EpiC Nigeria: Building a Stronger Medical Oxygen Ecosystem

Background

The Meeting Targets and Maintaining Epidemic Control (EpiC) project is a global initiative initially designed to provide strategic technical assistance and direct service delivery to achieve HIV epidemic control. EpiC was modified in early 2020 to include strengthening health systems' capacity to respond to the COVID-19 pandemic.

In Nigeria, EpiC contributed to efforts to prevent, prepare for, respond to, and bolster health systems to address the pandemic beginning in June 2020. EpiC provided technical support to set up the public health emergency operation center in Bayelsa and upgraded and retrained staff of the polymerase chain reaction (PCR) laboratories for COVID-19 diagnosis at the National Institute for Medical Research (NIMR) Lagos, University of Uyo Teaching Hospital (UUTH) Uyo, and Chief Odumegwu Ojukwu University Teaching Hospital (COOUTH) Awka. The USAID-funded Strengthening Integrated Delivery of HIV/AIDS Services (SIDHAS) and Strategic HIV/AIDS and TB Response Program (SHARP) Task Order (TO) 2 projects were supported with infection prevention and control (IPC) interventions to sustain HIV and tuberculosis (TB) services in five states.

EPIC'S KEY ACCOMPLISHMENTS

- Supported 70 facilities to improve access to medical oxygen
- Built capacity of 60 health workers on management of hypoxemia and oxygen delivery systems
- Developed oxygen system plans for 18 health facilities
- Developed a DHIS2-based medical oxygen equipment tracking system
- Connected and supported 164 health care workers in an online community of practice

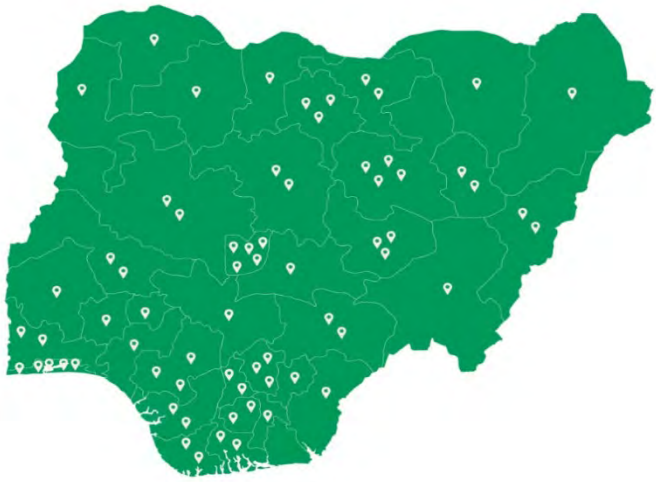
EpiC later supported 88 health facilities across Nigeria to receive and install 200 United States Government-donated ventilators and train staff on their use, and provided technical assistance (TA) to strengthen case management and critical care in the supported health facilities. EpiC also helped to expand access to COVID-19 vaccination among the general population and

EpiC is a global cooperative agreement dedicated to achieving and maintaining HIV epidemic control. It is led by FHI 360 with core partners Right to Care, Palladium International, and Population Services International (PSI).

priority population including people living with HIV (PLHIV) in Akwa-Ibom, Cross River, Anambra, and Enugu states.

From August 2021 through November 2022, EpiC provided TA to the Federal Ministry of Health (FMOH) to strengthen the medical oxygen ecosystem. A total of 70 health institutions across all 36 states and the federal capital territory were selected for support, building on the success of the previous COVID-19 case management and critical care support in 88 health facilities (Figure 1).

Figure 1. The location of the 70 supported health facilities across Nigeria



Medical oxygen is on the World Health Organization (WHO) list of essential medicines; a lifesaving intervention for treatment of hypoxemia with no clinical substitutes or alternatives.[1] Maintaining a supply of medical oxygen requires special procurement, storage, distribution, administration, and overall management of a functional system that ensures sustainable availability and access. The COVID-19 pandemic exposed critical gaps in availability and access to medical oxygen in most low- and middle-income countries.

Implementation strategy

Through strategic engagement with members of the national coordination platform—United 4 Oxygen (U4O)—and the 70 facilities, a multi-stakeholder approach was adopted to share concepts, best practices, and capacity building, and ensure stakeholder collaboration. The project's central implementation strategies included: (1) strengthen coordination for the national oxygen ecosystem among key stakeholders, (2) introduce and scale up oxygen use tracking and hospital equipment management systems, (3) build capacity of facilities for managing oxygen systems, (4) build primary and community-based capacity to diagnose hypoxemia and strengthen referrals/linkages to higher levels of care for hypoxemia treatment, and (5) strengthen capacity of health workers to provide medical oxygen to patients with severe COVID-

[1] World Health Organization. WHO model list of essential medicines-21st list. Geneva: WHO; 2019. Available from: https://www.who.int/groups/expert-committee-on-selection-and-use-of-essential-medicines/essential-medicines-lists.

