

Oxygen Supply in Northern Malawi: Needs Assessment Report

INTRODUCTION

Health services in low resource countries are already extremely under-resourced and face huge challenges in treating the approx. 15% of people infected with severe symptoms of COVID-19 requiring oxygen therapy. Even with access to appropriate equipment, their energy requirements must be considered. According to the WHO, approximately one third of hospitals and clinics in sub-Saharan African countries have the reliable power supply necessary for these to be effective.

Oxygen is used to treat acute respiratory illness and has been shown to reduce mortality and improve COVID-19 patient outcomes. An Oxygen concentrator is an electrically powered device which concentrates oxygen from ambient air by removing nitrogen. They are a cost effective way to produce oxygen in health facilities. A key challenge to running an Oxygen Concentrator in low resource settings is a lack of uninterrupted reliable access to electricity, which can lead to health facilities being unable to produce oxygen reliably leading to associated negative health impacts. As part of a wider project to develop low-cost, reliable oxygen concentrators, Community Energy Malawi and The University of Strathclyde engaged with a selection of rural health centers in Northern Malawi to assess their existing services and oxygen supply capability. This short report summarizes the findings.

OVERVIEW OF HEALTH FACILITIES

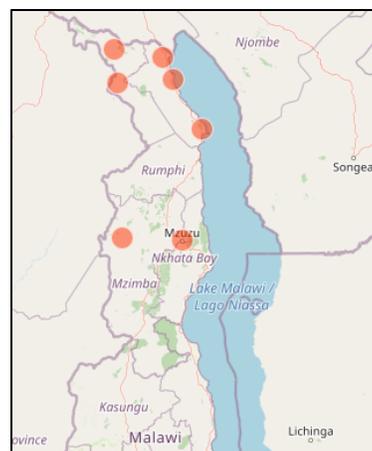
In total, 7 rural health centers (Table 1) were surveyed and data was collected using the kobo-collect survey platform. All the health centers visited operate under CHAM on a Service Level Agreement with the Government of Malawi.

Table 1. Health Centers Surveyed

Name of Health Centre	Traditional Authority	District
St Clara Health Center	Mwenewenya	Chitipa
Kaseye	Mwaulambya	Chitipa
Atupele Community Hospital	Kilupula	Karonga
Hope Clinic	Kyungu	Karonga
St Anne's Health Center	Wasambo	Karonga
Mzambazi Community Hospital	Chindi	Mzimba
St John's Hospital	Mtwalo	Mzimba

All the health centers run an Outpatient Department (OPD) and also provide Child Healthcare including Vaccinations. Other common services offered in these facilities include maternal healthcare, nutrition and emergency care.

On average, each health facility has 6 buildings which commonly house the OPD, Administration Block, Maternity wing, Laboratory, Under 5 clinic and the Antiretroviral Therapy (ART). However, there is significant range in capacity (ranging from 1 to 16 building and from 2 to 194 members of staff).



On average, the health centers treat 615 people per week (ranging from 90 to 2000) with Malaria being the most commonly treated illness affecting mostly women and children. Also featuring highly are Pneumonia or other respiratory illnesses affecting mostly children and maternal healthcare. 5 of the health centers perform baby deliveries with an average 18 deliveries per week.

4 of the health centers do not have access to clean and safe water with most of them having localized water pumping systems without water treatment mechanisms. The rest of the facilities have piped connections to the Northern Region Water Board which provides them with clean and treated water.

For the services provided, all health centers reported that there are fees associated with certain services. Through a Service Level Agreement with the Government of Malawi, all Under 5 and ART services are free for all clients while the rest have a fee attached.

ENERGY SITUATION

6 of the health centers are connected to the national grid but they also have genset backup systems. 4 of the facilities have solar PV systems running either as a backup system or specifically powering certain section or devices.

All the health centers connected to the national grid reported to have experienced an unscheduled power outage at any given time of the day.

The facilities are responsible for the electricity bills incurred from the grid electricity with is averaged at MK 252,566.00 per month. All these facilities have diesel generators as a backup option costing them an average MK 62,200.00 per month.

3 of the solar PV systems are said to be working perfectly well while 1 is partially working – the reason being the system's failure to satisfy the planned energy demand. The biggest system is a 10 Kilowatts system at Atupele Community Hospital in Karonga district while the smallest is 700 watts at St Clara health center in Chitipa.

The major appliances requiring electricity in the health facilities are lighting, medical devices (Oxygen Concentrators, Sterilizers, Microscopes, Xray Machines, Chemistry Analyzers, Centrifuge, and Nebulizer Machine), ICT (Computers and communication machines), Refrigerators.

COVID-19 PREPAREDNESS

All the health centers are implementing covid-19 related activities to ensure the safety of the staff, clients and surrounding communities. These activities include making available sanitization facilities, Personal Protective Equipment and implementation awareness activities.

5 had not yet handled any covid-19 related issues. For the ones that handled suspected cases, one sample came out positive while for the other case the sample came out negative.

6 of the health centers feel they are well prepared to provide primary care for covid-19 cases. This is mostly through the availability of isolation centers, PPE and Oxygen concentrators although not enough. For the health center that is not prepared, they cited the unavailability of designated isolation center and PPE for the staff members.

