August2021

Making clean cooking affordable and accessible during COVID-19: 'Pay-as-you-go' smart meters promote health equity

Nairobi, Kenya

Affordability of clean cooking solutions like liquefied petroleum gas (LPG) stoves is one of the biggest barriers to reducing exposure to household air pollution in resource-poor households. New research suggests that "pay-as-you-go" smart meter technology can help address the affordability challenges of clean cooking by enabling incremental fuel payments for households in place of paying the full upfront cost of a LPG cylinder. A recent study assessing pay-as-you-go LPG cooking patterns showed that in spite of economic and other hardships, the amount of LPG consumed by households remained relatively stable, illustrating how smart meter technology may have maintained a healthier home environment for at-risk populations during the lockdown.

Overcoming clean fuel inequities during COVID-19

Household air pollution generated from the use of polluting stoves paired with fuels like wood, charcoal, animal waste or kerosene is a leading risk factor for disease in Sub-Saharan Africa, particularly among women and children. Stoves powered by electricity, or fuelled with gaseous fuels like LPG, natural gas and biogas are clean and scalable available solutions proven to reduce household air pollution exposure and disease. Affordability is a common barrier to their adoption by the poor households. A recent study[1] in an informal settlement in Nairobi, led by the University of Liverpool and Amref International University in Nairobi, Kenya revealed that 95% of study households enrolled in the pay-as-you-go (PAYG) LPG programme during COVID-19 lockdown maintained use of the fuel source despite lockdown-related declines in household income. For comparison, a sample of households in Eldoret, a peri-urban community in western Kenya, without access to PAYG meters during lockdown – and who instead had to rely on single, bulk purchases of LPG – reduced their average use of gas by 75%.

[1] Matthew Shupler, Mark O'Keefe, Elisa Puzzolo, Emily Nix, Rachel Anderson de Cuevas, James Mwitari, Arthur Gohole, Edna Sang, Iva Čukić, Diana Menya, Daniel Pope, Pay-as-you-go liquefied petroleum gas supports sustainable clean cooking in Kenyan informal urban settlement during COVID-19 lockdown, Applied Energy, Volume 292, 2021, 116769, ISSN 0306-2619, https://doi.org/10.1016/j.apenergy.2021.116769.

Pay-as-you-go LPG offers much more than affordability

Households involved in the research reported benefits of PAYG LPG beyond fuel affordability. Additional to the flexible payment scheme offered by PAYG LPG, customers also valued the increased safety from burns/gas explosions, the ability to prepare multiple dishes simultaneously using the double-burner stove provided with the smart meter technology, and having fuel cylinders delivered directly to their home. Households in the study indicated that they could carry out a higher amount of cooking/bathing tasks with PAYG LPG compared to the same amount spent on kerosene, partially due to the double-burner stove.

Using the food-energy intersection to meet multiple SDGs

Another study[2] conducted in the same informal settlement in Nairobi and also led by the University of Liverpool and Amref International University assessed effects of COVID-19 lockdown in April 2020 on energy and food security. During lockdown, a quarter of households who were buying LPG in bulk (e.g. 6 kg cylinders) could not maintain its use in the face of loss of employment and income decline, and switched instead to polluting cooking fuels such as kerosene or wood, which could be bought in smaller amounts or gathered for free. Additionally, 95% of all households reported income loss with 88% indicating they were food insecure. Households that switched their primary cooking fuel away from LPG during lockdown were more likely to alter the foods they consumed, with common changes including reduced consumption of meat and breads and higher consumption of vegetables.

These households also tended to have had lower LPG consumption prior to lockdown and had suffered greater pandemic-related income loss compared to households that continued to use LPG. Thus, inequities in clean cooking fuel access may have been exacerbated by COVID-19 lockdown.

This study highlighted the complex relationship between shifting household demographics, financial strain, diet and cooking patterns during COVID-19 lockdown and also showed how the food-energy nexus provides an opportunity to address two key Sustainable Development Goals (SDGs): achieving zero hunger (SDG 2) and universal affordable, modern and clean energy access (SDG 7) by 2030, further compounding the health benefits afforded through clean household energy. Ensuring that LPG is affordable, accessible and meets the dietary and cooking needs of families should be a policy priority for helping improve food and energy security among the urban poor while at the same time preventing lung and

[2] Matthew Shupler, James Mwitari, Arthur Gohole, Rachel Anderson de Cuevas, Elisa Puzzolo, Iva Čukić, Emily Nix, Daniel Pope, COVID-19 impacts on household energy & food security in a Kenyan informal settlement: The need for integrated approaches to the SDGs, Renewable and Sustainable Energy Reviews, Volume 144, 2021, 111018, ISSN 1364-0321, https://doi.org/10.1016/j.rser.2021.111018.

cardiovascular disease. Further research is needed into novel approaches to ensuring that affordable clean cooking solutions are available for all.

"These two studies highlight increased challenges to equitable energy access due to the COVID-19 pandemic, but present exciting opportunities for innovative technologies like pay-as-you-go smart meters to overcome households' financial strain and allow them to breathe cleaner air in their homes when cooking." Matt Shupler, University of Liverpool