Air quality and health effects

WHO resources and support
History of WHO activities related to air pollution (1)

- **Regulation**

- **Interregional work**

- **Public health programmes**

- **Data collection**
  - Since 1973 GEMS/Air

WHO Regional Office for Europe (1980). Glossary on air pollution. Copenhagen: WHO Regional Office for Europe

WHO Regional Office for Europe (2002). Release of the first version of the AirQ software

Urban air pollution: Global and regional challenges but we are aware of the importance of cities and the role they can play against air pollution.
WHO guidelines for ambient air quality (WHO AQGs)

The first edition!

1987

2000

2006

Update of WHO Global Air Quality Guidelines

Ongoing update

Under development since 2016
WHO Air Quality Guidelines

Robust public health recommendations
Intended for worldwide use
Support informed decision-making
Comprehensive and objective assessment of evidence
Evolution of WHO Air Quality Guidelines (WHO AQGs)

✨ Changing number of air pollutants included

1987

Organic gases:
- Acrylonitrile
- Benzene
- Carbon disulfide
- 1,2-Dichloroethane
- Dichloromethane
- Formaldehyde
- Polynuclear aromatic hydrocarbons
- Styrene
- Tetrachloroethylene
- Toluene
- Trichloroethylene
- Vinyl chloride

Indoor:
- Environmental tobacco smoke
- Man-made vitreous fibres

2005

Classical air pollutants

- Particulate matter
- Nitrogen dioxide
- Ozone
- Sulfur dioxide

Since 2016

Classical air pollutants

- Nitrogen dioxide
- Ozone
- Sulfur dioxide
- Carbon monoxide

Mineral dust of natural origin
Evolution of WHO Air Quality Guidelines (WHO AQGs)

- Changing number of air pollutants included
- Accumulated scientific evidence and formulation of guidelines
- Use of WHO AQGs to protect public health; environmental equity
- Importance of risk communication
- Introduction of interim targets to facilitate implementation
- Evolving approach to evaluating evidence and developing guidelines
- Consideration of indoor air pollutants
WHO Indoor Air Quality Guidelines

2009

WHO GUIDELINES FOR INDOOR AIR QUALITY

DAMPNESS AND MOULD

2010

WHO GUIDELINES FOR INDOOR AIR QUALITY

SELECTED POLLUTANTS

2014

WHO HANDBOOK ON INDOOR RADON

A PUBLIC HEALTH PERSPECTIVE
Uptake of WHO AQG in air quality standards

- UNECE Convention on Long-range Transboundary Air Pollution
  Joint Task Force on the Health Aspects of Air Pollution established in 1998; chaired by WHO ECEH

- European Union legislation
  WHO AQGs explicitly referred to in the Directive on ambient air quality and cleaner air for Europe

National ambient air quality standards in relation to WHO AQG for PM$_{10}$

https://link.springer.com/article/10.1007/s00038-017-0952-y
AND....
Global Platform on Air Quality and Health

Priorities

• Refinement of exposure measurements
• Effectiveness of face masks, air filters
• Effects of desert dust on health
• Effects of re-suspended particles on health
• Effects of biomass burning on health
• Low cost air quality sensors
• Household and ambient air pollution relationship
• Household energy: Enhanced monitoring of use and health impacts through surveys and others
Air quality in cities
Clean energy access
Mortality from air pollution
WHO ambient air quality database

Webpage:  www.who.int/airpollution/data/cities
App:  whoairquality.shinyapps.io/AmbientAirQualityDatabase/
Trends in air pollution
Changes in concentration (2010-2016)
91% of world population breathe an air above the WHO Air Quality Guidelines.
Exposure to air pollution in 2016

91% of world population breathe air above the WHO Air Quality Guidelines

4.2 million deaths in 2016
Input information needed for assessing the impacts of air pollution

Air pollution

Population

Health data

Risk

Source: <a title="Air Pollution PNG Black And White" href="http://pluspng.com/air-pollution-png-black-and-white-9055.html">Air Pollution PNG Black And White</a>
AirQ+ software tool for health risk assessment of air pollution

http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/activities/airq-
AirQ+ 1.3 new version in three languages

Support to countries
WHO has been supporting many countries

• Scientific support
• Capacity building
• Track Progress
3 billion people, 3 decades....
% Exposed to Household Air Pollution from Cooking (2016)

Population (%)
- <5
- 5-25
- 26-50
- 51-75
- 76-95
- >95
- Data not available
- Not applicable

Women and Children
accounted for over 60% of all premature deaths from HAP in 2012.

Black Carbon
The rapid transition of three billion people from using polluting to clean fuels and technologies could be one of the most effective black carbon mitigation opportunities of all.

3.8 million
die prematurely every year from household air pollution from cooking (2016). Household air pollution is mostly created by using kerosene and solid fuels such as wood with polluting stoves, open fires and lamps.

