A black fog hovers over the villages of Odisha, India, so much so that the sun all but disappears. These dark skies are also thicker at certain times of the day. It is, in fact, precisely when women, with small children sitting nearby, are leaning over a traditional, indoor wood-fire stove, called a *chulha*, to cook food.

For twelve years, this has been how Vandana Duveh prepared meals for her family every day. “Everything was black,” she says. “The pots were black. The air was black. It was so smoky that my children couldn’t do homework inside the house,” she adds. “And I used to get sick and cough all the time.” For years, she did not know, or not fully understand, that chemical pollutants arising from this smoke were actually attacking her entire body.

In many regions of India, as well Asia, Africa and the Americas, people cook food using open flames inside their homes, or they prepare their meals over low quality kitchen equipment. To create fire, they may use anything from wood, coal, agricultural residue or even cow manure gathered from around their homes. These methods result in an estimated three billion people – one-third of the world population – being exposed to household air pollution (HAP), and to serious illnesses.¹ The fumes from substandard cooking are the fourth leading risk factor for all diseases in developing countries, according to the World Health Organization (WHO). A 2014 report from the Lancet Respiratory Medical Commission puts it succinctly: Air pollution is the biggest environmental cause of death worldwide.²
Smoke that kills
Global exposure to household air pollution

All over the world, people cook over open fires, and burn solid fossil fuels while generating smoke, which leads to household air pollution (HAP), which is the result of incomplete combustion of these fuels.

Population using solid fuels (%)
- <5
- 5-25
- 26-50
- 51-75
- 76-95
- >95
- Not applicable/No data

4
HAP is the fourth biggest health risk in the world.

4.3 million
People per year die worldwide from exposure to household air pollution.

7.7
Percent of total mortality attributable to household air pollution.
The silent, steady danger

People cook this way for a variety of reasons, including poverty, because often they have no access to electricity or cooking gas and, as importantly, because they lack information about the dangers of cooking this way. This was the case for Dr. Sola Olopade, who was raised in Nigeria and is now Professor of Medicine at the University of Chicago and a leading pulmonary disease physician. “Growing up, I was aware that people used firewood to cook, but usually it was done in open spaces outside. It was a normal part of the culture. I really had no idea of the ill effects. Now, as a pulmonologist, I’m sensitized to lung problems.”

As the clinical director of the Center for Global Health at the University of Chicago, Olopade has been leading research projects about household air pollution in the US and Africa. Originally, he intended to investigate allergies and asthma in rural Nigeria. Once there, he was shocked to find that about 70% of the women were cooking with firewood inside their homes. “For these women, this is normal. Preparing meals this way is expected of them, as it is for many women around the world. Even worse, many of these women were carrying their babies on their backs while cooking.” Newborns and infants are particularly vulnerable to lung disease, Olopade notes, due to their immature lungs and immune systems.

Olopade’s realizations led him to refocus his research. He confirmed an alarming result: Women who are exposed to household air pollution tend to have preterm babies with low birth weight. In comparison, a control group of pregnant women who prepared meals using ethanol stoves, which burn much more cleanly than traditional cookstoves, was more likely to carry their babies to term. “Regarding the maturation of babies, two weeks can make a big deal,” Olopade states. The health risks are also considerable for children. Exposure to household air pollution almost doubles the risk of childhood pneumonia. And among children under 5, over half of deaths from acute lower respiratory infections (ALRI) are due to indoor air pollution from household solid fuels.
Due to the incomplete combustion of these fuels, people inhale soot containing harmful black carbon and other small particles. According to WHO, household air pollution is the fourth biggest health risk in the developing world. Women lack both access to clean cookstoves and information about health risks for them and their children.

What Olopade learned affected him so much that he began dedicating a major part of his research to the threat from household air pollution – globally and in his home country. In Nigeria, for example, about 128 million people were still using biomass, coal or kerosene for their cooking needs in 2017. This is the largest region in the world with the population relying on biomass for cooking, and its persistence is deeply worrisome for Olopade. “This type of cooking is killing more people, overall, than HIV, tuberculosis and malaria combined, and these deaths are totally preventable,” he says. “And it’s women and children that have the highest risk.”

