Health: What is the scale of the issue?

Photo courtesy of: Ajay Pillarisetti
Presentation Overview

- Understanding and taking action on air pollution and health
- Monitoring of HAP & Health
- Methods - Exposure & Mortality
- Results – Global & regional
- Comparing the results
- Moving Forward
Incomplete combustion of biomass & fossil fuels produces air pollutants and climate pollutants

Direct health impacts - from air pollutants

Indirect health impacts – from climate change (extreme weather events, changes in disease vectors, agriculture production, water shortages etc.)

PM (e.g. black carbon)
The most studied and health-damaging pollutant is particulate matter (PM)

The relationship between PM & health is size dependent. Particles smaller than 2.5μm are able to penetrate deep into the lungs and effect the body more systematically leading to diseases like stroke, heart disease, cancers and pneumonia.

PARTICLE SIZE AND DEPOSITION

PM<10μm – Coarse
PM<2.5μm – Fine
PM<1μm – Ultrafine
WHO contributions to addressing this major health risk

- **Document the size of the burden of disease** – this presentation

- **Monitoring trends in air pollution**
  - Global databases on Household Energy Use & Household Air Pollution
  - Global database on Outdoor Air Pollution in cities
  - Global platform for Air Quality & Health → combining satellite imagery, chemical transport models & ground-level monitoring in development
WHO contributions to addressing this major health risk…

- **Normative work**
  - **WHO Air Quality Guidelines:** provide the scientific evidence on the health impacts of air pollution as well as recommendations on pollutant levels safe for health.
  
  - **WHO Indoor air quality guidelines for household fuel combustion:** provide guidance on policies and the impact of different fuels/technologies (for cooking, heating & lighting) on health.
WHO contributions to addressing this major health risk…

- **Raising awareness & providing support to countries**
  - Building capacity in-country and various settings for the monitoring of air quality and its impacts on health in both permanent and transitional settings
  - Building a stronger evidence base to guide countries and programmes on how to implement the most effective interventions to meet WHO Air Quality Guidelines levels
WHO contributions to addressing this major health risk…

Supporting understanding about:

Effective interventions (for health)

Health Risks from short-lived climate pollutants

Health Co-benefits of Mitigation

Connecting air pollution and health to sustainable development, climate & supporting international cooperation

Climate & Clean Air Coalition on SLCP

UN SG Sustainable Energy for All initiative

Global Alliance for Clean Cookstoves
WHO’S MONITORING OF HAP & HEALTH
WHO Monitoring of HAP & Health

- WHO has been reporting estimates of household solid fuel use and attributable household air pollution (HAP) disease burden estimates for over a decade.
WHO’s Monitoring of HAP & Health

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WHO produces exposure and HAP disease burden estimates to inform:
- MDG reporting
- Policy & planning of public health interventions
- Identify ‘hot spots’ to help ensure limited resources are allocated to areas where the need is greatest
- Build capacity in countries to plan, evaluate and monitor their HAP situation
- Monitor progress of international efforts to address air pollution, household energy, climate and sustainable development
METHODS FOR ESTIMATING EXPOSURE & DISEASE

Pop. Exposed to HAP = % of HH primarily using solid fuels for cooking

- Applied a non-parametric multi-level statistical model to estimate the percentage of households primarily relying on solid fuel for cooking

- To derive 2012 estimates, data were used from:
  - 711 National Surveys
  - 157 Countries
  - 99% of all LMIC

One country, so many surveys

One country, so few surveys
Methods: New Evidence for Health Outcomes

- Integrated exposure response function across combustion risk factors was used to derive risk estimates for ischemic heart disease, stroke, acute lower respiratory infections, and lung cancer.
Methods: New Evidence for Health Outcomes

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Disease outcomes:
- Acute Lower Respiratory Infections (ALRI);
- Chronic Obstructive Pulmonary Disease (COPD);
- Lung Cancer (Biomass + Coal);
- Ischaemic Heart Disease (IHD)
- Stroke

\[ PAF = \frac{P_e(RR-1)}{P_e(RR-1)+1} \]

<table>
<thead>
<tr>
<th>Disease</th>
<th>RR (95% CI) women</th>
<th>RR (95% CI) men</th>
</tr>
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<tbody>
<tr>
<td>ALRI</td>
<td>2.9 (2.0-3.8) for children</td>
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In some areas, a significant fraction of ambient air pollution (AAP) is caused by household fuel combustion.

To estimate the fraction of the AAP mortality caused by HAP, emissions estimates of HH solid fuel use for cooking as % of total ambient PM2.5 was calculated and applied to the AAP disease burden.
RESULTS: GLOBAL EXPOSURE & DISEASE BURDEN
Results: HAP Exposure, 2012

Population Primarily Relying on Solid fuels for cooking in 2012
Results: HAP Exposure, 2012

- 2.9 billion people exposed or...
- 42% of the global population
- % exposed has decreased, but the absolute # exposed has remained relatively constant

Population Primarily Cooking with Solid Fuels

<table>
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<th>Region</th>
<th>Exposed Percentage</th>
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<tbody>
<tr>
<td>HIC</td>
<td>0%</td>
</tr>
<tr>
<td>Wpr</td>
<td>45%</td>
</tr>
<tr>
<td>Sear</td>
<td>63%</td>
</tr>
<tr>
<td>Eur</td>
<td>12%</td>
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<tr>
<td>Emr</td>
<td>34%</td>
</tr>
<tr>
<td>Amr</td>
<td>15%</td>
</tr>
<tr>
<td>Afr</td>
<td>78%</td>
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Results: HAP Mortality, 2012

- **88%** due to non-communicable diseases
- **54%** of all childhood pneumonia deaths attributed to HAP in 2012
- **22%** of all stroke, 15% of all IHD, & 17% of all lung cancer deaths
Results: HAP Mortality, 2012

Number of deaths

- Africa (Afr): 597,158
- Amr LMI: 80,677
- Amr Hi: 1,247
- Emr LMI: 204,894
- Emr Hi: 3
- Eur LMI: 97,631
- Eur Hi: 17,937
- Sear: 1,692,427
- Wpr LMI: 1,616,431
- Wpr Hi: 6
Results: HAP Mortality, 2012

Deaths per 100,000 capita

Afr: 63
Amr LMI: 14
Amr HI: 0
Emr LMI: 38
Emr HI: 0
Eur LMI: 36
Eur HI: 3
Sear: 92
Wpr LMI: 99
Wpr HI: 0
World: 61
More than 50% of all HAP attributable deaths in women & children

Disease risk from HAP is higher in women than in men, but underlying disease rates are higher in men

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Results: Deaths to joint effects of HAP + AAP, global & by region

~ 7 million deaths globally
COMPARING THE RESULTS: WHAT ARE THE DIFFERENCES
Previous WHO estimates

- WHO estimated that in 2002, 2.7 billion people were exposed to household air pollution.
- Approximately 2 million deaths - most of which were due to childhood pneumonia and chronic obstructive pulmonary disease.
What accounts for the big increase in 2012?

• Underlying population & mortality estimates

• More disease outcomes accounted for

• Risk estimates – methods & values

• Methods of exposure assessment
How WHO is moving forward…

- **WHO Indoor Air Quality Guidelines: Household Fuel Combustion**
- **Global Platform on Air Quality & Health**
- **Tracking & monitoring of air quality & health impacts**
- **Cooperation with international initiatives on air quality, energy & health**