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Randomized Trial Study to Determine the Impact of Gas Stove Interventions on Children with Asthma

Additional submitted attachment is included below.

From:	Thomas Phillips
To:	Energy - Docket Optical System
Subject:	Randomized Trial Study to Determine the Impact of Gas Stove Interventions on Children with Asthma, CEC Docket No. 19-ERDD-01
Date:	Tuesday, March 16, 2021 4:48:34 PM
Attachments:	PastedGraphic-1.tiff

TO: California Energy Commission || Docket Unit, MS-4 || Re: Docket No. 19-ERDD-01 || 1516 Ninth Street || Sacramento, CA 95814-5512

Thank you for holding the March 2, 2021 workshop and considering public input on this important public health issue. Below are some additional comments re: Randomized Trial Study to Determine the Impact of Gas Stove Interventions on Children with Asthma, Request for Comments on a Forthcoming Solicitation.

Please advise me on whether the links will still work when you post this document.

1. Research Needs

The solicitation is asking "what is the effectiveness of household gas stove interventions on asthma outcomes?" This does not seem to be the right question. We already know that gas stoves are a significant source of indoor pollution and health risk, and that low carbon buildings will require electric stoves. Rather, the relevant and critical questions should address how to best mitigate the effects of gas stoves, e.g.:

- What are the main barriers in switching from gas to electric stoves in existing homes, especially in low income and in vulnerable populations such as asthmatics? E.g., cost, consumer and industry awareness, cultural factors, health concerns.
- How can stove change outs be accelerated and incentivized? Can replacement stoves be upgraded to induction stoves? Can public housing and other groups use mass purchasing?
- How can kitchen ventilation equipment and practices be improved?
- What is the effect of residential combustion safety testing and gas appliance adjustment on IEQ and carbon emissions? Such tests are routinely conducted by low income weatherization programs, and may include gas leak detection. Gas stoves, wall furnaces, and floor furnaces are associated with higher indoor NO2 and PM levels in California (CARB, 2005. Indoor Air Pollution in California, Sec. 2.2).
- In the interim, could portable induction burners be used successfully to reduce indoor pollution, carbon emissions, and costs for vulnerable populations?

To address these questions, it will probably require a combination of survey and focus group studies, market research, demonstration studies, and market transformation.

2. Re: Workshop Questions 3 and 4: sample size and funding level required.

Gas stove and cooking emissions are a few of the many in-home asthma triggers (See Fig. 1).

Social determinants are also very important for asthma incidence and exacerbation. Wildfire air pollution and extreme heat have now become more important factors for respiratory health in California. Space heating with a gas stove is still an important risk factor for asthma for some population groups and housing types, but it has rarely been evaluated in the asthma context.

An effective asthma intervention study must address these various risk factors, as well as the large variability in home ventilation, air mixing, outdoor air quality, and cooking practices. Heating with a gas stove is common in low income households, but this episodic activity would require special monitoring and ethical provisions. Furthermore, the effect size of gas stove use on asthma in California low income populations could be much less than that of other major asthma triggers such as pests, mold, and other alleges. All these factors will make it very hard to quantify the effect of gas stove use except under extreme conditions such as malfunctioning burners and space heating with a stove.

To tease out the effect of gas stoves alone would require a large sample and a very large budget, and a pilot study to confirm the feasibility of meeting the study objectives, e.g., that the study methods perform well and with enough sensitivity to detect significant differences, and that sample selection is adequate. Large field studies of IEQ in about 60 to 100 homes funded by CARB and EPA ca. 2000 had funding levels on the order of $1M. The proposed EPIC study could easily approach $2 M after adjusting for inflation, gas appliance costs, healthy measurement costs, and the large number of asthma-related variables.

Figure 1: Evidence-Based Housing-Relating Environmental Asthma Triggers and Weatherization Measures and Impacts. Tonn et al. 2014. Health and Household-Related Benefits Attributable to the Weatherization Assistance Program. ORNL/TM-2014/345.

3. Study Design:

If the CEC decides to fund an asthma intervention study, it should learn from extensive research on in home interventions. For example, a combination of several mechanical interventions and parental education have been found to be cost effective (Wu & Takaro, 2007). Community based advisors have also been identified as a key to success in low income communities (Krieger et al. 2002). Using Community Health Workers, this multi-component approach has been adopted by Healthy Home programs by HUD, some states, and various NGOs. It is also reimbursable by Medicare in many states.

A more targeted and feasible study design would be to study low income homes that have been weatherized vs. controls, and implement the combination of asthma intervention measures (the *Weatherization Plus Health* model) with and without gas stove measures (induction stove replacement, portable induction burners) and with improved kitchen ventilation. An alternative approach would be to first model the potential effectiveness of such measures, using a model developed for multifamily homes in Boston (Fabian et al., 2012; Underhill et al., 2020), and then conduct a limited number of case studies to verify and calibrate the model.

This approach of using weatherized homes would also be a good opportunity to assess other

low carbon measures such as improved cooling through passive and active measures, such as upgraded window replacements, additional insulation, window shades/films, upgraded heat pumps, etc. (*Weatherization Plus Health Plus Resiience* model). Some utilities in the Northeast region are funding such upgrades to asthma intervention programs (Ellen Tohn, 2021. Solutions for Managing In-Home Environmental Asthma Triggers During the Pandemic, at 34:45 +).

A large number of low income homes in CA are weatherized each year through state, federal, and utility programs, and climate action programs have increased funding for these programs. All of these programs address gas appliances by testing CO and appliance venting as part of their combustion safety tests. These homes represent a golden opportunity to piggyback by adding asthma trigger and climate resilience interventions and patient education and support, similar to the approach used in the Weatherization Plus Health program that Washington state and others are using.

4. Here is the new asthma intervention review I mentioned in the workshop, plus another new study.

Chan et al., Feb. 2021,
Community-based interventions for childhood asthma using comprehensive approaches: a systematic review and meta-analysis
https://aacijournal.biomedcentral.com/articles/10.1186/s13223-021-00522-9.
They reviewed several US studies, including one RCT study, and found that community based interventions were associated with significant reductions in several health effects and increases in use of the asthma action plan.

Tieskens et al., 2021 (From Fabian group at Boston University).
The impact of energy retrofits on pediatric asthma exacerbation in a Boston multi-family housing complex: a systems science approach.
https://ehjournal.biomedcentral.com/articles/10.1186/s12940-021-00699-x.
They modeled the effects of cooking, smoking, window opening and mechanical ventilation improvements on healthcare utilization costs in multifamily retrofits.

Sincerely yours,
Tom

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