Master list: Health studies related to gas stoves pollution

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Gas Stove Studies 2022-2023 Summary

Summary of new information on benzene from leaked and burned methane

Jan, 2022 study in 53 homes in California found gas stoves **emit methane when they are turned off**. LeBel, et al. estimated that natural gas stoves emit 0.8–1.3% of the gas they use as unburned methane. More than three-quarters of methane emissions we measured originated during steady-state-off. Steady-state-off emissions provide the largest source of natural gas leakage in homes. No evidence of a relationship between either the age of the stove or purchase price of the stove with methane emissions.

In June, 2022, the VOCs in natural gas coming into homes are characterized. Gas samples came from 69 residential locations in the Greater Boston area. Twenty-one (21) hazardous air pollutants were found. Benzene (bootstrapped mean = 164 ppbv; SD = 16; 95% CI: 134–196) was detected in 95% of samples along with hexane (98% detection), toluene (94%), heptane (94%), and cyclohexane (89%), contributing to a mean total concentration of NMVOCs in distribution-grade NG of 6.0 ppmv (95% CI: 5.5–6.6).

In October, 2022 LeBel et al calculated that NG leakage from stoves and ovens **while not in use** can result in indoor benzene concentrations that can exceed the California Office of Environmental Health Hazard Assessment 8-h Reference Exposure Level of 0.94 ppbv─benzene concentrations comparable to environmental tobacco smoke. (Note, WHO states that there are no safe levels of exposure to benzene.)

In June, 2023, Kashtan et al.; conducted study in 87 homes in California and Colorado and they looked at mean benzene emissions from **burned gas**. Mean benzene emissions from gas and propane burners on high and ovens set to 350 °F were 10 to 25 times higher than emissions from electric coil and radiant alternatives. Benzene produced by gas and propane stoves also migrated throughout homes, in some cases elevating bedroom benzene concentrations above chronic health benchmarks for hours after the stove was turned off.

New studies on NOx/Gas Stoves

Lebel Jan, 2022 same study as above; In 32 homes, they measured NOx (NO and NO2) emissions and found them to be linearly related to the amount of natural gas burned. The data suggest that families who don't use their range hoods or who have poor ventilation can surpass

the 1-h national standard of NO2 (100 ppb) within a few minutes of stove usage, particularly in smaller kitchens.

This new study on gas stove use and asthma in Puerto Rican children and adolescents was published in July, 2023. This is a longitudinal study (helpful in determining causality because not just one slice in time). They controlled for a lot of factors include smoking and outdoor air pollution (The multivariable analysis of asthma was adjusted for age, sex, household income ($15,000/y or <$15,000/y), parental asthma, early-life (in utero or in the first 2 years of life) secondhand smoke, change in body mass index (BMI) z-score between visits, an unhealthy diet at both visits, residential distance to a road at the baseline visit, and the time between visits.) Current asthma was more common in participants with gas stove use at either visit (60.5%) or at both visits (61.2%) compared with those reporting electric stove use at both visits (52.9%). In the multivariable analysis, participants reporting gas stove use at both visits had **2.45 times significantly higher odds of asthma compared with those reporting electric stove** use at both visits (Table I, model 1).

Ecuador has a nationwide induction stove promotion program. Between 2015 and 2021,one-tenth of all Ecuadorian households acquired an induction stove. In August 2023, Gould et al did an analysis of the program. They found that increased induction stove uptake was associated with declines in all-cause and respiratory-related hospitalizations nationwide They controlled for many other factors. This is an important study because it shows stove replacement can improve health outcomes. Before this study, there was the Paulin study that showed replacing gas stove reduced NOx but that study didn't look at health outcomes.

This Canada study finds mixed results between association between gas stove and asthma but doesn't control for outdoor air pollution or smoking so it's difficult to interpret it. They also don't show results for how ventilation affects asthma.

Published in *Environment Research*, the study examined the impact of cooking fuels, heating fuels and passive smoking during pregnancy and up to 36 months after birth, tracking more than 4,000 mother-child pairs in upstate New York and assessing all domains of child development. The study found *unclean cooking fuel exposure* from pregnancy to 36 months of age increased the odds of failing any developmental domain by 28%, the gross motor domain by 52%, and the personal-social domain by 36%. Read the University's press release here. ***Noting this study didn't separate out gas from wood. It's difficult to parse the potential differences in the health impacts of gas/propane and wood.

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- Massachusetts Medical Society resolution passed in 2019
- Washington State Medical Association policy statement passed in 2021
- American Medical Association resolution passed in 2022
- American Public Health Association policy statement passed in 2022
- American Lung Association literature review from 2022
- Pennsylvania Medical Society resolution passed in 2022
- American Thoracic Society Workshop Report in 2024.
- *NOTE: the National Hispanic Medical Association is considering a resolution*

International:

Asthma Australia: "Gas stoves and heaters are a major source of indoor air pollution that impacts the human body including the respiratory system" and cited a report from the Climate Council of Australia finding that the use of gas in homes is responsible for up to 12% of childhood asthma in Australia. https://asthma.org.au/blog/gas-impacts-on-health/

New Zeland: I wanted to make sure you all have this report just released by the New Zealand government. It includes a literature review that concludes "There is sufficient evidence on the adverse effects of NO2 from natural gas combustion. We therefore do not recommend additional research on indoor NO2 from gas combustion." It also estimates, based on data from scientific studies, that gas stoves increase longterm indoor NO2 exposure by 2.88 ug/m3 where they are used. Based on that increase, the report estimates an annual 208 premature deaths, 236 cardiovascular hospitalizations, 775 respiratory hospitalizations, and 3,230 asthma cases resulting from the 360,099 gas stoves in use in New Zealand.

The report notes that there is high uncertainty around the specific amount of annual NO2 exposure from gas stoves, but that even the lower bound of exposure would result in additional healthcare costs.