Using the GBD results for progress on Air Quality Management in India

Some challenges, many opportunities

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### DALYS: South Asia by Risk Factor

<table>
<thead>
<tr>
<th>1990</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Childhood underweight</td>
<td>1 Household air pollution</td>
</tr>
<tr>
<td>2 Household air pollution</td>
<td>2 Smoking</td>
</tr>
<tr>
<td>3 Suboptimal breastfeeding</td>
<td>3 High blood pressure</td>
</tr>
<tr>
<td>4 Smoking</td>
<td>4 Childhood underweight</td>
</tr>
<tr>
<td>5 Iron deficiency</td>
<td>5 Low fruit</td>
</tr>
<tr>
<td>6 Ambient PM pollution</td>
<td>6 Ambient PM pollution</td>
</tr>
<tr>
<td>7 High blood pressure</td>
<td>7 High fasting plasma glucose</td>
</tr>
<tr>
<td>8 Low fruit</td>
<td>8 Iron deficiency</td>
</tr>
<tr>
<td>9 Sanitation</td>
<td>9 Alcohol use</td>
</tr>
<tr>
<td>10 Alcohol use</td>
<td>10 Suboptimal breastfeeding</td>
</tr>
<tr>
<td>12 High fasting plasma glucose</td>
<td>21 Sanitation</td>
</tr>
</tbody>
</table>

The diagram shows the top 12 risk factors for DALYS in South Asia for the years 1990 and 2010. Lines connecting the factors indicate changes or relationships between the years.
The Challenge

- The burden is not decreasing and the evidence is unequivocal!
- The burden is seamless across rural–urban boundaries
- Interventions to tackle OAP and HAP would have to be in sink (at least in some measure)
- WHO-AQGs are universally applicable for defining counterfactuals but NAAQM focused only on the urban
- Density of intervention efforts would need to be substantively increased to achieve and demonstrate health benefits
- Range of health effects are broader and magnitudes bigger than previously estimated (more chronic outcomes included in the ambit)
- Multitude of competing risk factors

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25-30% of outdoor particle pollution in India is from household fuels.

The Opportunities

- **Extensive base of ground level air quality monitoring information for both validating models and interpolation on exposure–response curves**
- **Some in-country exposure response for short-term health effects**
- **First ever maternal, child and adult air pollution cohorts launched by ICMR to both develop integrated IERs and develop exposure models for use in on-going cohorts**
- **Multiple CVD/Chronic disease cohorts underway allowing an examination of air pollution as a risk factor**
- **Increasing base of geo-coded health information**
HEI-PAPA-Chennai results

Balakrishnan et al., 2011

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Integrated Exposure-Response: Outdoor Air, SHS, and Smoking and Heart Disease

![Graph showing relative risk against annual mean μg/m³ of PM$_{2.5}$]

- **Relative Risk**
- **Annual mean μg/m³ of PM$_{2.5}$**

- **HAP Zone**
- **Secondhand Tobacco Smoke**
- **Outdoor Air Pollution**

CRA, 2012
ICMR-CAR Research Framework

On going Adult SRU-cohort
On Endo-Vascular Disease

Primarily Rural & HH fuel use related

Primarily Urban & Fossil fuel use related

Indoor

Exposure Assessment & Modeling

Outdoor

ADULTS

PREGNANT WOMEN & CHILDREN

New Mother-Child Cohort for Adverse Pregnancy Outcomes/ ALRI
**Brief Overview of ICMR-CAR Objectives**

**I MC Cohort**
- Establish the relationship between air pollution exposures and select pregnancy and early childhood outcomes in a rural urban mother child cohort

**II Adult cohort**
- Assess exposures for adults in an on-going rural–urban SRU cohort to allow long-term exposure reconstructions and to establish associations with pulmonary function

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**III Exposure Modeling**

**IV Land Use Regression Modeling**

**V Gene-Environment Interactions**
ICMR-CAR AP-Health Outcomes

- **Pregnancy outcomes**
  - Primary: Birth Weight
  - Secondary: Gestational Age; Spontaneous/missed abortions; Intrauterine fetal demise (IUFD); Intrauterine growth retardation (IUGR); Premature birth; Still birth
  - Exploratory: Birth defects

- **Child Health Outcomes**
  - Primary: Acute Respiratory tract infection
  - Secondary: Neonatal & Infant mortality

- **Adult Outcomes**
  - Primary: Pulmonary Function
  - Exploratory: Inflammatory Biomarkers; Endovascular Changes

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Moving from use of IERs for burden estimations to ascertaining how clean is clean enough?

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Ground Reality on risk perception

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Next steps

- Inform policy actions based on exposure reduction potentials of alternative technologies without requesting additional research (policy for evidence and not evidence for policy)

- Launch a national burden of disease assessment focused on OAP and HAP in collaboration with the GBD group

- Launch a public portal enabling state level assessments

- Direct research efforts towards understanding E-R and intervention impacts

THANK YOU
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