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Household air pollution

16 October 2024

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Key facts

- Around 2.1 billion people worldwide (around a third of the global population) cook using open fires or inefficient stoves fuelled by kerosene, biomass (wood, animal dung and crop waste) and coal, which generates harmful household air pollution.
- Household air pollution was responsible for an estimated 3.2 million deaths per year in 2020, including over 237 000 deaths of children under the age of 5.
- The combined effects of ambient air pollution and household air pollution are associated with 6.7 million premature deaths annually.
- Household air pollution exposure leads to noncommunicable diseases including stroke, ischaemic heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer.
- Women and children, typically responsible for household chores such as cooking collecting firewood, bear the greatest health burden from the use of polluting fuels and technologies in homes.
- It is essential to expand use of clean fuels and technologies to reduce household air pollution and protect health. These include solar, electricity, biogas, liquefied petroleum gas (LPG), natural gas, alcohol fuels, as well as biomass stoves that meet the emission targets in the WHO Guidelines.

Overview

Worldwide, around 2.1 billion people still cook using solid fuels (such as wood, crop waste, charcoal, coal and dung) and kerosene in open fires and inefficient stoves (1). Most of these people are poor and live in low- and middle-income countries. There is a large discrepancy

in access to cleaner cooking alternatives between urban and rural areas: in 2021, only 14% of people in urban areas relied on polluting fuels and technologies, compared with 49% of the global rural population.

Household air pollution is generated by the use of inefficient and polluting fuels and technologies in and around the home that contains a range of health-damaging pollutants, including small particles that penetrate deep into the lungs and enter the bloodstream. In poorly ventilated dwellings, indoor smoke can have levels of fine particles 100 times higher than acceptable. Exposure is particularly high among women and children, who spend the most time near the domestic hearth. Reliance on polluting fuels and technologies also require significant time for cooking on an inefficient device, and gathering and preparing fuel.

Guidance

In light of the widespread use of polluting fuels and stoves for cooking, WHO issued a set of normative guidance, [the Guidelines for indoor air quality: household fuel combustion](#), which offer practical evidence-based guidance on what fuels and technologies used in the home can be considered clean, including recommendations discouraging use of kerosene and recommending against use of unprocessed coal; specifying the performance of fuels and technologies (in the form of emission rate targets) needed to protect health; and emphasizing the importance of addressing all household energy uses, particularly cooking, space heating and lighting to ensure benefits for health and the environment. WHO [defines fuels and technologies](#) that are clean for health at the point of use as solar, electricity, biogas, liquefied petroleum gas (LPG), natural gas, alcohol fuels, as well as biomass stoves that meet the emission targets in the WHO Guidelines.

Without strong policy action, 1.8 billion people are estimated to still lack access to clean fuels and technologies in 2030 (1). There is a particularly critical need for action in sub-Saharan Africa, where population growth has outpaced access to clean cooking, and 923 million people lacked access in 2022. Strategies to increase the adoption of clean household energy include policies that provide financial support to purchase cleaner technologies and fuels, improved ventilation or housing design, and communication campaigns to encourage clean energy use.

Impacts on health

Each year, 3.2 million people die prematurely from illnesses attributable to the household air pollution caused by the incomplete combustion of solid fuels and kerosene used for cooking (see [household air pollution data](#) for details). Particulate matter and other

pollutants in household air pollution inflame the airways and lungs, impair immune response and reduce the oxygen-carrying capacity of the blood.

Among these 3.2 million deaths from household air pollution exposure:

- **32% are from ischaemic heart disease: 12% of all deaths due to ischaemic heart disease, accounting for over a million premature deaths annually, can be attributed to exposure to household air pollution;**
- **23% are from stroke: approximately 12% of all deaths due to stroke can be attributed to the daily exposure to household air pollution arising from using solid fuels and kerosene at home;**
- **21% are due to lower respiratory infection: exposure to household air pollution almost doubles the risk for childhood LRI and is responsible for 44% of all pneumonia deaths in children less than 5 years old. Household air pollution is a risk for acute lower respiratory infections in adults and contributes to 22% of all adult deaths due to pneumonia;**
- **19% are from chronic obstructive pulmonary disease (COPD): 23% of all deaths from chronic obstructive pulmonary disease (COPD) in adults in low- and middle-income countries are due to exposure to household air pollution; and**
- **6% are from lung cancer: approximately 11% of lung cancer deaths in adults are attributable to exposure to carcinogens from household air pollution caused by using kerosene or solid fuels like wood, charcoal or coal for household energy needs.**

Household air pollution accounted for the loss of an estimated 86 million healthy life years in 2019, with the largest burden falling on women living in low- and middle-income countries.

