollution (4) due to burning of solid fuels for cooking and heating
– Is probably underestimated
– Is work in progress ............................................
THANKS

- This website offers interactive access to charting down to country level
- Country level data will be available from late 2013
- Individual risk factor results with finer detail are currently in preparation for publication