Assessing Household Cooking Energy and Potential for Transition to E-Cooking in Informal Urban Settlements Cooking in Informal Urban Settlements

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Theory of change and why study electric cooking in informal settlements

Nearly 1.5 Billion have access to electricity yet continue to use solid biomass for cooking. Primary reasons in rural areas are that a) fuelwood can be gathered from one's own trees or from the surrounding landscape with investments of time but without cash outlays where commercial fuels and electricity needs cash outlays, b) compared to urban rural electricity access is lower and c) incomes are generally lower in rural settings. In urban areas on the other hand gathering fuelwood is not generally viable and at the same time commercial fuels such as LPG are expensive both in upfront costs and lumpy recurrent costs. Those with higher incomes do overcome the barriers of upfront costs/lumpy payments, but those live in dense urban informal settlements, without secure tenancy and stable incomes find themselves in a precarious situation. They do spend on fuelwood, charcoal, and other commercial fuels, and yet do not enjoy the benefits of clean cooking commensurate with spending. Moreover, it should in principle be cost effective to bring reliable access in these settlements. Hence, there is an opportunistic entry point to examine what the barriers to adoption of e-cooking are since with prepaid electricity the payments are not lumpy.

Abstract

Initially measures to drive adoption may succeed in urban settings where a) there is constrained access to biomass- leading to fuelwood/charcoal becoming purchased fuels, b) consumers more likely to value time and convenience, and c) living quarters are smaller and lack ventilation.

Informal settlements can constitute a significant proportion of the urban population, and being in urban settings would be subject to poor biomass access. These populations are particularly vulnerable and yet spend significant sums on recurrent costs albeit on solid biomass fuels. They constitute a demograhic that is vulnerable in housing tenure, are likely spending as much as what clean fuels should cost, yet continue to reply on poor quality fuels and devices. They are unable to make lumpy payments for fuels. They are likely to benefit from distribution models that can allow smaller one-time purchases.

While most in informal settlements do have electricity access- they face issues of housing tenure, tenancy; poor quality housing structures, inevitable reliance on unofficial electricity connections (which they nevertheless pay for) that are possibly unsafe/unreliable for use, and reluctance of utilities to engage with them. Electricity access might be adequate for lighting, mobile charing and other small uses, but there is no assurance that the connection can be used safely for cooking- something that requires one or two orders of magnitude higher power than lighting or cell-phone charging. Yet this demographic may have the highest returns to public investments when it comes to transitioning to clean cooking.

However, the electrical power requirements for such cooking is in kiloWatts as opposed to in tens or hundreds of Watts and not those with nominal access to grid electricity may be able to avail themselves of safe reliable power- either due to housing/wiring quality behind the meter or supply reliability in front of the meter.

Use of electricity for specific cooking tasks (e.g. kettles, microwave, toasters, rice cooker or an electric pressure cooker) is already popular in the global north even when the primary cooking fuel might be natural gas or propane or LPG. We observe evidence of electric cooking (we include heating and boiling water as cooking tasks for brevity), albeit as a small fraction of the fuel stack, even in urban informal settlements in Kampala and Nairobi where both home wiring and supply quality were a challenge.

Note that within the limits of use where lifeline tariffs are available, the cost of electricity can be half to a third of the cost of LPG fuel. But lifeline tariffs are currently available only for a fraction of desired cooking requirements. Electricity can potentially be used immediately at least for some tasks, by nearly 60% of the 2.5 billion that cook with solid biomass but have an electric grid connection at their home. Many of these 60% live in rural areas and the governments of many countries in SSA have invested heavily in bringing wire to the home. In this case, the marginal costs of enabling electric cooking can be low especially if one can leverage appropriate tariffs.

A challenge does remain in the reliability and quality of supply, the safety of the wiring and the physical structure of the dwelling. Existing connection quality, earthing, protection, ready-boards and inside wiring may be adequate only for lighting and solid-state electronics. Informal settlements may have the additional barrier from the lack of formal tenancy rights and the inability of the utility to address illegal connections.

Study Findings

The report presents the initial findings from two surveys conducted in the urban informal settlements of Mathare, Kenya and Namuwongo, Uganda to assess the household cooking energy usage and potential for transition to E-cooking. The survey included inquiries about household demographics, electricity connection and monthly electricity costs, and cooking behaviors and their associated costs.

Case of Namugongo, Uganda Urban Informal Settlement

A survey of 256 households in Namuwongo was carried out. All the respondents were asked which energy sources they used to cook food or boil water, revealing 90.63% used charcoal exclusively. Most of the remaining households, engaged in fuel-stacking charcoal with either firewood, briquettes, or kerosene. The findings underscore the significant reliance on charcoal among households.

Out of 251 households with a wired connection, 59.76 % of households shared a Yaka Meter, 19.52% owned their own Yaka Meter, and 20.72% were unmetered. Approximately 22% of wired homes (56 households) used electricity for E-cooking, predominately for boiling water only. Of these E-cooking households, around 90% used an electric kettle. Comparing electricity boiling usage between households with and without a Yaka Meter, it was found that 16 households with a Yaka meter used electricity solely for boiling water, compared to 42 people without a Yaka Meter who did the same.

The monthly payments (in USD) for charcoal, the primary cooking energy source, and electricity for households using a Yaka meter are shown in Figure 1 below. It is evident that most households spent nearly 3 times as much on charcoal for cooking or boiling water than on electricity per month. The payment disparity suggests the potential for households in this informal settlement to transition to e-coking, and consequently reap the positive environmental and health benefits.

