

Switching from gas to electric stoves cuts indoor air pollution

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Switching from a gas stove to an electric induction stove can reduce indoor nitrogen dioxide air pollution, a known health hazard, by more than 50 percent according to new research led by scientists at Columbia

University Mailman School of Public Health. The findings appear in the journal [Energy Research & Social Science](#).

The study was carried out as part of a pilot project titled "Out of Gas, In with Justice" led by Northern Manhattan-based nonprofit WE ACT for Environmental Justice. The pilot is the first to evaluate the feasibility and benefits of transitioning from gas to induction stoves in affordable housing. The study is the first to evaluate the effects of residential cooking electrification in a public housing setting in the U.S.

The study comes as New York City passed a law in 2023 that will ban gas-powered heaters, cooking stoves, and water boilers in all new buildings to meet climate goals. Similarly, in 2022, California adopted an electric-friendly statewide building code requiring buildings to be "all-electric ready." Gas stoves are used in about 38 percent of U.S. homes but their prevalence varies significantly by state, reaching 62 percent in New York.

Twenty [low-income households](#) in a public housing building in the Bronx were recruited and randomized to have their gas stove replaced with an induction stove or serve as a control group. Between October 2021 and July 2022, homes were monitored continuously over three seven-day periods to assess indoor air quality (NO₂, CO, PM_{2.5}) and stove use before and after the intervention. The impact of cooking on [indoor air quality](#) was also evaluated during controlled cooking tests. Participants were invited to take part in a focus group.

Researchers found a 56 percent reduction in average daily NO₂ concentrations in the induction [stove](#) group compared to the control group using gas stoves. During controlled cooking tests, the median background NO₂ concentration (18 ppb) in gas homes rose to 197 ppb and negligibly changed in induction homes. No significant changes were seen with CO and PM_{2.5}. During focus group discussions, participants

using the new stoves unanimously reported being pleased with the transition. None of the participants opted to switch back to gas cooking despite having the option to do so at zero cost.

Participants were extremely satisfied with their new induction stoves, citing features like their ability to heat faster while maintaining a cool cooking surface. They said induction stoves improved their quality of life by reducing their anxiety about fires due to gas leaks.

Short-term exposure to NO₂ is associated with aggravation of respiratory diseases, hospital admissions, [emergency room visits](#), and premature mortality. Premature mortality is also associated with long-term exposure to NO₂ along with asthma onset.

"These results suggest that decarbonization energy transitions can improve health by reducing indoor nitrogen dioxide while also addressing the holistic health ramifications of energy use in low-income populations," said first author Misbath Daouda, Ph.D. '23, assistant professor of Environmental Health Sciences at the University of California Berkley who began the study as a doctoral student at Columbia Mailman School.

While the study did not measure the climate benefits of the intervention, there is ample research on the negative effects of gas stoves. Residential gas use accounts for 15 percent of the country's gas consumption. Gas is composed primarily of methane, a greenhouse gas with more than 80 times the global warming potential of CO₂ over a 20-year timeframe.

"A green energy transition should prioritize electric stoves, which both reduce [greenhouse gas](#) emissions and improve the health of vulnerable populations," says senior author Darby Jack, Ph.D., professor of environmental health sciences.

Children living in poor New York City neighborhoods are three times more likely to be hospitalized for asthma than children who live in wealthy neighborhoods. African American youths with asthma experience four times more emergency department visits, three times the hospitalization rate, and nearly eight times the death rate than their white counterparts.

"People of color and low-income individuals are more likely to live in smaller, older apartments that have poor ventilation, ineffective or broken range hoods and dated appliances that leak more gas. It is crucial for [environmental justice](#) that they are not left behind in this transition," says study co-author, Annie Carforo, MUP, Climate Justice Campaigns Manager, WE ACT.

Study co-authors include Diana Hernández at Columbia Mailman; Andrew Hallward-Driemeier, Steve Chillrud, and Roisin Commane at Columbia's Lamont Doherty Earth Observatory; Annie Carforo, and Jennifer Ventrella at WE ACT; Michael Johnson and Heather Miller at Berkeley Air Monitoring Group; Yu Ann Tan at RMI, Carbon-Free Buildings; Jessica Tryner at Access Sensor Technologies and Michelle Feliciano at the Association for Affordability, Inc.

More information: Misbath Daouda et al, Out of Gas, In with Justice: Findings from a gas-to-induction pilot in low-income housing in NYC, *Energy Research & Social Science* (2024). [DOI: 10.1016/j.erss.2024.103662](#)

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