

Monitoring Electricity Reliability at Kenyan Healthcare Facilities

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Electricity reliability is important to the functioning and productivity of public institutions and firms of all sizes. In this project we monitor electricity reliability at grid-connected rural health facilities in Kenya during the COVID-19 pandemic, a time during which it is particularly important to ensure the continued delivery of health services. We find that poor quality electricity is costly to health facilities in the form of increased monetary costs and diminished quality of services. Power outages are common, with the majority of facilities in our sample experiencing an outage in the past 30 days. Voltage fluctuations caused equipment damage at about a third of facilities within the past six months. Back-up power sources, while common, only partially mitigate the negative effects of poor electricity quality.

Introduction

Electricity is a public service important to the functioning of firms of all sizes in many industries. During the COVID-19 pandemic the continued delivery of health services has depended critically on reliable access to electricity—for functions such as lighting, data management, refrigeration, sterilisation, and provision of running water. While grid connections in sub-Saharan Africa have grown rapidly in recent years, power reliability has varied and often remains a critical issue. In the healthcare sector, a systematic review finds that in eight countries with data in sub-Saharan Africa, only 34 percent of hospitals had reliable electricity in the week prior to the survey (Adair-Rohani et al 2013). In this study, we document the quality of electricity services in Kenya and the impacts of service interruptions on healthcare providers. We focus on rural facilities, which tend to have less reliable power and disproportionately service lower income communities.

Data and Methodology

In January 2021, we randomly selected registered health facilities that were listed in the Kenya Master Health Facility List in ten counties in the Western, Coast, Eastern, and Rift Valley regions of Kenya. Research team members called facilities to confirm their electricity connection status. The sampled facilities that were surveyed consisted of 812 facilities connected to grid electricity, with the median facility connected in 2012. This study focused on smaller health facilities: dispensaries, small medical clinics, and the lowest level referral hospital. Just over half of the sampled facilities are government-run, with the remaining organisations are largely comprised of private practices and faith-based organisations. Technicians and other staff at the selected health facilities were surveyed on recent power outages, equipment usage and failure, alternative energy sources, and energy costs via phone interviews. The first round of surveys began in January 2021; the

second round began in April 2021; the third round began in August 2021. All data were shared with the national utility company to facilitate better targeting of limited resources for network maintenance.

Findings

We find that poor service quality is costly to health facilities in the form of increased monetary costs and diminished quality of services. Power outages are common, with the majority of facilities (78%) experiencing an outage in the past 30 days. A typical facility experiences about 10 hours of blackout per week, with a significant subset experiencing extended blackouts lasting 24 hours or longer. Outages were spread out heterogeneously over time and space. Certain counties disproportionately had more severe problems with outages. Likely due to poor clearance from vegetation and other issues with the infrastructure, outages are more common during the rainy season as uninsulated lines short and imperfect grounding leads to local outages. In addition to loss of power, excessive voltage fluctuations can also leave a health facility without use of essential equipment, and equipment can be damaged. Voltage fluctuations caused equipment damage at about a third of facilities within the past six months.

In response to grid electricity that is often unreliable, many facilities have backup power systems. 62% of facilities had a generator as a backup power source. 42% had a solar system. Less than 2% of facilities had no backup power source at all. Despite the ubiquity of backup power sources, respondents reported that power outages affect the provision of health services and costs incurred by the facility. 40% of respondents indicated that the facility's total energy costs are affected by outages, likely due to the costs of maintaining and running backup power sources. Two-thirds of respondents reported that health services are affected by outages. This can partly be explained by the types of equipment that typically only operates when grid electricity is available. According to our data, the average facility has 3 to 4 types of equipment that do not run when grid power is offline. Delays in switching to backup power may also disrupt operations, and about 12% of respondents indicated that their backup power source has itself previously failed.

Conclusion and Policy implications

Among grid-connected rural health facilities in Kenya, we document that episodes of low quality electricity service affects the health services they provide and their energy costs. Despite the widespread use of backup energy sources, they only partially mitigate the negative effects of outages and constitute a significant expenditure in capital investment. The results suggest that beyond increasing the number electricity connections, increasing the productive use of electricity in rural areas will likely require investments to improve the quality of service that is provided. We note in the data that short outages are common but often left unreported to the utility company, also suggesting that improved reporting, monitoring, and maintenance processes may help address recurring problems. Moving forward, a key area of future work is to identify and better understand the kinds of policy changes that can help improve service delivery.

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