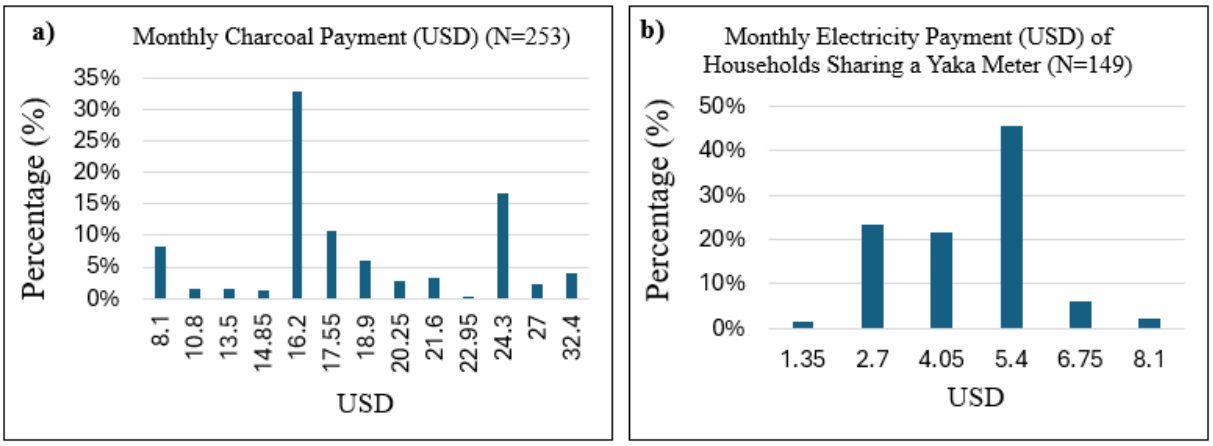

Figure 1- Monthly expense on a) charcoal and b) electricity among households sharing a Yaka Meter in USD.

Case of Mathare, Kenya Informal Settlement

In the survey conducted in Mathare, 242 households participated. Regarding cooking energy sources, the majority used kerosene and LPG only, 17.4% and 15.7% respectively. Other households were predominately fuel-stacking charcoal with LPG (12%), charcoal with kerosene (12%), or kerosene with LPG (10.7%). About 6.2% of the total households are fuel-stacking electricity with other energy sources. Contrasting with Namuwongo, the Mathare settlement has a wider energy mix and reduced reliance on charcoal for cooking.

Out of the 242 households, 234 were equipped with a wired connection with approximately 80% of the households unmetered, 7% shared a meter, and 9% owned a meter. This contrasted with the electrical connectivity observed in Namuwongo, where sharing a meter was most prevalent. Among households with a wired connection, approximately 55% used electricity for boiling water only, while 6% used electricity for cooking food and/or boiling water. 57% of households exclusively using electricity for boiling water used an electric kettle and 35% used a General electric stainless water heater immersion coil.

Given the energy mix in the Mathare settlement, the total monthly expenditure of all households (N=242) is compared with the electricity payment for unmetered households (N=194) in Figure 2 below. Around 60% of households spent 1200-1599 Ksh (8.8-12 USD) per month whereas most unmetered households spent 500 Ksh (3.70 USD) or less on electricity. This highlights the potential for these households to transition to E-cooking.

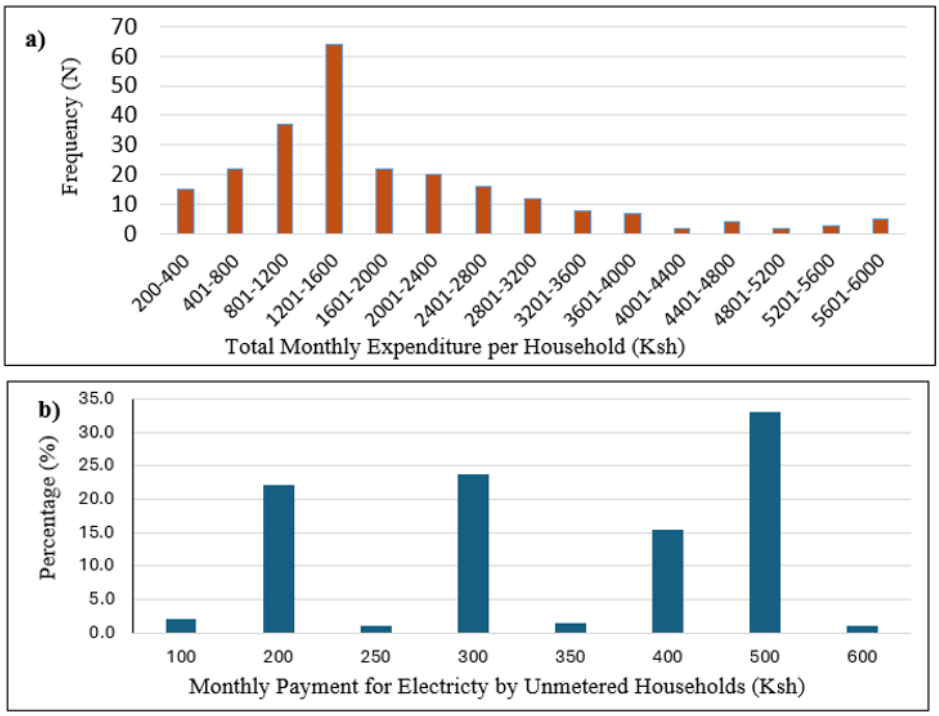

Figure 2. a) Total Monthly Expenditure (Ksh) on Cooking Energy Sources (charcoal, Kerosene, LPG, Ethanol, Briquettes, Firewood) b) Monthly electricity payment of households without a meter. 1 Ksh=0.0074 USD