Indoor Air Pollution: Indian Perspectives

Dr. Damodar Bachani
Deputy Commissioner (NCD)
Ministry of Health & FW
Air Pollution & Disease Burden
Causes of Death (%) in Urban Population (25 to 69 years); India: 2001-2003

4 major NCDs - Cardiovascular diseases, Malignant & other Neoplasms, COPD, Asthma & other respiratory diseases & Diabetes Mellitus contributes to 55% of the total reported deaths in urban area

Source: Special Survey of Deaths, Registrar General of India
Causes of Death (%) in Rural Population (25 to 69 years); India: 2001-2003

3 major NCDs-Cardiocvascular diseases, COPD, Asthma & other respiratory diseases, Malignant & other Neoplasms contributes to 43% of the total reported deaths in rural area

Source: Special Survey of Deaths, Registrar General of India
Air Pollution & Disease Burden

• The Global Burden of Disease 2010 ranked air pollution as a leading cause of death and disability in India.

• Taken together, HAP and AAP account for 9% of the national disease burden.

• 13 of the top 20 cities in the world with the highest levels of PM 2.5 are in India, with Delhi featuring at the top of the list.
Deaths & DALYs due to Air Pollution

The Global Burden of Disease 2010 assessment

• Approx. 1.6 million premature deaths and 49 million Disability-Adjusted Life Years (DALYs) are attributable to fine PM≤ 2.5 µm arising from Household and Ambient Air Pollution in India

• 1.04 million premature deaths and 31.4 million DALYs to Household Air Pollution

• 627,000 deaths and 17.7 million DALYs to Ambient Air Pollution
Burden of disease attributable to 15 leading risk factors in 2010, expressed as a percentage of India DALYs

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

% DALYs attributable to risk factors

- War & disaster
- Intentional injuries
- Unintentional injuries
- Transport injuries
- Other non-communicable
- Musculoskeletal disorders
- Diabetes/urogen/blood/endo
- Mental & behavioral disorders
- Neurological disorders
- Digestive diseases
- Cirrhosis
- Chronic respiratory diseases
- Cardio & circulatory diseases
- Cancer
- Other communicable
- Nutritional deficiencies
- Neonatal disorders
- Maternal disorders
- NTD & malaria
- Diarrhea/LRTI/other infectious
- HIV/AIDS & tuberculosis
Top 15 causes of ill-health in India (GBD/CRA 2010)
HAP Total: ~1,000,000 premature deaths annually

Household Air Pollution is the leading cause in Women and Girls
Household Air Pollution is 3\textsuperscript{rd} leading cause in

Men and Boys:

Top 15 causes of ill-health in India (GBD/CRA 2010)
HAP Total: \(\sim\)1,000,000 premature deaths annually
Health Outcomes of Air Pollution

- Acute Lower Respiratory Infection (Pneumonia) and Chronic Obstructive Pulmonary Disease (COPD)
- Increasing evidence for Ischemic Heart Disease (IHD), Stroke, Lung Cancer, TB, Asthma and other cancers.
- Diseases associated with smoking are increasingly being associated with exposure to air pollution, albeit at lower levels of relative risk.
A. Male IHD: 17,102,900 DALYs

B. Female IHD 9,092,910 DALYs

C. Child ALRI 17,139,800 DALYs

India: IHD and child ALRI
Use of Solid Fuels in India
Use of Solid Fuels in India

• As per Census, 2011, 780 million Indians, out of 2.8 billion world wide, continue to rely on solid fuels such as wood, dung and agricultural residues for cooking.

• Percentage of solid fuel use has decreased gradually over the years, the absolute numbers remain comparable.
Population Cooking with Solid Fuels in 2010 (%)

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization

© WHO 2012. All rights reserved.
Satellite-based ambient PM$_{2.5}$

van Donkelaar et al, EHP 2010
%PM$_{2.5}$ from “Residential” Emissions from INTEX_B

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

1990:
85%: 700 million people using solid fuels

2010:
60%: 700 million people

780 million people in the Chulha Trap

780 million people in the Chulha Trap

Fig. 1. Distribution by state of households using biomass or coal as their main cooking fuel in 2005. From (IIPS, 2007).
State-wise estimates of 24-hr kitchen concentrations of PM2.5 in India

Solid-fuel using households

Balakrishnan et al., 2013
Exposure to Household Air Pollution

• National exposure models developed for solid fuel using household-level average estimates of PM 2.5
• Average exposures
  
  Women 337 µg/m3
  Men 204 µg/m3
  Children 285 µg/m3
• These levels are greatly in excess of the current WHO air quality guideline interim targets (WHO-AQG IT-1) of 35 µg/m3, or the Indian standard of 40 µg/m3.
Indian Population in 2010

Household Air Pollution

Increasing prosperity and development

- Very low income 200 million
- Low income 400 million
- Middle income 400 million
- High income 200 million

Non-solid fuels
- LPG: Liquified Petroleum Gas
- Ethanol, methanol
- Kerosene
- Coal
- Charcoal

Solid fuels
- Wood
- Crop waste, dung

Electricty
Natural gas
Interventions for Reducing Household Air Pollution & Health Hazards
Potential Interventions

- Make the “available” clean: Next-generation biomass cookstoves
- Make the “clean” available: Expand LPG, electric cooking, solar and other options
- Discourage use of coal and kerosene in household use
- Develop health-driven dissemination programs, e.g., smokeless villages, targeting particularly at-risk communities such as women and children; urban slum dwellers
<table>
<thead>
<tr>
<th>Indicator</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Relative reduction in premature mortality from NCDs</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>2 Obesity &amp; Diabetes Prevalence</td>
<td>Halt the rise</td>
<td></td>
</tr>
<tr>
<td>3 Relative reduction in prevalence of insufficient physical activity</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>4 Relative reduction in the prevalence of raised blood pressure</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>5 Relative reduction in mean intake of salt/sodium intake</td>
<td>20%</td>
<td>30%</td>
</tr>
<tr>
<td>Indicator</td>
<td>2020</td>
<td>2025</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Relative reduction in alcohol use</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Relative reduction in prevalence of current tobacco use</td>
<td>15%</td>
<td>30%</td>
</tr>
<tr>
<td>Eligible people receive drug therapy and counselling to prevent heart attacks and strokes</td>
<td>30%</td>
<td>50%</td>
</tr>
<tr>
<td>Availability of essential NCD medicines &amp; basic technologies to treat major NCDs in public/private facilities</td>
<td>60%</td>
<td>80%</td>
</tr>
<tr>
<td>Relative reduction in household use of solid fuel (indoor pollution)</td>
<td>25%</td>
<td>50%</td>
</tr>
</tbody>
</table>
Action Points for Target 10

• Promote inter-sectoral coordination for development of policies for reducing indoor air pollution due to use of solid fuel
• Develop and implement indoor air pollution guidelines
• Develop and conduct evidence based public health campaign to raise awareness on harmful effects of indoor air pollution
• Build capacity of health system for prevention and control of diseases resulting from indoor air pollution
Surveillance for Air Pollution & Effects on Health

- Expanded monitoring network, especially in rural areas
- Improved data collection regarding household cooking energy
- Better integration of exposure and health outcome assessments
- Standardizing data collection and reporting methods
- Better monitoring of rural ambient air pollution and relation to HAP
- Contribution of HAP to specific health burdens
- Using surveillance systems for monitoring of health indicators
- Estimating the economic impacts of HAP and AAP
SUSTAINABLE DEVELOPMENT

Thanks