Poison in the air

One major reason that HAP causes disease is that incomplete fuel combustion contains a
mass of dangerous fine particles including black carbon, heavy metals and carbon monoxide. When inhaled, the particles travel from the lungs into the blood, which leads to diseases. According to WHO, the three main diseases that result from exposure to HAP contaminants are stroke (34%), ischemic heart disease (26%) and chronic obstructive pulmonary disease (COPD, 22%). Combined, these diseases lead to four million premature deaths annually.

- The impact of being exposed to household air pollution is worse than smoking 400 packs of cigarettes per year.

  **Dr. Sola Olopade**, physician at the University of Chicago

  “When ultrafine particulate matter from household air pollution enters the body, it causes inflammatory reactions in the airways. The body becomes a war zone as the antioxidant defense system is activated. For a short amount of time, depending on the nutritional status of the exposed individuals the body can win, but overwhelming exposure leads to generalized inflammation and chronic diseases,” explains Dr. Olopade. “The impact of being exposed to this high level of pollutants is worse than smoking 400 packs of cigarettes per year.” Women who cook under these conditions are very likely to develop emphysema, a form of COPD. Among other conditions, emphysema leads to breathlessness and respiratory problems – conditions that are usually found in long-term smokers who are over the age of 50.

People need access to information about dangerous cooking methods. “For many families, this knowledge can help empower them to make better cooking decisions and ultimately, to improve health and lead longer, more productive lives,” says Kip Patrick, Senior Director at the Global Alliance for Clean Cookstoves [4], a public-private partnership hosted by the UN Foundation. The Global Alliance works to raise awareness about clean cooking and to increase access to cleaner stoves and fuels in places like Odisha, India and elsewhere around the world.
Preparing medical professionals

To reach people in both rural and urban Africa, for example, the Alliance helps educate doctors about symptoms that result from indoor cooking. “If a woman is coughing and her child suffers from eye issues, the physician needs to be able to recognize that this combination of symptoms is potentially caused by household air pollution,” says Patrick. The physician is then ready to identify if the health issues and the patients’ cooking methods are connected.
Small particles, big threat

Diseases caused by air pollutants

Open-flame cooking generates emission of pollutants, including fine particles. These penetrate deep into lung passageways and enter the bloodstream, causing:

- Stroke
- Ischaemic heart disease
- Lung cancer
- COPD*
- Childhood pneumonia
- Low birth weight

*Chronic obstructive pulmonary disease
Dr. Spencer Jones, Head of Global Medical Affairs for Sandoz, echoes the importance of providing medical professionals with further education. Jones is a member of the Sandoz ‘Breathe Africa’ program, which created educational programs for medical professionals in Zambia, Ethiopia and Kenya. For many developing nations, says Jones, the problem is not obtaining medicine. Instead, the challenge is providing medical professionals with the most current and effective treatment strategies. “We spoke to a lot of doctors and nurses. And everyone said, ‘It’s education and access to information we need.’”

Jones says one of the challenges is updating physicians’ medical education. “Doctors may only know the treatments from the time of their studies, but over time, the medical community learns how to manage diseases differently. This is why access to medical information needs to be continuous.” As an example, Jones says, patients may be given oral tablets for asthma, which was the common treatment for acute conditions decades ago. “That patient takes his tablets at a clinic, completes the course of treatment and eventually stops taking the tablets,” Jones continues. “The chronic inflammation underlying the respiratory disease isn’t treated.” With every exacerbation, the patient has an increased risk of mortality. The new standard against chronic asthma is a relatively modern treatment via inhaled corticosteroids, which shows proven clinical evidence in reducing mortality. “So this is the situation we’re in,” he explains. “We have to provide continuous education for local healthcare professionals, according to local and international guidelines.”

Cleaner air via television and technology

The Global Alliance for Clean Cookstoves is also informing the public directly, including through a behavior change campaign and reality television programming in Kenya. “Based on our research, we knew that over 80% of the targeted population regularly watch television and listen to the radio,” says Kip Patrick. To reach families with messages about clean cooking, the Alliance recently launched a TV and radio show called ‘Shamba Chef,’ hosted by Janet Kirina and Melvin Alusa, who are well-known national presenters in Kenya. In the show, the hosts travel to different communities to help people renovate their kitchens. “Shamba Chef includes educational information about cooking, nutrition, and household air pollution, as well as the messages needed to motivate households to purchase and adopt cleaner cooking solutions.” Other direct approaches include radio and tv advertising, as well as door-to-door-campaign and community outreach. “In Ghana, we’ve also created a girls empowerment program with the ‘Ghana Girl Guides,’” explains Patrick. “Young women learn about the dangers of household air pollution and the benefits of clean cooking, and they’re then encouraged to talk to their fellow students and families about it. This way, the Girl Guides can bring information back to their villages, becoming clean cooking ambassadors.”

