Evaluating the effects of access to air quality data on household air pollution and exposure - An interrupted time series experimental study in Rwanda

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Abstract The use of biomass cooking fuels in low- and middle-income countries impairs air quality. Particulate matter smaller than 2.5 microns ($PM_{2:5}$) is a significant pollutant from biomass burning, and is linked to respiratory and cardiovascular diseases, and adverse pregnancy outcomes. Further, this energy poverty dilemma reinforces gender disparities, keeps children from schools, causes environmental degradation, and interferes with social and economic development. Lack of access to, and inadequate adoption of, improved cooking stoves and fuels are key barriers to improved air quality. This paper presents a _eld experiment nested within a large-scale health efficacy trial. 90 households in Rwanda were enrolled and provided with an air quality sensor and feedback device recording indoor air quality as $PM_{2:5}$ for 16 weeks at 2.5 minutes sampling interval. After 6 weeks, this data was provided dynamically to households through a display and an auditory alarm. We examined the effect of receiving this air quality data on air pollution. While access to air quality data did not, in aggregate, improve air quality, we did observe several promising correlations worthy of further investigation. Namely, the associations between personal exposure or rainfall and increased $PM_{2:5}$ were reduced after households had access to air quality data. We hypothesize that the behavior changes required to observe these effects - opening doors and windows and moving away from cooking sources - are easy and immediate, in contrast to the costs and complexities of entirely eliminating biomass cooking.

Keywords: Clean cooking adoption, LPG, air quality, air quality; $PM_{2:5}$; behavioral intervention; PE; Rwanda