

# **The Impact of Free Distribution of LPG Equipment to Rural Households: The Case of Ghana's Rural LPG Promotion Program**

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## **1. Introduction**

Household air pollution is responsible for over three million deaths annually (WHO, 2016) with a greater percentage of these in developing countries. Apart from deaths, exposure to pollution resulting from the use of solid cooking fuels exposes users not only to the risk of contracting respiratory and cardio-vascular diseases (WHO, 2017) but also to other less obvious health effects such as child stunting when babies are exposed in-utero (Adjei-Mantey and Takeuchi, 2019). Solid cooking fuels continue to remain the leading fuels used by almost three-quarters of households in Ghana (GSS, 2017) and this remains a challenge in the country's quest to reduce household air pollution.

One of the measures taken by Ghana's ministry of energy to promote the use of modern cooking fuels is the roll out of a policy named Rural Liquified Petroleum Gas Promotion Program (RLPGPP). This policy aims to accelerate the uptake of LPG and make it the first-choice domestic cooking fuel in rural communities. Under this policy, rural households are provided with filled LPG cylinders and cookstoves with corresponding accessories free of charge. This is to help make it easier for beneficiary households to make the decision to switch from using traditional and dirty cooking fuels to a cleaner and healthier fuel, in this case, LPG. By the end of year 2017, the ministry had distributed a total of 149,500 cylinders and 118,360 cookstoves with accessories including gas regulators and gas tubes to districts across the country. As part of this policy, the ministry also aimed to facilitate the setting up of mini refill outlets in every beneficiary district in collaboration with LPG marketing companies to make cylinder refill options available to beneficiaries.

After four years of implementing this program, it remains to be seen whether generally, the targets of this policy have been achieved. The aim of this study is to assess the impact of the RLPGPP on household cooking fuel usage by using two rounds of a national survey on household living standards. Although there are several studies that explore the impact of LPG distribution in developing countries, evaluation of the policy at the nation-wide level is still scarce. In addition, this study investigates if any unintended impacts have resulted from the program; in this study, we focus on the potential impacts of the program on poverty alleviation in rural households.

## **2. Data and Method**

This study uses the two most recent rounds of the Ghana Living Standards Survey (GLSS 6&7). These are independent cross-sectional nationwide surveys which collect household data on similar variables at different times. From these datasets, we construct district level data.

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We assign each district a unique code for both time periods and compute district averages for the variables of interest for households within each district. We do this for both rounds of the data to arrive at baseline and end-line level data. At the district level, the proportion of households in a district that use LPG as their primary cooking fuel is used as a response variable to judge the impact of the RLPGPP since that is the main goal of the program – to increase LPG usage among households especially those in rural areas. We also examine the impacts of the program on the proportion of households within a district who live in poverty and in extreme poverty determined by upper and lower poverty lines.

Due to potential endogeneity, we first use the instrumental variable approach to address the potential endogeneity and appropriately measure the impacts. We use the difference in votes obtained by the two biggest political parties as a share of total valid votes in the most recent national elections prior to the program implementation as our instrument. Because this turned out to be a weak instrument and to avoid the biases of using the two stage least squares in the presence of weak instruments, we use the limited information maximum likelihood estimation. The difficulty in finding a stronger instrument necessitated the use of matching methods and difference in differences after matching. In this approach, we matched beneficiary districts with districts that had not benefited from the RLPGPP based on pre-treatment characteristics and measured the impacts. To reduce any remaining biases and to make results more robust, we applied the difference in differences estimation after matching treated and control units to measure the impacts of the program.

### **3. Results**

The instrumental variable approach finds no statistically significant impacts of the program; LPG use has not increased significantly as a result of the program neither has firewood use reduced any significantly. Consequently, the program had yielded no significant reductions in the proportion of households that live in poverty and extreme poverty in rural districts. Results from the matching methods also confirm that the impact of the program on LPG and firewood use is not statistically significant. On the other hand, the difference in differences estimation post matching show significant impacts on poverty. The proportion of households below the poverty lines have reduced significantly attributable to the program. Further investigations reveal that increases in new constructions of LPG refill stations could be a potential channel through which the program has impacted on the poverty situations within the districts.

### **4. Conclusions**

Based on all our estimation results, we conclude that implemented in isolation, the program did not have the strong impact in respect of its primary objective of increasing LPG usage as well as any impacts on poverty. However, when implemented in conjunction with other factors such as having the right amount of infrastructure and a sufficient refill plan in place, the program has the potential to yield significant impacts.