For many families, learning about cleaner cooking options offers the chance for better health and longer lives.

Kip Patrick, Senior Director at the Global Alliance for Clean Cookstoves
Giving people access to information about cleaner cooking solutions is a start. Another step is to enable their access to better cooking equipment, along with clean fuels. “Ideally, all households would eventually gain access to the energy sources used in developed countries – such as gas and electricity,” says Kip Patrick. “Use of clean-burning fuels is where you really start to see the dramatic improvements in health.” While there’s much work ahead to provide clean stoves and fuels for the global population, progress is being made, sometimes one person at a time. Two years ago in India, Vandana Duveh began using a new stove. “It uses less fuel and it cooks faster. There is less smoke, and the food tastes better,” she says. “What more could you hope for?”

India is already supporting a nation-wide change to clean fuels, says Patrick. The government of India even delivers a free LPG connection to households and subsidizes the gas sold to them. “Still,” Patrick adds, “some parts of the country may be years away from a formal distribution infrastructure.”
The work to be done

Like other experts, Sandoz’s Dr. Spencer Jones says the global situation is changing, if slowly. “Access to medical information and building capacity locally is crucial. In Ethiopia, we collaborated with the Minister of Health.” The program was a success, and during this process his team raised the level of attention to respiratory health within the Ministry. “If we speed up access to medical information globally, that’s the thing I would like to encourage everyone to do.”

Kip Patrick agrees. For all of the progress that has been made, black cooking smog continues hovering over areas of Odisha and thousands of communities around the world. Increasing access to information – whether how to cook safely, how to access cleaner cooking solutions, or how to treat those who are already ill – must continue. “Residents inside homes and entire communities, are still inhaling toxic cooking smoke,” Patrick notes. “It’s happening, even now, right as we speak. And we have to work together to stop it and to ensure cooking no longer kills.”

Digital cooking – A cloud-based system for better health

Another program for cleaner cooking solutions, Project Surya [7], was launched with a team of international partners including Nexleaf Analytics, based in Los Angeles, California. Project Surya focuses on financing improved stoves – meaning any stove designed to displace a traditional method of cooking with fire – using innovative wireless monitoring in Odisha, India. Clean stoves are equipped with sensors that measure how long and how often they are used. The data is uploaded to a cloud in real time, so clean stove usage can be analyzed in these homes and communities.

Besides reducing household air pollution, the technique has another long-term, positive effect: “Women receive a small loan to procure a clean cookstove. When using the stoves regularly, they receive usage-based payments from a climate fund for the carbon emissions they mitigate,” says Erin Ross from Nexleaf Analytics. This method is known as Sensor-enabled Climate Financing. It enables even extremely low-income women to afford clean cookstoves. “The aim is to reward women for their climate stewardship,” adds Ross. “As a result, women who change their cooking behaviors are not only able to afford cleaner stoves, but they also experience financial inclusion.”

Overall, progress towards cleaner cooking is being made globally. The International Energy Agency projects that due to improvement activities like these, the number of people without access to clean cooking facilities will decline to around 2.3 billion people in 2030. By 2040, annual premature deaths due to HAP are projected to fall to under 3 million.

While there’s much work ahead to provide clean fuels globally, much has been already been achieved in Odisha. “It was very exciting for us to see that some of the women in Odisha have stopped using their traditional stoves,” says Ross. “One woman even asked a field staffer to remove the sensor that had been attached to her mud stove – she had dismantled the old cookstove completely.”

2. Prof. Dr. Stephen Gordon et al. The Lancet Respiratory Medicine Commission
   “Respiratory risks from household air pollution in low and middle-income countries,”
   The Lancet Respiratory Medicine
   Pregnancy outcomes and ethanol cook stove intervention: A randomized-controlled trial
7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4922741/

Source URL: https://www.sandoz.com/stories/access-medical-information/dangerous-cooking-extinguishing-health-risks-open-flame-stoves

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[12] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4922741/