- Women and children are the most at risk.
- 18% from stroke
- 27% from ischaemic heart disease
- 20% from chronic obstructive pulmonary disease (COPD)
- 8% from lung cancer
- 27% are due to pneumonia

TIME LOST
Girls in households that cook with polluting fuels spent up to 35 hours a week collecting wood and water.
Defining “Clean” Energy for Health

WHO Guidelines for indoor air quality: household fuel combustion

Summary of Guideline Recommendations

- Address **ALL** household energy end-uses
- Provides **performance** PM & CO targets for fuels & stove/lamp combinations
- No unprocessed **coal** use, avoid **kerosene**
- Prioritize the healthiest or ‘cleanest’ options in the transition to clean household energy
- Synergies with climate change mitigation
Definition “Clean” Energy for Health

Exposure and disease burden

Clean - unexposed

Polluting - exposed
Definition “Clean” Energy for Health

Harmonizing efforts and definitions

Clean - unexposed

Polluting - exposed
So what’s next?

- How can I monitor the progress & impacts of interventions?
- What is the household energy & health situation in my country?
- Who is working on household energy and/or related health issues?
- What are the health benefits of different interventions?
- What are some tools to better equip the health sector on clean HH energy?
Clean Household Energy Solutions Toolkit (CHEST)

*Information & tools to transition to clean energy in the home*

- Stakeholder Mapping
- Needs Assessment and Situation Analysis
- Identification of Technological and Policy Interventions
- Guidance on Standards and Testing
- Monitoring and Evaluation
- Engaging the Health Community
- Communication and Raising Awareness
What is the household energy and health situation in country?

Rural
46% of the population live in rural areas
94% cook mainly with solid fuels or kerosene

Urban
54% of the population live in urban areas
62% cook mainly with solid fuels or kerosene

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Premature deaths/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child and maternalmalnutrition</td>
<td>22 988</td>
</tr>
<tr>
<td>Air pollution</td>
<td>22 396</td>
</tr>
<tr>
<td>High systolic blood pressure</td>
<td>21 230</td>
</tr>
<tr>
<td>Dietary risks</td>
<td>16 633</td>
</tr>
<tr>
<td>Alcohol and drug use</td>
<td>15 434</td>
</tr>
</tbody>
</table>

GHANA

Fuelwood harvesting

Opportunities for transition to clean household energy

NDIA
What are the policy and technological solutions & how to track their impacts?
What are resources to better communicate risk & solutions for household energy use?

AIR POLLUTION AND CHILD HEALTH

Prescribing clean air
Sustainable energy in health care: looking beyond SDG3
Urban health – many opportunities for action against air pollution

Solutions

- Invest in energy-efficient power generation.
- Improve domestic, industry and municipal waste management.
- Make greener and more compact cities with energy-efficient buildings.
- Reduce agricultural waste incineration, forest fires and certain agro-forestry activities.
- Provide universal access to clean, affordable fuels and technologies for cooking, heating and lighting.

Clean air for health #AirPollution
97% of cities in low- and middle-income countries with more than 100,000 inhabitants do not meet WHO air quality guidelines. (49% in high-income countries)

SEE YOUR OWN CITY’S LEVEL AT: BREATHLIFE2030.ORG
WHO knowledge goods for the dialogue across sectors

- Incorporating health in urban and territorial planning (with UN-Habitat, forthcoming)

- Housing and Health Guidelines (launch next month)
Analytical tools to support Health and Economic Impact Assessments

Development and application of analytical tools to support the assessment of the health and economic impacts of interventions in key sectors, including on transport, household energy, green space and land-use, solid waste management (open source, flexible, evidence-based tools)
Strengthening local capacity on urban health and air pollution

Regional training workshop on Environmental Health Impact Assessment, CEHA, Amman, Jordan, 2017

Capacity building activities as part of Urban Health Initiative pilot project in Kathmandu, 2018

Capacity building activities as part of Urban Health Initiative pilot project in Accra, 2018

Urban Health Initiative and BreatheLife training event at the World Urban Forum, Kuala Lumpur, Malaysia, 2018
Equipping health care workers to address air pollution issues

To prevent PNEUMONIA:
- Keep your home smoke free. Use a clean cookstove - such as ethanol, LPG, biogas, or clean biomass stoves.
- Change from kerosene to solar lamps if possible.
- Keep smoke out of the home. Cook in a well-ventilated place and keep children away from cookstove fire and fuels, and smoke.
- Wash hands often, feed your child nutritious food and get them all recommended vaccinations.

**DANGER SIGNS**
- 1. Fever
- 2. Breathing to fast
- 3. Chest in-drawing
- 4. Unusually sleepy/can’t wake up
- 5. Coughing gets worse

**ADVICE TO THE CAREGIVER**
- If PNEUMONIA is suspected:
  - Seek care quickly at nearest health centre.
  - Watch out for danger signs and return to the health centre straight away if you see them.

