

Title: Combating Household Air Pollution with Clean Energy Solutions in Ghana – How a Better Understanding of Human Biology and Human Behavior can Improve Energy Policy

Time/Date: April 20, 2022 8:00 AM - 9:30 AM Mountain Daylight Time (MDT) 3:00 PM – 4:30 PM Coordinated Universal Time (UTC)

Questions not answered as part of the live webinar. Note - some questions were modified to aid in clarity or to combine multiple similar questions.

Question: Is there a potential risk that the pollutants measured in one household might have actually been generated either in another household or from a different emissions source? If so - could this cross-contamination have impacted your results? Did you look at pollutant types besides carbon monoxide and particle mass? Black carbon for example.

Response: Yes - we are fairly certain that a significant portion of the personal PM_{2.5} exposure experienced by participants originates from sources other than that individual's cooking fire. Of course, what matters for health is just this -- an individual's total exposure -- so we are not too worried that "cross-contamination" impacted our results in the sense that we are obtaining biased estimates of the health impacts of HAP exposure. In the context of the GRAPHS RCT, however, we are pretty confident that LPG arm participants were exposed to other sources and that this residual exposure attenuated the benefits of the intervention.

Question: Do you know of any efforts to include education on indoor air pollution and clean cookstoves in maternal and child health clinics policies and laws?

Response: No -- we are not aware of any clean fuels access policies that are explicitly framed in the manner that you suggest. But it is an excellent idea and one that we are pursuing in Ghana. Like many good ideas, I (Darby) first heard this one from Kirk Smith, whose Newborn Stove Study in Haryana was based on this.

Question: It seems the distributed lag models suggested that exposures later in pregnancy most impacted several health impacts. The suggestion to ensure intervention as early in pregnancy as possible certainly seems justified for other reasons (and is aspirational), but how do the late-pregnancy exposure-response results play into this recommendation?

Response: First, we note that the distributed lag model (DLM) for birthweight suggests that early pregnancy is important. As you say, however, the DLMs do seem to imply that interventions later in pregnancy would be impactful for pneumonia and for lung function and cardiovascular trajectories. We would want to see corroboration of these results from other studies before we made a firm recommendation in favor of mid-pregnancy interventions, and again the birthweight results do suggest that delay may come at a cost. Additionally, given operational realities it may be better for government programs to target early pregnancy (or even preconception) if the critical window goal is to have exclusive clean fuel use by mid pregnancy.

Question: It seems that access to LPG stations could be a major barrier to adoption of gas cookstoves, especially in rural areas. Do you have any thoughts on how this barrier could be overcome?

Response: Ghana is in the process of switching from a filling station model to a cylinder recirculation model for LPG distribution. This will result in many additional locations where users can purchase LPG. Costs will remain a barrier, and LPG marketing companies will not have an incentive to set up cylinder exchange depots in communities where demand is likely to be low. The bottom line is that government policy will almost surely be needed to encourage LPG transitions in rural areas.

Question: Cookstove and fuel prices are only two elements of the total “cost” of a cooking system. These prices don’t take into account the environmental or societal costs of air pollution. Is there a way to use policies and reporting methods that account for total costs (fuel + environmental) to hasten the transition to LPG?

Response: A [Pigouvian tax](#) does just that -- by taxing consumption goods (fuels in this case) at their marginal social damages (caused by negative externalities), a tax can fully “internalize” these external costs. This is the thinking behind, e.g., carbon taxes. For biomass fuels, however, this is very difficult to operationalize because they are hard to tax. Wood is mostly collected by the end user and thus there is no transaction to tax. Charcoal is mostly produced and sold via informal, unregulated channels. And of course taxing these fuels, which are mostly used by the poor, would be highly regressive.

Question: Did this study consider charcoal-making stoves?

Response: Cookstoves designed to produce charcoal were not specifically evaluated as part of this study. Therefore, we cannot provide guidance on the implications of these cookstoves on either health or policy implications.