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Comment Received From: Stephanie Holm, MD MPH
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Need for Robust Methods and Increased Funding

Additional submitted attachment is included below.

Dear Maninder Thind and the California Energy Commission,

We wish to provide formal comments on the proposed solicitation regarding "Randomized Trial Study to Determine the Impact of Gas Stove Interventions on Children with Asthma". The signatories include academic researchers, a community participatory science expert, and leaders of a community-based asthma organization with presence in Fresno and Bakersfield. The researchers include two physician-scientists with substantial expertise in children's asthma and an indoor air quality and exposure scientist with special expertise on gas burner and cooking pollutant emissions, and controls. Several of us offered verbal comments during the March 2nd public workshop in relation to the posed questions, including the following key points. (1) We believe the study should focus on resource-challenged families living in varied types of housing including single-detached, townhouses and apartments in low- and potentially high-rise multifamily buildings. (2) Communities could be selected based on criteria developed for AB 617 work and via the CalEnviroscreen tool. (3) The duration of the study should be long enough to follow participants for at least one year and the duration of the grant should be long enough to cover substantial preparatory work needed for a study of this magnitude. And (4) The study design should formally consider the connected challenge of managing exposures to cooking pollutants and controlling exposures through use of effective kitchen ventilation.

Below we elaborate on the last of these points and offer additional input with the intent to help the CEC support the best possible science to answer the question of how gas stove interventions, including electrification, may affect the health of children with asthma.

While we recognize the potential importance of electrification, both for decreasing greenhouse gas emissions and potentially contributing to decreases in household NO_2, it would be a mistake to assess electrification without concomitant assessment of ventilation interventions. Cooking-related pollution comes not only from the gas or electric burner, but also the oils and the food being cooked, and encompasses a wide range of pollutants. In addition to the NO_2 that would be expected to decrease with a conversion from gas to electric equipment, cooking produces substantial fine and ultrafine particles, as well as carcinogens and irritant gases, including acrolein, which has a chronic reference exposure level that is commonly exceeded in California homes. A review of published literature on $PM_{2.5}$ emissions during cooking found that cooking method, oil type and fuel type were important predictors of $PM_{2.5}$ emissions.(1) Thus, focusing on the fuel source alone misses a substantial portion of the pollutant exposure related to cooking. This is critically important because other cooking-related pollutants, such as fine and ultrafine particles, also have well-known associations with childhood asthma.(2) Without consideration of those other factors, the potential improvement of electrification could be masked- both in terms of the changes in exposure and the potential changes in health outcomes.

Moreover, cooking ventilation is important as an intervention to decrease exposure to all cooking related pollutants. Use of a range hood has been shown to decrease indoor concentrations of multiple pollutants 2-3 times faster than when cooking is done without a range hood (including NO_2 and ultrafine particles), (3) and prior work in the homes of children with asthma (with a mix of gas and electric stoves) demonstrated that ever use of the range hood was associated with indoor pollutant levels.(4) Thus, cooking ventilation interventions should be considered in combination with electrification so that the contributions of each can be elucidated. The most scientifically rigorous way to do this would be in a factorial design with 4 groups: (1) control (with gas stove and existing range hood), (2) electrification of stove (with existing range hood), (3) Range hood testing and replacement with ventilation education (but existing gas stove), and (4) electrification with range hood testing and

replacement as well as cooking ventilation education. Each of these groups will need approximately 75 homes in order to ensure sufficient power to detect differences. As mentioned in the public comment session, there will be an ethical imperative to provide all the interventions to all study participants at the end of the study (in this case electrification, range hood and education), so the budget must allow for that. We anticipate a necessary funding duration of 4 years in order to establish community frameworks needed to recruit sufficient families, and follow all families for over a year. We are currently poised to begin data collection on a pilot study that will assess the impact of a cooking ventilation intervention (measurement of range hood function, replacement of the range hood if necessary and an educational intervention) in the homes of children with asthma, with both exposure outcomes and objective measurements of asthma-related outcomes as well as symptoms. If the data collected in our study supports our hypothesis of discernible respiratory health benefits from use of kitchen ventilation, omission of this control option in a study funded by CEC could be criticized – by both industry groups and advocates – as biased against gas in its exclusive focus on electrification. Thus, for both scientific and political reasons, a factorial design that includes both electrification and cooking ventilation intervention will be important.

As mentioned above, cooking creates multiple pollutants which are relevant to childhood asthma. This includes not only NO_2 and NO_x, but also particulate matter of multiple size fractions (included ultrafine particles), and irritant gases (including acrolein). It is much more likely that effects on children's asthma will be seen if all these pollutants are reduced via effective ventilation, and the study will be most impactful if it includes measurements of many pollutants, including those such as ultrafine particles, which remain expensive to measure. We urge the CEC to include the measurement of a multitude of pollutants in the solicitation, rather than focusing on the nitrogen oxides.

In short-term health studies, such as our pilot study on cooking ventilation described above, proximate measures of health outcomes are often used. But those proximate outcomes are simply stand-ins for the more important outcomes that affect people's lives. For example, in our cooking ventilation study we are using the effects on breathing tests (spirometry and fractional exhaled nitric oxide) as our proximate measure. Additional valuable indicators of impacts include healthcare utilization (doctor's visits, ER visits, medication use), as they can help to quantify both the individual and societal benefits of interventions. But to assess differences in healthcare utilization effectively requires at least one year of follow up time, and partnering with organizations that have individual-level health care utilization data to assess utilization both before and after the intervention. A potential way to balance the need for intensive (and expensive) exposure and clinical outcome measurements with the need for a long follow-up period would be to have intensive monitoring campaigns in a household immediately before and shortly after the intervention, with brief follow-up phone interviews during the next year, and repeat intensive measurements at the end of this one-year follow-up. This would allow for direct assessment of the meaningful health impacts, rather than proximate outcomes that are one step removed.

We feel strongly that in order for this CEC funding to best address the question of cooking interventions on children with asthma, there is a critical need for partnering with organizations, such as other California agencies (e.g., CalEPA and CDPH) that also have a vested interest in air pollution and health effects. Based on our prior experience, and the study challenges and needs, one million dollars will be insufficient for a rigorous answer to this question. Simply providing the equipment (electric range, range hood) and paying for installation costs for the 300 households needed for this type of study would cost approximately one million dollars; a second million dollars (~250,000 per year) would be necessary to run a study of this magnitude.

Sincerely,

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