**COOKSTOVE SMOKE KILLS**
- One half of childhood deaths from PNEUMONIA

**BREATHE LIFE**
Cookstove smoke kills
Protect your child from cookstove smoke and reduce their risks of household air pollution

Community Health Workers starting their daily routine in Cajamarca, Peru. Photo credit: PAHO Peru
Outreach to citizens and communities

Localizing BreatheLife through the Urban Health Initiative
Identifying shared pollutants for climate change and air pollution

- **Transport, buildings, Industry, Land use**
  - Air pollution: PM/BC, O$_3$, NO$_x$
  - Climate Change (SLCPs): BC, methane, O$_3$
  - Climate Change: CO$_2$

- **Local/short term health impacts**
- **Global/long term health impacts**
Identifying common drivers of climate change and air pollution

Global Sources of Greenhouse Gas Emissions
- Buildings: 24%
- Transport: 6%
- Industry: 14%
- Energy inc. Electricity/heat: 21%
- Agriculture: 35%

49Gt CO$_2$eq

Global Sources of Urban Ambient PM$_{2.5}$
- Domestic fuel burning: 20%
- Transport: 25%
- Industry (inc. electricity generation): 18%
- Other human origin: 15%
- Natural sources: 22%

4.2 million deaths/yr

IPCC, 2014
Karagulian et al, 2015
Ensuring we get the health benefits of decarbonization

Global total net CO₂ emissions

In pathways limiting global warming to 1.5°C with no or limited overshoot as well as in pathways with a high overshoot, CO₂ emissions are reduced to net zero globally around 2050.

Non-CO₂ emissions relative to 2010

Emissions of non-CO₂ forcers are also reduced or limited in pathways limiting global warming to 1.5°C with no or limited overshoot, but they do not reach zero globally.

Methane emissions

Black carbon emissions

Nitrous oxide emissions

Energy-supply

Trade-offs

Synergies

Energy-demand

Trade-offs

Synergies

Land

Trade-offs

Synergies

SDG 3
Good Health and Well-being

IPCC report on global warming of 1.5C (2018)
Quantifying the health co-benefits of climate mitigation action

### Global preliminary estimated avoided deaths attributable to PM$_{2.5}$ under two emissions scenarios

<table>
<thead>
<tr>
<th>Emissions scenario</th>
<th>2050 (median)</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDC commitments</td>
<td>109,308</td>
<td>(75,400, 158,520)</td>
</tr>
<tr>
<td>2°C scenario</td>
<td>383,194</td>
<td>(255,511, 576,280)</td>
</tr>
</tbody>
</table>

Preliminary research findings from study conducted by WHO, Basque Centre for Climate Change, University of Exeter and the EC Joint Research Centre Directorate for Energy, Transport, and Climate, Air and Climate Unit (2018)
Reporting evidence directly to countries

Outdoor air pollution can have direct and sometimes severe consequences for health.

Fine particles which penetrate deep into the respiratory tract subsequently increase mortality from respiratory infections, lung cancer, and cardiovascular disease.

The five most populated cities for which there is air pollution data available have annual mean PM$_{2.5}$ levels that are above the WHO guideline value of 10 µg/m$^3$.

Source: Ambient Air Pollution Database, WHO, May 2014.

**HOUSEHOLD AIR POLLUTION**

**BANGLADESH**

Percentage of population primarily using solid fuels for cooking (%), 2013

- **RURAL AREAS**: >95%
- **URBAN AREAS**: 59%
- **NATIONAL TOTAL**: 89%

Source: Global Health Observatory, data repository, World Health Organization, 2013

Percent of total deaths from ischaemic heart disease, stroke, lung cancer, chronic obstructive pulmonary disease (18 years +) and acute lower respiratory infections (under 5 years) attributable to household air pollution, 2012

- Total Deaths: 192,400
- (44%) Attributable to household air pollution

Source: Global Health Observatory, data repository, World Health Organization, 2012

Air pollution in and around the home is largely a result of the burning of solid fuels (biomass or coal) for cooking.

Women and children are at a greater risk for disease from household air pollution. Consequently, household air pollution is responsible for a larger proportion of the total number of deaths from ischaemic heart disease, stroke, lung cancer and COPD in women compared to men.

In Bangladesh, 67% percent of an estimated 17,100 child deaths due to acute lower respiratory infections is attributable to household air pollution (WHO, 2012).
Bringing air pollution and health to the climate negotiations

Presidency Event on Climate Change and Health: UNFCCC COP-23, Bonn, November 2017
Engaging the health sector on climate change and air pollution

92% of people worldwide do not breathe safe air

Join us in breathing life back into our cities and our planet at BreatheLife2030.org

Global call to action on climate and health

First ever health report to UNFCCC-COP

Health/AP as priority in 2019 UNSG climate summit
Thank you