

# Rural Lighting in Kenya



Over a billion people worldwide, most of whom live in sub-Saharan Africa, lack electricity, and mainly rely on kerosene lanterns for light. Recently, prices for solar lanterns have been dropping and they may help supply clean, affordable lighting and phone charging to those who are not connected to the electric grid. Yet little rigorous evidence is available on how this new technology is being adopted and used and how it affects people's lives. Researchers are partnering with SolarAid to examine potential barriers to adoption and evaluate the impact of solar lanterns on energy expenditures, light use, consumption of kerosene and other energy sources, time use, health, education, safety, and happiness.

## Policy Issue

Access to household electricity is associated with numerous positive socioeconomic effects, including higher income, employment, better health, and positive educational outcomes. But millions of households worldwide lack power and sub-Saharan Africa is the least "electrified" -- more than two-thirds of households there lack electricity. Rural households in Africa typically rely on kerosene lanterns, but fuel for the lanterns is expensive, the fumes might have adverse health effects, and the lighting quality is low. Extending the electric grid to remote areas is expensive and poses political, administrative, and logistical challenges. A number of governments and development organizations are therefore seeking alternative methods of providing people with even the most basic power. Since the cost of solar power has fallen dramatically in recent years, many are looking to solar lanterns, however the impacts and use of solar lighting in sub-Saharan Africa are not fully quantified. This research aims to help fill that gap by examining current demand for solar lights, usage patterns, and their impact on households.

### RESEARCHERS

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### COUNTRY

Kenya

### PARTNER

### PROGRAM AREAS

Education, Health

### TOPICS

Environment, Product Pricing, Technology Adoption

### TIMELINE

2015-2016

## Evaluation Context

This study is taking place in Nambale and Teso-South, two sub-counties in Busia, Western Kenya, where the electrification rate is about 10 percent. The current price for a solar light in this area is low compared to the costs of a grid connection □- around US \$400 in that region - which many rural households living on less than US \$2 per day cannot afford.

The study is being conducted in partnership with Acumen Fund and SolarAid, one of the largest distributors of solar lanterns in East Africa. SolarAid distributes solar lanterns mostly through schools

via its social enterprise, SunnyMoney. SolarAid has sold over 1.8 million solar lanterns in total and around 500,000 lights in Kenya.

## Details of the Intervention

Researchers are conducting a randomized evaluation to measure demand for solar lights and to evaluate their impact on energy expenditures, light use, consumption of kerosene and other energy sources, time use, educational outcomes as well as touching on health, safety, and happiness. Researchers will randomly assign a total of 1,400 households from 20 schools to one of the following groups:

Free solar lanterns: 400 households (20 from each school) will receive a free solar light, 200 of which will also receive a light that can charge a mobile phone.

Solar lanterns for purchase: 600 households will receive a voucher that allows them to purchase a solar light at three different prices: either at 400 Kenyan Shillings (USD \$4), 700 Kenyan Shillings (USD \$7), or at the full price of 900 Kenyan Shillings (USD \$9).

Comparison group: 400 households (20 from each school) will not be offered lanterns either for free or for sale at the time of the study.

A subsample of solar lights will have sensors that record the date and time the solar lights are used and charged. Kerosene lanterns sensors will also be installed in 13 households in each school selected randomly from both the comparison group and the households receiving a free light.

The research design will enable researchers to measure the impacts accessing solar lanterns have on rural households. They will first look at the financial returns to investing in solar lanterns, namely how long it takes an average household to save on kerosene, candles, or batteries to make up for the upfront cost of the solar light. We will also measure whether possible reduction in energy expenditures have an effect on general savings and expenditure patterns. Second, they will look at changes in time use, particularly during productive hours such as study time, to see whether solar lantern usage translates into higher test scores for children and/or higher income for guardians. Third, they will measure respiratory and eye infections, perceived safety and happiness.

In addition, this design will enable researchers to get an indication on whether there are market failures, such as the lack of availability of solar technology in the study area, and demand-side barriers, such as insufficient information about the product and/or the supplier, lack of trust or externalities within or outside of the household. Finally, the researchers will evaluate what role social networks play in a household's decision to adopt this novel technology.

## Results and Policy Lessons

Project on-going; Results forthcoming.

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