Clean Household Energy for Public Health in Ghana

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Household Air Pollution

Nearly 3 billion people use traditional cookstoves and fuels.

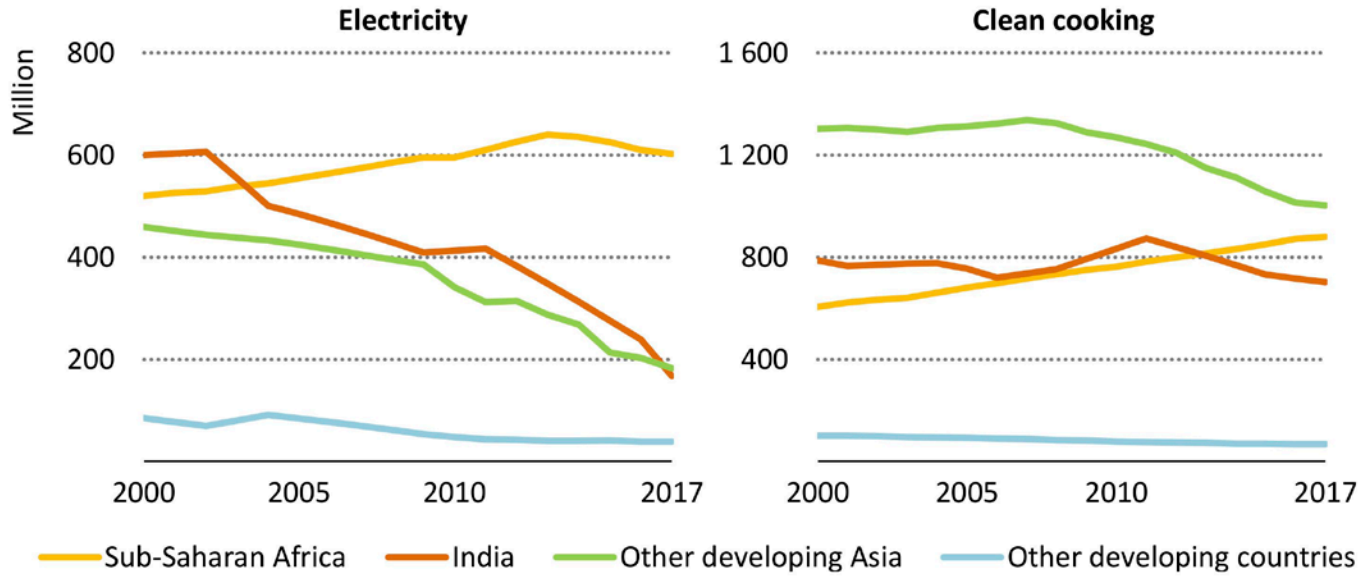
- WHO estimates that 3.8 million preventable air pollution-related deaths occur each year from polluting cookstoves[1]
- Burning biomass, typically used for cooking, contributes to about 25% of the world's black carbon emissions annually[2]

In sub-Saharan Africa, biofuels account for over 60% of overall energy consumption,[3] and the population with no access to clean cooking is increasing.[4]

Over the last 15 years, this issue has had a day in the sun - significant investment in clean cookstoves

- Most of these interventions have failed, in two ways
  - Limited adoption and sustained use of clean technologies
  - Air pollution exposures remain high, even when the adoption/use hurdle is cleared
- LMICs that have made significant progress have used very large clean fuel subsidies (Ecuador, Indonesia, Morocco)

Figure 2.7 ▷ **Population without modern energy access**



IEA 2018 World Energy Report

Traditional Cooking in Ghana

In Ghana, ~70% of households cook with biomass.[5]

- **Health.** Human exposure to air pollution increases risk of early childhood pneumonia, lung cancer, chronic pulmonary obstructive disease (COPD), & cardiovascular disease. HAP exposure is top risk factor for death and disability.[6]
- **Deforestation & forest degradation.** Fuelwood harvesting in excess of sustainable growth is a leading cause of deforestation.
- **Climate change.** Cookstoves emit CO_2, methane, and black carbon, all of which are greenhouse pollutants.
- **Poverty and gender inequality.** Collecting fuelwood and cooking over an open fire is time-consuming and a physically strenuous activity, which falls primarily on women and children.

Strong government commitment to household energy transitions – 50% by 2030 – but no real sense of what to do

12 yrs of collaboration w/ Ghana MOH

- Ghana Randomized Air Pollution and Health Study (GRAPHS): Large scale randomized controlled trial assessing air pollution exposure and health impacts
- Enhancing LPG Adoption in Ghana (ELAG): RCT assessing barriers to LPG adoption (transportation costs; health information)
- Program evaluation of Ghana MOE household energy interventions
- Health effects of air pollution exposure
    - Lung function
    - Epigenetic modification
    - Microbiome
    - Neurodevelopment

Project Structure: Assess, Design, and Test

Phase I (Years 1 – 2): Assessment of needs and opportunities

- Needs assessment: nationally representative household survey
- Exposure assessment: nationally representative air pollution exposure assessment
- Behavioral assessments: how do households make decisions about technology adoption and use? How do they respond to nudges?
- Technology assessment: costs of clean options (LPG, electricity, ethanol, processed biomass pellets); regulatory and infrastructure constraints

Phase II (Years 3 – 5): **Testing at scale**

Deploy the most promising technologies and behavioral interventions in 2 districts – approx. 30,000 people

How does this differ from prior efforts?

- Incorporate behavior change approaches to support adoption and sustained use of clean fuels.
- Develop a stack of clean energy technologies that can (hopefully) fully displace traditional open fires – match technologies to needs.
- Transition entire communities towards clean alternatives.
- Identify broader energy system changes that support and sustain household and community level transitions.

References

1. https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

2. Bond, Tami C., et al. "Bounding the role of black carbon in the climate system: A scientific assessment." *Journal of Geophysical Research: Atmospheres* 118.11 (2013): 5380-5552

3. IEA (2014), Africa Energy Outlook, IEA, Paris (page 37).

4. IEA (2018), World Energy Outlook 2018, IEA, Paris (Figure 2.7, page 96).

5. Asante, Kwaku Poku, et al. "Ghana's rural liquefied petroleum gas program scale up: A case study." *Energy for Sustainable Development* 46 (2018): 94-102.

6. http://www.healthdata.org/ghana

7. IEA (2018), World Energy Outlook 2018, IEA, Paris (page 97).