Biomass burning among small-scale fish processors in Ghana: Implications for climate, health, and well-being

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Very little is known about the health risk associated with small-scale biomass burning industries in developing countries. Industries include brick burning, brewing, fish/meat smoking, shea butter production etc., and engage tens of millions of people globally. This study seeks to understand the environmental exposure, health burden, and human welfare impact of participation in the fish smoking industry. The study took place in coastal Ghana in the towns of Moree and Elmina. The sample size is 463 women/households with 304 in the treatment group, and 159 in the control group. We conducted an in-depth structured health and sociodemographic survey to gather data on self-reported health outcomes, all aspects of the fish smoking business, other environmental exposures, and socioeconomic and demographic variables. For a subset of 145 women (109 treatment; 46 control) we objectively measured carbon monoxide (CO) exposure for a 24-hour period. For a smaller sub-sample (N=29, 22 treatment; 7 control) we collected data on particulate matter of 2.5 microdiameter (PM2.5) exposure. Analysis of 24-hour data collected on CO illustrate statistically significant differences in treatment and control participants with fish smoking households having an average 24 hour exposure of 8.2299 ppm (vs. control households at 3.0357 ppm). Similarly, we observe statistically significant differences for PM2.5 exposures, with exposure levels orders of magnitude higher in fish smoking households, and well beyond international permissible standards.

Our analysis of health impacts of fish smoking suggest that those engaged in the activity are at much higher health risk. We observe statistically significantly higher prevalence of respiratory symptoms, eye irritation, neurologic symptoms, and burns among women engaged in fish smoking. Multivariate analysis controlling for other environmental exposures and socioeconomic and demographic characteristics of women confirm that the health burden is much higher for this population. Finally, we consider the role of fish smoking in the economic life of coastal communities. Its contribution to the cash income of households in the region is significant, and households that participate in this activity are better off on average than those who do not. We recommend a both behavioral (education) and technological (improved smoking ovens) as potential solutions.