

## Comparing changes in air pollutant concentration before and after cook-stove replacement in rural Ghana

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**Background and Aims:** Using novel, low cost, real-time air quality monitors, we performed a pilot study to analyze the impact of transitioning from open flame cooking to efficient, low emission cookstoves (Envirofit) in a region of Northern Ghana where studies of meningitis epidemics and climate are currently underway. These emissions are important since exposure to air pollution may be a contributing factor towards meningitis transmission and susceptibility.

**Methods:** Monitors were equipped with sensors to measure concentration of total volatile organic compounds (VOCs), ozone, carbon monoxide (CO), and carbon dioxide (CO<sub>2</sub>). Typical cooking takes place in an enclosed room with an open doorway and burns dried millet stalks between three rocks on which a pot sits. The monitors were placed inside the enclosed cooking areas at 6 sites.

**Results:** Cooking resulted in elevated concentrations of CO, CO<sub>2</sub>, and total VOCs. These three pollutants were positively correlated during cooking with correlation coefficients ranging from 0.34 to 0.88. The cookstoves emit between 1/5 and 1/18 of the combusted carbon as CO. During cooking events, concentrations of those three pollutants, which are products of combustion, were negatively correlated with ozone concentrations, as expected since emissions of nitrogen oxides from the cookstoves consume ambient ozone. After installing the cookstoves, CO<sub>2</sub> concentrations decreased, but VOCs and CO increased slightly.

**Conclusions:** Low cost portable monitors are robust and effective at analyzing variations of concentrations over time. We applied these monitors to evaluate the emissions and air quality in kitchens of rural Ghana before and after new cookstoves were put into use. It is yet unclear whether the long-term use of Envirofit stoves will lead to reduced exposure to various air pollutants within kitchens.