Almost half of all deaths due to lower respiratory infection among children under 5 years of age are caused by inhaling particulate matter (soot) from household air pollution.

There is also evidence of links between household air pollution and low birth weight, tuberculosis, cataract, nasopharyngeal and laryngeal cancers.

Impacts on health equity, development and climate change

Significant policy changes are needed to rapidly increase the number of people with access to clean fuels and technologies by 2030 to address health inequities, achieve the 2030 Agenda for Sustainable Development, and mitigate climate change.

- **Women and children disproportionately bear the greatest health burden from polluting fuels and technologies in homes as they typically labour over household chores such as cooking and collecting firewood and spend more time exposed to harmful smoke from polluting stoves and fuels.**

- **Gathering fuel increases the risk of musculoskeletal injuries and consumes considerable time for women and children – limiting education and other productive activities. In less secure environments, women and children are at risk of injury and violence while gathering fuel.**
- **Many of the fuels and technologies used by households for cooking, heating and lighting present safety risks. The ingestion of kerosene by accident is the leading cause of childhood poisonings, and a large fraction of the severe burns and injuries occurring in low- and middle-income countries are linked to household energy use for cooking, heating and lighting (2).**
- **The lack of access to electricity for over 750 million (1) people forces households to rely on polluting devices and fuels, such as kerosene lamps for lighting, thus making them exposed to very high levels of fine particulate matter.**
- **The time spent using and preparing fuel for inefficient, polluting devices constrains other opportunities for health and development, like studying, leisure time, or productive activities.**
- **Black carbon (sooty particles) and methane emitted by inefficient stove combustion are powerful short-lived climate pollutants (SLCPs).**
- **Household air pollution is also a major contributor to ambient (outdoor) air pollution.**

WHO response

WHO provides technical support and capacity building to countries and regions to evaluate and scale-up health-promoting household fuels and technologies. To address household air pollution and its negative impact on health, WHO:

- **develops guidelines for indoor air quality and household fuel combustion, to provide health-based recommendations on the types of fuels and technologies that protect health, and effective strategies for the dissemination and adoption of cleaner household fuels and technologies;**
- **builds capacity at the country and regional level through direct consultations and workshops on household energy and health;**
- **maintains the global household energy database to monitor progress in the transition to cleaner fuels and stove combinations in households, reporting as the custodian agency for reporting on SDG indicator 7.1.2, the proportion of the population with primary reliance on clean fuels and technologies. WHO also supports assessments of burden of disease from household air pollution resulted from the use of polluting fuel and technologies;**
- **develops and updates tools and resources such as the Clean Household Energy Solutions Toolkit (CHEST) to help countries identify stakeholders working on household energy and public health to design, implement and monitor policies addressing household energy for better health;**
- **supports governments to estimate costs and health benefits of implementing household energy interventions;**
- **convenes the global Health and Energy Platform of Action (HEPA), which strengthens cooperation between the health and energy sectors to ensure universal access to clean and sustainable energy for households and health-care facilities in order to protect health;**

- works with countries, researchers and other partners to harmonize methods of planning and evaluation across settings for consistent and rigorous household energy and health assessments;
- leads efforts with countries and surveying agencies to enhance, harmonize and pilot questions for national censuses and surveys, including assessing the health risks of using polluting household energy, as well as differentiated gender impacts from household energy practices; and
- develops guidance and resources for integrating clean household energy into global health and climate change initiatives as well as decision-support tools.

References

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 2. Puthumana JS, Ngaage LM, Borrelli MR, Rada EM, Caffrey J, Rasko Y: Risk factors for cooking-related burn injuries in children, WHO Global Burn Registry. Bull World Health Organ. 2021 Jun 1;99(6):439-445. <https://doi.org/10.2471%2FBLT.20.279786>
- Accelerating access to electricity in health-care facilities
 - Synthesizing evidence and knowledge on air pollution
 - Identifying solutions for countries