All in all, 5 of the health centers have designated isolation centers while 2 do not have. The isolation centers have an average 6 bed capacity. For the 2 health centers that do not have isolation centers, one health center reported that they plan to set up one as soon as possible while the other health center said there was no immediate plan to have one in place because they would always refer such cases to the District Hospital.

All the Isolation centers are electrified with 6 connected to the national grid, 1 on solar PV while 5 have designated diesel generators for backup. Electricity supply is relatively well covered. The larger centers already have a grid supply and established generators the others have newly provided generators. The smallest center only had basic solar until a new generators arrived in May. One of the centers has a 10kW solar PV system in addition to grid connection.

Oxygen Specific Issues

All Health Facilities have oxygen concentrators available. These are all bedside concentrators with capacity ranging from 5 – 20 litres per minute. Table 2 below summarizes the current situation regarding oxygen use at each facility. There is a clear mismatch between oxygen requirements and oxygen concentrator availability, particularly at the larger facilities. This is prior to the implementation of isolation centers that would drastically increase oxygen requirements. There is also a limited expectation on lifespan of the concentrators. Furthermore, reliability is mentioned as a problem by all health centers, with the main underlying causes cited as unreliable energy supply and lack of maintenance capacity.

Table 2. Oxygen Needs and Resources

	Number of Wards with Oxygen	Total beds across all wards	Patients using oxygen across all wards (per month) *	Number of Oxygen Concentrators available	Expected time before failure (years)
Health Facility 1	3	7	8	3	2
Health Facility 2	4	88	5	4	2
Health Facility 3	1	2	0	1	2
Health Facility 4	2	54	8	4	1
Health Facility 5	5	80	45	3	1
Health Facility 6	5	10	5	4	2
Health Facility 7	9	100	90	5	2

* Respondents were asked to estimate total patients visiting the wards and the percentage requiring oxygen. Some responses were incongruous with a valid percentage and it is suspected the response was the actual number of patients needing oxygen. In these cases a best interpretation of the data was attempted.

In Figure 1 further information on reliability is provided. Faults with flow meters and power plugs were reported as a leading cause of failure, both noted to fail 'often'.

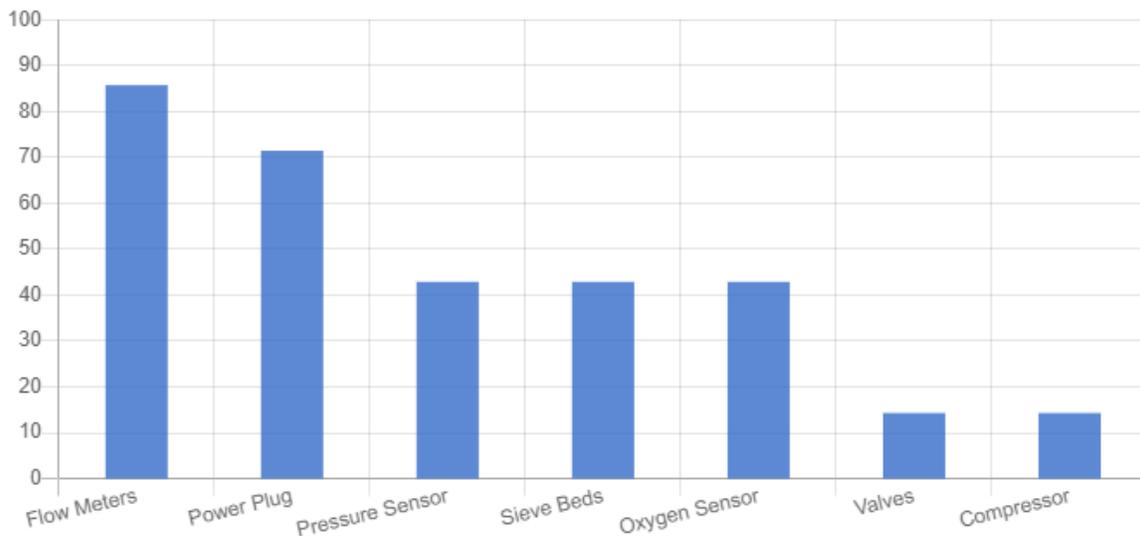


Figure 1: Oxygen Concentrator Components most likely to fail (by percentage of responses)

SUMMARY

In general, these prominent rural health centers have an existing capacity for treatment with oxygen and have commenced preparation for possible COVID-19 demand by planning for isolation units and obtaining additional oxygen concentrators and back-up generators. However, the capacity to deal with even existing oxygen demand appears to be limited and the use of expensive, polluting, diesel generators is less than ideal.

In general, reliable electricity would greatly improve the service delivery in the health centers. All potential devices would be able to run efficiently without interruption which can also lead to an increase in the number of clients they can attend to. With reliable electricity, the health centers would cut their energy expenditure brought about by running diesel generators.

Availability of low-cost, easy to maintain oxygen concentrators is an urgent requirement to enable effective response to a rise in COVID-19 patients.