

Invisible and ignored: air pollution inside the homes of Nairobi's residents

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Air pollution is a visible problem in Kenya's capital, Nairobi. The city's poor air quality is evident in its congested streets where passenger vehicles, trucks and motorcycle taxis jostle for space while belching clouds of black smoke.



Slums in Nairobi, Kenya. Image source: www.citiesalliance.org/nairobi

Nairobi's [construction boom](#) and practices like the [burning of garbage](#) only add to the levels of outdoor air pollutants. The World Health Organisation (WHO) reports that the level of fine particulate matter in the city's outdoor air is 17 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). This is [70%](#) above the recommended maximum level.

This figure could even be higher given the absence of a robust monitoring system. Outdoor (ambient) air pollution causes more than [3-million premature deaths](#) globally each year and increases the risk of respiratory diseases and cardiovascular conditions.

What's less discussed is the problem of indoor air pollution – the presence of air pollutants in homes, offices and classrooms. These could be gases like carbon monoxide and can come from various sources, such as fuels used for cooking and lighting.

Indoor air pollution is not so visible, even though it's estimated to cause [4.3-million premature deaths](#) globally each year. Estimates of indoor air pollution levels in Nairobi's households are hard to come by. This is partly due to the complexities of setting up monitoring devices in people's houses.

The invisibility of the problem is exacerbated by the fact that it's seen as a private problem because it happens in a household setting. But it's an important environmental risk factor for our health given that we spend a large amount of our time indoors.

We have been [conducting research](#) to understand the levels and burden of household air pollution in Nairobi's informal settlements. Our research in Korogocho and Viwandani indicates that average levels of fine particulate matter within households are approximately [76 \$\mu\text{g}/\text{m}^3\$](#) . This is over three times more than the WHO [recommended](#) maximum level of $25\mu\text{g}/\text{m}^3$.

An urban problem

Household air pollution is primarily driven by fuels that are burnt for cooking and lighting. While it's been associated with rural communities, household air pollution is also an urban issue. Residents of informal settlements have little access to electricity or liquefied petroleum gas. They primarily burn firewood, charcoal and kerosene.

Some households even resort to burning plastic bags and containers when they can't buy charcoal or kerosene. Burning these fuels releases pollutants such as carbon monoxide, sulphur dioxide, nitrogen dioxide, poly-aromatic hydrocarbons as well as particulate matter of varying sizes.

Wood smoke has been shown to have [similar](#) pollutants as cigarette smoke, but at higher concentrations. This has health implications for firewood users. Poor ventilation in homes because of concerns about security or outdoor air pollution adds to the levels of pollution. The pollutants are [associated](#) with respiratory diseases, cancers and adverse maternal and child outcomes.

Women are more exposed because they are primarily involved in cooking and household work. A cross-sectional [survey](#) in Nairobi's slums indicates that females form 37% of the slum population, with those aged 20-29 years forming the highest proportion.

In the search for low cost and innovative solutions to the problem of indoor air pollution in poor urban households, three [workshops](#) were convened last year in Nairobi.

These involved policymakers, academics, researchers and NGO representatives. Also present were residents of Korogocho and Viwandani – two informal settlements in Nairobi. Together they developed a basket of potential policy interventions which were modelled in different scenarios.

The first involved changing the fuel mix used in cooking and lighting by increasing the price of kerosene and lowering prices for gas and clean cook stoves. This showed a marginal reduction in levels of household air pollutants.

In the second scenario, the price control measures were combined with stronger enforcement of pollution regulations. This resulted in a tripling of the reduction effect in comparison to the previous scenario.

The third scenario added increased health impact assessments and air quality monitoring to scenario two. This led to an even further drop in air pollutant levels.

The final scenario combined all the policy measures mentioned above with a reduction in outdoor air pollution and improved ventilation. This led to the greatest decrease in indoor air pollutant levels.

What the modelling tells us

The modelling showed that while price controls may be effective initially, sustaining gains in air quality and health outcomes will require a combination of different measures. The results also show that only targeting household air pollution isn't enough.

Because indoor and outdoor air pollutants constantly interact with each other as air moves in and out of people's homes, the greatest gains will only be realised when outdoor air pollution is addressed effectively.

But it's easy to focus on ambient air pollution which is more visible and ignore the problem within households. That's why policymakers need to ensure that both challenges are monitored and addressed. Reducing exposure to both indoor and outdoor air pollution is critical to improving health outcomes for vulnerable populations in the informal settlements in Africa's cities.

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