# Critical Issues in Combining Disparate Sources of Information to Estimate the Global Burden of Disease Attributable to Ambient Fine Particulate Matter Exposure

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### The Global Burden of Disease Study 2010



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#### 🕻 A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010

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#### Summary

Lancet 2012; 380: 2224-60 2055, 2058, 2060, 2062, and 2063 See Special Report page 2067

2129, 2144, 2163, and 2197

figures 3, 4, and 6 see http://

Background Quantification of the disease burden caused by different risks informs prevention by providing an See Comment pages 2053, 2054, account of health loss different to that provided by a disease-by-disease analysis. No complete revision of global disease burden caused by risk factors has been done since a comparative risk assessment in 2000, and no previous analysis has assessed changes in burden attributable to risk factors over time.

See Articles pages 2071, 2095, Methods We estimated deaths and disability-adjusted life years (DALYs; sum of years lived with disability [YLD] and years of life lost [YLL]) attributable to the independent effects of 67 risk factors and clusters of risk factors for 21 regions \*Author listed alphabetically in 1990 and 2010. We estimated exposure distributions for each year, region, sex, and age group, and relative risks per floint senior authors unit of exposure by systematically reviewing and synthesising published and unpublished data. We used these estimates, ‡Corresponding author together with estimates of cause-specific deaths and DALYs from the Global Burden of Disease Study 2010, to calculate See Online for appendix the burden attributable to each risk factor exposure compared with the theoretical-minimum-risk exposure. We For interactive versions of incorporated uncertainty in disease burden, relative risks, and exposures into our estimates of attributable burden.

walthmetricsandevaluation or gbd/visualizations/regional Institute for Health Metrics and Evaluation (S S Lim PhD, A D Flaxman PhD, K G Andrews MPH C Atkinson BS

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Findings In 2010, the three leading risk factors for global disease burden were high blood pressure (7.0% [95% uncertainty interval 6 · 2-7 · 7] of global DALYs), tobacco smoking including second-hand smoke (6 · 3% [5 · 5-7 · 0]), and alcohol use (5.5% [5.0-5.9]). In 1990, the leading risks were childhood underweight (7.9% [6.8-9.4]), household air pollution from solid fuels (HAP; 7.0% [5.6-8.3]), and tobacco smoking including second-hand smoke (6.1% [5.4-6.8]). Dietary risk factors and physical inactivity collectively accounted for 10.0% (95% UI 9-2-10-8) of global DALYs in 2010, with the most prominent dietary risks being diets low in fruits and those high in sodium. Several risks that primarily affect childhood communicable diseases, including unimproved water and sanitation and childhood micronutrient deficiencies, fell in rank between 1990 and 2010, with unimproved water

www.thelancet.com Vol 380 December 15/22/29, 2012

### http://www.thelancet.com/themed/global-burden-of disease



Article

## Exposure Assessment for Estimation of the Global Burden of Disease Attributable to Outdoor Air Pollution

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2005 population-weighted regional estimated average PM<sub>2.5</sub>

Distributions of selected regional 2005 estimated PM<sub>2.5</sub> by urban and rural areas

## Needed: a risk model for PM<sub>2.5</sub> exposure over the entire global range



**Ischemic Heart Dise** 



Hazard Ratio



Hazard Ratio





Relative Risk

## Comparison of Ambient Air Pollution Linear (red) and IER (blue) Risk Models for IHD Mortality



PM2.5 (ug/m3)

Relative Risk

## **Top 15 Global Risk Factors in 2010**



# Themes

- Criteria:
  - GBD considers an appropriate treatment of "imperfect" data better is than no data
- Problem Characteristics
  - No data on risk at high ambient concentrations
  - Needed to incorporate 'indirect' information form disparate combustion sources
- Strengths
  - Something is better than nothing
  - Estimate risk for sources with no direct information (HAPs and CV mortality)
- Limitations
  - Many (as yet) untested assumptions
- Research Needs
  - Conduct cohort studies in highly polluted environments (Asia)