

Dirty cooking fuels pose major threat to infants in India

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Credit: Tima Miroshnichenko from Pexels

Twenty-seven of every 1,000 babies and children die due to exposure to dirty cooking fuels in India, where air pollution is among the worst in the world, according to new Cornell research.

Of the top 100 cities with the worst air pollution, 83 are in India, according to the sixth annual World Air Quality Report, released in 2023. All of them had levels of pollution 10 times higher than the World Health Organization's air quality guidelines.

And while outdoor air pollution gets a lot of attention, the Environmental Protection Agency and other organizations suggest that poor indoor air quality is much deadlier because it's where most people spend the majority of their time.

"This is the first paper out there that gives a robust causal estimate of the true cost of using these biomass fuels for households, in terms of the young lives lost," said Arnab Basu.

Basu is professor in the Charles H. Dyson School of Applied Economics and Management and first author of the [article](#) "Cooking Fuel Choice and Child Mortality in India," which was published on April 26 in the *Journal of Economic Behavior & Organization*.

"We use nationally representative Demographic and Health Survey data from over 25 years—this is a comprehensive dataset and we were able to identify all kinds of polluting fuels used by households," Basu said.

The paper was co-authored with Nancy Chau, also a professor in the Dyson School, which is part of the SC Johnson College of Business; Tsenguunjav Byambasuren, a doctoral student in applied economics; and Neha Khanna, Ph.D. '98, a professor of economics at Binghamton University.

The researchers used large-scale household survey data from 1992 to 2016 to determine the human cost of reliance on dirty cooking fuels, and found that the largest effect was shown in infants under 1 month old. That's an age group, Basu says, where lungs are not fully developed and

when infants are most closely stuck to their mothers, who are often the primary home cooks.

Interestingly, Basu said, the mortality effect is much higher for [young girls](#) than boys in Indian households. This is not because girls are more fragile or susceptible to pollution-related respiratory illnesses, but rather that in India there is a strong son preference and families may be less likely to seek treatment when a young daughter falls ill or begins to cough, he said.

"A switch to cleaner fuels would not only have a positive impact on overall childhood health, but would also address this neglect of daughters," Basu said.

According to the WHO, about a third of the world's population cooks food over an open fire or in stoves fueled by biomass (wood, animal dung and crop waste)—contributing to an estimated 3.2 million deaths per year worldwide.

Basu posits that there may be a confluence of reasons India is even more significantly affected. Indian households tend to be large, he said, often with one household member, frequently female, responsible for preparing all meals.

While [unmarried women](#) in India participate in the [labor force](#) more, Basu said, there are societal expectations that married women take care of young children and household concurrently. Indian cuisine is often fairly labor-intensive, relying on slow-cooking methods and extensive prep work, thus more exposure for mom, and her young children, to kitchen pollutants.

The Demographic and Health Survey contained data on 10 different types of fuels used by Indian households, from kerosene to biomass

fuels. The researchers showed that of these biomass fuels, burning firewood is most harmful, followed by crop waste and animal waste.

But mandating change is difficult.

"A lot of focus is on outdoor [air pollution](#) and how crop waste is burned," Basu said. "Governments can make laws against crop burning and can give farmers payments in advance to incentivize them not to burn."

The paper suggests looking at indoor pollution is equally important, with an understanding that regional agricultural land ownership and forest cover, household characteristics and family structure, among other factors, play a role.

For instance, having separate outdoor rooms for cooking saves lives, Basu said, as would a shift to using pelletized pine needles or other renewable and cleaner forms of [fuel](#). Still, alternatives like electricity are costly and options like liquefied petroleum gas (LPG) are frequently insufficient to fuel cooking for a larger household that prefer brick ovens rather than the smaller stoves associated with LPG use.

Introducing and promoting the use of alternative fuels represents a significant challenge, but the chief takeaway from the paper is that a switch to cleaner fuels would save the lives of thousands of young Indian children, Basu said.

More information: Arnab K. Basu et al, Cooking fuel choice and child mortality in India, *Journal of Economic Behavior & Organization* (2024). [DOI: 10.1016/j.jebo.2024.04.006](https://doi.org/10.1016/j.jebo.2024.04.006)

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