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## Evaluating the Performance of Household Liquefied Petroleum Gas Cookstoves.

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### **Abstract**

Liquefied petroleum gas (LPG) cookstoves are considered to be an important solution for mitigating household air pollution; however, their performance has rarely been evaluated. To fill the data and knowledge gaps in this important area, 89 laboratory tests were conducted to quantify efficiencies and pollutant emissions from five commercially available household LPG stoves under different burning conditions. The mean thermal efficiency ( $\pm$ standard deviation) for the tested LPG cookstoves was  $51 \pm 6\%$ , meeting guidelines for the highest tier level (Tier 4) under the International Organization for Standardization, International Workshop Agreement 11. Emission factors of CO<sub>2</sub>, CO, THC, CH<sub>4</sub>, and NO<sub>x</sub> on the basis of useful energy delivered (MJ<sub>d</sub>) were  $142 \pm 17$ ,  $0.77 \pm 0.55$ ,  $130 \pm 196$ ,  $5.6 \pm 8.2$ , and  $46 \pm 9$  mg/MJ<sub>d</sub>, respectively. Approximately 90% of the PM<sub>2.5</sub> data were below the detection limit, corresponding to an emission rate below 0.11 mg/min. For those data above the detection limit, the average emission factor was  $2.4 \pm 1.6$  mg/MJ<sub>d</sub>, with a mean emission rate of  $0.20 \pm 0.16$  mg/min. Under the specified gas pressure (2.8 kPa), but with the burner control set to minimum air flow rate, less complete combustion resulted in a visually yellow flame, and CO, PM<sub>2.5</sub>, EC, and BC emissions all increased. LPG cookstoves met guidelines for Tier 4 for both CO and PM<sub>2.5</sub> emissions and mostly met the World Health Organization Emission Rate Targets set to protect human health.

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