



Communication and Marketing Department
Isebe loThungelwano neNtengiso
Kommunikasie en Bemerkingsdepartement

Private Bag X3, Rondebosch 7701, South Africa
Welgelegen House, Chapel Road Extension, Rosebank, Cape Town
Tel: +27 (0) 21 650 5427/5428/5674 Fax: +27 (0) 21 650 5628

www.uct.ac.za

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Prepaid meters for low-income households linked to energy poverty and food insecurity – new research

A doctoral thesis by Isaac Kwamena Nunoo from the University of Cape Town's (UCT) [School of Economics](#) has highlighted the crucial role of electricity in enhancing household welfare in Ghana and South Africa.

The thesis explored the impact of electricity and fuel usage in home-based enterprises on household welfare. It found that both electricity and fuel were important for increasing income from non-farm enterprises. However, the thesis found that the difference in the choice between these two inputs was negligible.

It also examined the connection between prepaid electricity meter systems and food insecurity. The results indicated that households using prepaid meters were more likely to experience hunger or food insecurity. The presence of prepaid meters was associated with a 3.9% higher likelihood of overall household hunger, as well as a 4.7% and 4.4% higher likelihood of hunger among adults and children, respectively.

Commenting on the findings, Nunoo said: "Low-income households often lack sufficient cash savings or a steady cash flow, making it challenging to cover essential expenses like food, electricity, and other necessities. When these households prioritise paying for electricity, it reduces the remaining income available for food, leading to a higher likelihood of food insecurity. This financial strain forces difficult trade-offs, highlighting the tough choices these families must make between maintaining basic utilities and ensuring adequate nutrition."

Titled "The heterogeneous impacts of energy type and metering systems on household welfare: insights from Ghana and South Africa", the thesis also assessed the impact of prepaid electricity meter systems on energy poverty in South Africa. It revealed that households using prepaid meters were 3.35% more likely to experience energy poverty compared to those with postpaid systems. The shift to prepaid meters also resulted in increased dependence on unclean energy sources for cooking and heating, with a 5.7% increase in biomass use for cooking, 10.9% for space heating, and 4.3% for room heating.

Nunoo said the incidence of energy poverty associated with prepaid metering systems often arose due to fuel stacking, where households relied on multiple energy sources. When prepaid metering systems limit electricity consumption, he said households were forced to use unclean energy sources, such as biomass, for cooking and heating. "This reliance on

unclean energy is a clear indicator of energy poverty, as it highlights the inability to access and afford cleaner, more reliable energy sources.”

He said the study underscored that vulnerable or impoverished South African groups were the most affected by energy poverty when using prepaid meters. “While the study delineated the challenges faced by vulnerable groups, it also proposed potential solutions to improve the situation for impoverished households using prepaid metering systems. Notably, the combined use of prepaid meters with the free basic electricity programme could alleviate energy poverty. Moreover, the study suggests that integrating prepaid meters with the Reconstruction and Development Programme housing scheme can serve as an effective pro-poor policy to reduce energy poverty,” he added.

He shared: “The well-insulated walls help reduce electricity consumption, and energy-efficient appliances further decrease energy use, making electricity purchases more cost-effective and rational when compared to unclean energy sources. This approach highlights the benefits of combining energy-efficient infrastructure with prepaid meters to lower overall energy costs and encourage the use of cleaner energy.”

According to Nunoo, the lack of significant difference between electricity and other fuels suggests that external and environmental factors should be considered when choosing an energy source.

“Electricity is often preferable to alternative fuels due to its lower environmental impact and associated health implications. This underscores the importance of promoting electrification for domestic and productive uses,” he said.

Nunoo said the findings clarified the ongoing debate regarding the most beneficial choice of energy for household improvement. Considering how prepaid electricity can help explain household welfare problems such as food insecurity and energy poverty, he said the research prompted academics and policymakers to revisit policies that may not have considered their effects on vulnerable populations and could potentially hinder the adoption and transition to clean energy.

“This analysis not only highlights the unintended consequences of certain public policies but also demonstrates how implementing relevant complementary policies can mitigate the identified negative impacts. By addressing these issues holistically, policymakers can better manage the challenges and ensure that the intended benefits of these policies are fully realised, while minimising any adverse effects.

“Ensuring that public policy achieves its intended purposes will lead to the acceptance of good initiatives and benefit everyone, including vulnerable populations and policymakers. I have had the opportunity to present my findings and receive relevant feedback at many conferences, including at the World Bank in Washington, D.C. as a visiting fellow,” he said.

His supervisor, Professor Edwin Muchapondwa, a professor of economics in the School of Economics, said the findings emphasised the need for targeted electrification strategies and safety nets, particularly for vulnerable populations, to address energy poverty and promote economic opportunities.

“Nunoo's work offers valuable contributions to public policy and sustainable development in Africa,” said Professor Muchapondwa.

Nunoo will graduate on Wednesday, 4 September with a PhD in Economics.

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Ridovhona Mbulaheni

Media Liaison and Monitoring Officer
Communication and Marketing Department
University of Cape Town
Rondebosch
Tel: (021) 650 2333
Cell: (064) 905 3807
Email: ridovhona.mbulaheni@uct.ac.za
Website: www.uct.ac.za