Energy access: Accelerating the adoption of clean cooking, heating and lighting to protect public health

Heather Adair-Rohani, WHO Dept Environment, Climate Change & Health
In 2020, around 1/3 of the world’s population still relies mainly on polluting fuels and stove combinations for cooking.
Why is lack of access to clean household energy a health problem?

Billions are exposed to high levels of health-damaging pollutants

Millions of deaths annually & leading cause of burns/poisoning in LMIC

Adverse impacts are greatest in women, children and infants and a major source of climate changing pollutants
Household air pollution is air pollution generated by household fuel combustion, leading to indoor air pollution, and contributing to ambient air pollution.

WHO Guidelines for Indoor Air Quality: Household fuel combustion, 2014

Credits: Heather Adair-Rohani, Nigel Bruce, Jessica Lewis.
Household Air Pollution: Composition

- Household air pollution contains a mixture of pollutants, including:
  - Particulate matter (PM)
  - Carbon monoxide (CO)
  - Nitrogen dioxide (NO₂)
  - Methane (CH₄)
  - Polyaromatic hydrocarbons (PAH)
  - Volatile organic compounds (VOC)
  - Black carbon
  - Carbon dioxide (CO₂)
  - Nitrous oxide (N₂O)

- Particulate matter <2.5 µg/m³ in diameter can penetrate deep into the lungs, enter the bloodstream, and damage tissues and organs
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Household Air Pollution & Impacts on Health

- PM
- CO
- PAH
- NOx
- SOx

- Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Childhood pneumonia
- Lung cancer
- Cataract

- Adverse Pregnancy Outcomes
- Cognitive development
- Tuberculosis
- Diabetes
How big is the health burden?

3.2 million deaths per year attributed to household air pollution from cooking alone, accounting for only those diseases with the strongest evidence.

Household air pollution also accounted for the loss of an estimated 86 million healthy life years, with the largest burden falling on women living in low- and middle-income countries.

Accounting for other end uses (e.g. space heating, lighting, supplementary cooking) and health outcomes would likely increase these numbers.
An overall perspective on the impacts of household energy use beyond disease

<table>
<thead>
<tr>
<th>Safety risks</th>
<th>Energy supply and deforestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns, scalds, poisoning, musculo-skeletal injuries, animal bites, violence etc.</td>
<td>Charcoal production, a fuel widely used in urban areas, is an important cause of deforestation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Climate impacts</th>
<th>Time burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polluting fuels and technologies contribute to global warming as they emit both CO₂ and SLCPs.</td>
<td>Fuel collection and cooking with inefficient stoves take time that could be spent on other activities.</td>
</tr>
</tbody>
</table>
Beyond cooking: health risks from other household energy

Residential heating and lighting with polluting fuels like kerosene, wood and coal devices is a source of household air pollution in some parts of the world.

The same inefficient devices for cooking are used for space heating.

Kerosene or paraffin, a polluting liquid fuel for health and climate is frequently used for lighting and space heating in some regions.

Household air pollution leaking outdoors via chimneys and hoods is an important source of ambient (outdoor) air pollution across the world, particularly in North America, Europe, and some parts of Asia.
HAP – Source of Outdoor Air Pollution

Results from HEI’s State of Global Air

India - 2015

<table>
<thead>
<tr>
<th>Source</th>
<th>Number of Deaths (Thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Biomass Burning</td>
<td>268</td>
</tr>
<tr>
<td>Anthropogenic Dust</td>
<td>100</td>
</tr>
<tr>
<td>Powerplant Coal</td>
<td>83</td>
</tr>
<tr>
<td>Industrial Coal</td>
<td>82</td>
</tr>
<tr>
<td>Open Burning</td>
<td>66</td>
</tr>
<tr>
<td>Brick Production</td>
<td>24</td>
</tr>
<tr>
<td>Transportation</td>
<td>23</td>
</tr>
<tr>
<td>Distributed Diesel</td>
<td>20</td>
</tr>
</tbody>
</table>

China - 2013

<table>
<thead>
<tr>
<th>Source</th>
<th>Number of Deaths (Thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial coal</td>
<td>155</td>
</tr>
<tr>
<td>Transportation</td>
<td>137</td>
</tr>
<tr>
<td>Residential biomass burning</td>
<td>136</td>
</tr>
<tr>
<td>Noncoal industry</td>
<td>95</td>
</tr>
<tr>
<td>Power plant coal</td>
<td>87</td>
</tr>
<tr>
<td>Open burning</td>
<td>70</td>
</tr>
<tr>
<td>Residential coal burning</td>
<td>41</td>
</tr>
</tbody>
</table>
HAP & Climate linkages

- Household emissions of climate-related pollutants escape from the home, contributing to ambient air pollution and climate change
- Cooking with polluting fuels is responsible for ~2% of human-created greenhouse gas emissions
- Household-level burning of polluting fuels is responsible for more than half of all global black carbon emissions
- Black carbon has a warming capacity up to 1,500 times greater than carbon dioxide
- Deforestation from unsustainable harvesting of trees for fuelwood and charcoal production contributes to carbon dioxide in the atmosphere
Inequities in clean energy transition – not universal

• The proportion of the population primarily using clean fuels and technologies for cooking has only increased by 12% over the last 10 years.