19 infection. These interventions were aligned with the National Strategic Health Development Plan (NSHDP– II: 2018–2022) and the National Oxygen Strategic Plan (NOSP 2017–2022) with a goal to reduce morbidity and mortality due to hypoxemia in Nigeria by addressing the key barriers limiting access to high-quality diagnostics and medical oxygen delivery systems in health facilities.

Strengthening national level coordination for medical oxygen

The COVID-19 pandemic provided an opportunity to assess and improve Nigeria's health system capacity for critical care service delivery including the medical oxygen ecosystem. Efforts to provide effective governance and strengthen coordination and strategic partnerships to drive improved oxygen access in the country started in 2017 with the development of the first national strategy and road map for scale-up of access to medical oxygen in health facilities and establishment of a coordination platform, U4O, chaired by the oxygen desk of the Department of Hospital Services (HSD) of FMOH. With the onset of the COVID-19 pandemic in 2020, significant investments from the Government of Nigeria and donors were committed to increase access and improve the oxygen ecosystem in the country.

The EpiC project provided support to HSD/FMOH for strengthening coordination through its membership in U4O. The COVID-19 pandemic brought to light the need for innovative mechanisms to ensure sustainability of health care programs. One of these needs was for improved virtual platforms for communication, trainings, and other technical support. To overcome the challenge with restrictions on physical meetings, EpiC provided FMOH's oxygen desk with internet services for one year to make virtual engagements possible.

EpiC assisted HSD/FMOH with review of the National Oxygen Strategic Plan (NOSP) 2023–2027, along with other stakeholders on the U4O. The document was finalized and approved by the Honorable Minister of Health in May 2023.

Rapidly assessing facility-level oxygen systems

EpiC conducted a rapid assessment of oxygen delivery systems in 18 government-owned tertiary health institutions in March 2022. The goal was to identify potential areas for investment and support for the medical oxygen ecosystem in response to increasing demand due to COVID-19 and the need for resilient and sustainable health systems. The assessment aimed to identify existing infrastructure and human resources within selected health facilities relevant to the provision of medical oxygen, as well as identify potential areas of investment for scaling up access to medical oxygen.

Overall, all the tertiary facilities assessed had the capacity to scale up medical oxygen access and use. However, 14 of 18 noted a stock-out of oxygen within six months prior to the survey, with reasons including limited access to oxygen suppliers, and challenges with transportation. Facilities with functional pressure swing adsorption (PSA) plants noted erratic and infrequent power supply as a major challenge to meeting the demand for medical oxygen. Another challenge was poor capacity for documenting the use of and forecasting demand for medical oxygen. The assessment also indicated limited supply of respiratory care equipment and oxygen supply systems in health care facilities. Some of these findings—shared with U4O during the review of the national oxygen strategy—informed strategies and interventions in the NOSP, such as capacity building, national and subnational coordination, development of a national equipment maintenance and inventory management system to avoid stockouts, and proposed dashboard to monitor medical oxygen use at all levels.

Following the assessment, significant investments and improvements were made to the national oxygen ecosystem through the Global Fund mechanism, United Nations agencies, Bill & Melinda Gates Foundation, and EpiC. Health facility staff received trainings on medical oxygen delivery systems and oxygen use.

Connecting facility staff through a community of practice

EpiC helped establish and facilitated a community of practice comprised of intensivists, biomedical engineers, and health workers involved in the use of medical oxygen from the supported health facilities, as well as FMOH representatives. The 164-member WhatsApp group was a medium for dissemination of information and served as a peer-to-peer learning platform for strengthening capacity to provide quality respiratory care with access to medical oxygen. The group was led by officials of HSD/FMOH, FHI 360/EpiC headquarters and country office staff, and clinical mentors selected from the tertiary institutions. At the end of each month, question and answer training sessions were conducted on topics selected by the group including managing medical oxygen waste, managing hypoxemia in COVID-19 patients, and maintenance of respiratory care and medical oxygen delivery systems. Participants noted their appreciation of the community of practice for peer-to-peer mentorship and coaching and the opportunity to contribute to the national response.

