Introduction to the Global Burden of Disease: *Global Effects Local Science*

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The Global Burden of Disease (GBD)

- A systematic scientific effort to quantify the magnitude of health loss from disease and injuries in 187 countries around the world from 1990 to 2010
  - E.g. cardiovascular disease, respiratory disease, HIV-AIDS, cancer road traffic injuries and
- Risks associated with conditions linked with those diseases
  - E.g. smoking, diet, high blood pressure, air pollution, overweight
  - Measured as “Disability Adjusted Life Years (DALYs) and Mortality”
- Last completed with WHO for Year 2000
- Newest version, funded by Gates Foundation, was published in December, 2012
  - HEI leadership for outdoor air pollution analysis
Published in Special Triple Issue of The Lancet
Previous Global Burden of Disease in 2000
Mortality attributable to leading risk factors

Ezzati et al. 2002; WHO 2002

Mortality in thousands (Total 55.86 million)
Much worldwide press describing the new GBD... from a global perspective, by region

**TOP 10 risk factors for disease in 2010**

1. Household air pollution from solid fuels
2. Smoking/second hand smoke
3. High blood pressure
4. Childhood underweight
5. Low fruit intake
6. High plasma glucose
7. High fasting plasma glucose
8. Alcohol use
9. Iron deficiency
10. Sub optimal breastfeeding

**Top killers across the world**

- High blood pressure: 3.5
- Household air pollution from solid fuels: 3.4
- High body-mass index: 3.4
- High fasting plasma glucose: 3.1
- Air pollution: 2
- High cholesterol: 0.2
- Low bone mineral density

**Death due to dietary risk factors**

- Disease attributable to tobacco smoking: 6.3
- Alcohol and drug use: 5
- Low diet of fruits: 4.9
- High sodium diet: 4
- Low nuts, seeds diet: 2.5
- Low vegetable food: 1.8
- Occupational risk factors accounted: 0.9 (figs in million)
Global Burden of Disease Regions:
India, included in “South Asia”
(also Pakistan, Nepal, Bangladesh, Afghanistan, Bhutan)
All been following press about high air pollution in Beijing, other Chinese cities

- Cyclists travel on the road on a hazy day in Huaibei, in central China's Anhui province, Jan. 14, 2013.
India: Many Cities Substantially Exceed WHO and Indian Air Quality Guidelines

2008 Annual Mean PM$_{10}$ Levels In Indian Cities*

WHO Guideline: 20 µg/m$^3$

India Standard: 60µg/m$^3$

Source: WHO 2011
What are the sources of global science on air pollution and health?
Particulate Matter (PM)

- High levels of PM (> 500 μg/m³) known to cause premature death
  - e.g. London 1952
- Many studies in US, Europe, elsewhere have found association of PM with mortality at much lower levels (<50 μg/m³)
  - No evidence of a “threshold” (safe level)

**Key new information:**
- Increasing local studies in Asia, Latin America confirm local effects
Public Health and Air Pollution in Asia – Science Access on the Net (PAPA-SAN)

• Compendium of studies on health effects of air pollution in Asia
• Currently > 420 studies in 11 countries
  • 44 Studies in India

*available at http://www.healtheffects.org/Asia/papasan-home.htm
Data from India: HEI Study in Chennai

- Careful analysis of *daily trends in air pollution and all cause mortality*
- Dr. Kalpana Balakrishnan and colleagues
- Overseen by HEI
- Independently and Intensively Peer Reviewed
- **Results:** Approximately 0.3% - 0.6% increase in mortality per 10 µg/m3 PM10
Asia in a Global Context

*(PM$_{10}$ and Daily Mortality)*

The effects of pollution are more similar than different ... ...and global science can be broadly relevant.
Public Health Impact can be a major driver of decisions

• GBD documents that air pollution is near the pinnacle of important factors affecting global public health

• High levels of outdoor air pollution, *is responsible for over 3.2 million premature deaths annually* and 74 million years of *healthy life years lost* around the world

• Developing Asia, including India and China bears fully 2/3 of the world wide global health burden in this key area

• 60 years of western health studies and an increasing base of high quality Indian health studies provide confidence in this assessment
• Today we will hear about the India specific results across a range of pollutants, people, and diseases
• How those results were calculated, and how their impact can be mitigated

• “Improving the health and well being of the world’s population is a moral imperative essential for stability and progress”  IHME 2012
Thanks!
Robert O’Keefe
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Major Report from:
HEI’s Public Health and Air Pollution in Asia (PAPA)
Nov. 2010

Summary of Current Global Epidemiologic Evidence on Health Effects of Air Pollution: Implications For Asia

PAPA SAN: Overview of all Asian health effects studies identified through 2007

Quantitative review (meta-analysis) of more than 80 time-series studies of daily mortality and hospital admissions
- Including 7 NEW PAPA Studies

First-ever review of over 100 studies of the chronic effects of exposure to air pollution (to be published separately)