• Most progress has been in the 5 most populous LMICs (other LMICs have seen little improvement).

• If current trends continue, a quarter of the world’s people, mostly in low- and middle-income countries, will lack access to clean cooking fuels in 2030.

Source: Tracking SDG 7
https://trackingsdg7.esmap.org

5 most populous LMICs: Brazil, China, India, Indonesia, Pakistan
Number of people lacking access to clean fuels and technologies, by region, 2000–20

Source: Tracking SDG 7
https://trackingsdg7.esmap.org
Urban vs Rural Access – Equity & trends changing with time

In 2020, 86 percent of people living in urban areas and just 48 percent of the rural population had access to clean fuels and technologies. In Sub-Saharan Africa, more than 93 percent of the rural population lacks access to clean cooking fuels and technologies.

Source: Tracking SDG 7
https://trackingsdg7.esmap.org
Challenges in achieving universal clean household energy adoption
Considering the full picture!

One of the problems faced is that, often, polluting and clean energy sources **co-exist** at the household level.
FUEL or STOVE STACKING = parallel use of multiple types of fuel and technologies in a single household as “stacking”.

<table>
<thead>
<tr>
<th>Energy service</th>
<th>Lower-income</th>
<th>Middle-income</th>
<th>Higher income</th>
</tr>
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<tbody>
<tr>
<td>Cooking</td>
<td><img src="diagram1.png" alt="Coal" /> <img src="diagram2.png" alt="Wood" /> <img src="diagram3.png" alt="Agricultural Residues" /> <img src="diagram4.png" alt="Dung" /></td>
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<td><img src="diagram5.png" alt="LP/Gas" /> <img src="diagram6.png" alt="Solar" /> <img src="diagram7.png" alt="Electricity" /></td>
</tr>
<tr>
<td>Lighting</td>
<td><img src="diagram8.png" alt="Candle" /> <img src="diagram9.png" alt="Open Fire" /> <img src="diagram10.png" alt="Kerosene" /></td>
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<td>Heating</td>
<td><img src="diagram1.png" alt="Coal" /> <img src="diagram2.png" alt="Wood" /> <img src="diagram10.png" alt="Kerosene" /> <img src="diagram3.png" alt="Agricultural Residues" /> <img src="diagram4.png" alt="Dung" /></td>
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<td><img src="diagram7.png" alt="Electricity" /> <img src="diagram5.png" alt="LP/Gas" /> <img src="diagram13.png" alt="Pellets" /> <img src="diagram14.png" alt="Oil" /></td>
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As countries transition to higher income levels, households transition to cleaner cooking, heating, and lighting energy sources. Source: Adapted from Sovacool (2012)
Stacking: Important to Consider Full Picture
All uses (cook, light, heat) must be clean to protect health
Barriers / 1 – Socio Cultural

- Cultural beliefs preferences, best cooking practices, familiar taste
- Gender norms
- Size of the house
  - the larger the more energy is required, the less incentive to change
- Community interactions
  - poor/good experiences with stoves can influence the whole community
- Level of education
  - lower level associated with greater reluctance to change
Barriers / 2 – Economic

- Income level or irregular income may be insufficient for purchasing
- Prioritization like school fees, healthcare and other expenditures seen as more important
- Perceived affordability if fuel/energy is purchased in small quantities, larger quantities outlay (e.g. LPG cylinder, electricity) may be perceived as unaffordable
- Upfront investment not always possible
- Lack of regulation and standardization
Barriers / 3 – Other factors

- LPG perceived as unsafe
- Unavailability or only intermittent availability
- Low emissions and fuel saving not as expected among users now seeking these features
- Lack of ‘cleaner’ transitional solutions with health benefit, particularly in more rural or remote areas
- Infrastructure – lack of adequate supply of electricity
What are some tools & resources available to support accelerating action to clean household energy for public health?
What can the health sector do?

- Provide evidence on health impacts of sustainable development & green economy strategies/technologies
- Develop evidence-based guidelines supporting effective interventions
- Use Health Impact Assessment (HIA) and other tools to assess policies and their health impacts
- Define and monitor health indicators to measure results and contribute to the tracking of SDGs (i.e. 3, 7, 11)
- Convene and advise Ministries of Health and other stakeholders to effectively address public health issues
- Leverage the ‘health argument’ to convene and advance policy discussions impacting health
WHO Guidelines for Indoor Air Quality: Household Fuel Combustion
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

Harmonizing efforts and definitions

Clean - unexposed

Polluting- exposed
WHO Tools to support countries in implementing the recommendations to achieve air quality guidelines

https://www.who.int/tools/clean-household-energy-solutions-toolkit/
Thank you

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