Virtual community of practice monthly webinar sessions and WhatsApp group messaging

Strengthening health worker capacity for management of hypoxemia and use of oxygen delivery systems

Medical oxygen therapy can prevent many hypoxemia-related deaths. However, treatment in low-income countries is often limited by poor hypoxemia diagnosis and unreliable oxygen supplies, in part due to high prices and weak maintenance systems. EpiC Nigeria built the capacity of 60 frontline health workers on management of hypoxemia and oxygen delivery systems. The goal was to improve capacity for pulse oximetry, management of diagnosed hypoxemia, and use of oxygen delivery systems. Participants included doctors, nurses, community health extension workers, and biomedical engineers. The trainings were followed by step-down trainings and facility-based clinical mentoring for health workers at the representative facilities. Participants stated they had a better understanding of management of hypoxemia, need for prompt detection of hypoxemia, importance of sensitizing health workers across different hospital units, and strengthening capacity for tracking oxygen need and consumption to avoid stock-outs.

Facility-based clinical mentoring for health care workers. Photo by EpiC Nigeria.

Understanding oxygen needs at the facility enhances efficiency of the oxygen ecosystem. EpiC trained 30 biomedical engineers and health workers from 21 health facilities on the development and use of oxygen system plans (OSPs) using a tool, adapted from United Nations Children's Fund (UNICEF). The Excel-based tool is customizable for planning systems from source to patient including budgeting. Health facility-level data and country parameters are used to calculate oxygen needs. Data from OSPs will be used to develop sustainability plans for liquid medical oxygen (LOX) facilities.

Developing a medical oxygen equipment tracking system

District Health Information System (DHIS2) tracker is an open-source, web-based application that supports data collection and analysis of transactional or disaggregated data. EpiC developed a DHIS2 tracker for inventory of oxygen-related equipment at the facility level. This tracker and OSPs are used to manage the facility oxygen ecosystem. The tracker has been deployed to 17 health facilities.

Training of health workers on management of hypoxemia and oxygen use. Photo by EpiC Nigeria.

Facilitating a national dialogue to strengthening medical oxygen use

An end of project dissemination was held November 29, 2022, in Abuja, where achievements, best practices, and lessons learned from project implementation were shared. Strategies and innovations for further strengthening the medical oxygen ecosystem in Nigeria were also discussed.

The hybrid meeting—in-person as well as online streaming—was attended by 35 people, including representatives from FMOH, USAID, WHO, National Agency for Food and Drug Administration and Control (NAFDAC), Federal Capital Territory Hospital Management Board (HMB), CHAI, Oxygen for Life Initiative (OLI), and Air Separation Nigeria Ltd.. Health care workers and biomedical engineers from supported facilities shared their experiences and the impact of capacity building on improving their performance and management of oxygen systems. Representatives from FMOH, NAFDAC, the private sector, FHI 360, and chief medical directors from tertiary health institutions led a panel discussion on strengthening the oxygen ecosystem.

Panel discussion during the end of project dissemination event. Photo by EpiC Nigeria.

Lessons Learned and Recommendations

Sustained access to safe oxygen in low- and middle-income countries is often limited by inadequate funding, availability of functional oxygen supply systems, weak equipment maintenance and repair systems, poor availability of data on oxygen supply/demand systems to guide planning/decision-making, and inadequate skills and expertise among health workers and technicians. EpiC project built in several strategies to ensure sustainability of investments including continuance of the Community of Practice for medical oxygen use, sharing the DHIS2 tracker with U40 for integration into the planned national inventory system for medical oxygen, and capacity building for health workers on detection and management of hypoxemia. Knowledge gained during the period of assistance has been integrated into the revised national strategy for scale-up of medical oxygen in health facilities (2023–2027). The COVID-19 interventions yielded a "resilience dividend"—improved performance during the pandemic, improved quality of critical care for the general population, and preparedness for future health crises. Based on the experience in Nigeria, EpiC recommends the following to ensure a sustained and resilient oxygen ecosystem:

- Explore and adopt sustainable options for power supply for health facilities with oxygen plants through a public-private partnership (PPP). Some available options include collaboration with Niger Delta Power Holding Company and Nigerian Electricity Supply Corporation (Nigeria) Limited (NESCO) for consistent power supply. Guaranty Trust Bank

suggested a partnership that can support donation of solar panels and accessories as a complement to the national grid.

- Engage NAFDAC and other regulatory agencies to ensure quality control and use of purified medical oxygen in Nigeria's hospitals.
- Conduct costing studies and business cases to drive more private sector involvement in improving medical oxygen access.
- Perform resource mapping and provide continuous capacity building of health workers and biomedical engineers in medical oxygen use (including quantification of oxygen needs).
- Sustain innovative training/mentoring approaches used by the project, including a vibrant community of practice.
- Digitize real-time oxygen consumption, document supply and demand for oxygen planning, forecasting, etc.
- Develop innovative financing models for sustaining medical oxygen access, e.g., revolving schemes, PPPs, and others.

Presentation of award to oxygen desk staff of the Department of Hospital Services. Photo by EpiC Nigeria.

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