

# Quantification and Costing Tools for Oxygen and Pulse Oximetry

## Background

### Purpose of the tools

The purpose of the quantification and costing tools for oxygen and pulse oximetry is to help procurement decision-makers and health facility planners understand the amount of oxygen or pulse oximeters needed to meet patient demand, and all costs associated with owning these devices over time. The tools:

- Allow the user to input their own data for the facility/ facilities being planned for and leverage country-specific baseline data for six countries (India, Indonesia, Kenya, Malawi, Senegal, and Tanzania). Any other country can use the tool by entering their own data.
- Estimate the total oxygen or pulse oximetry need for a health facility or group of facilities.
- Outline oxygen delivery or pulse oximetry devices available to meet this need and their associated costs.
- Support planning and budgeting of custom device mixes and show associated costs.

### Quantification overview

Planning for the long-term need of oxygen delivery sources or pulse oximetry devices can be complex. Within a single facility, this need may vary over time and is influenced by many factors, including number and type of beds, number of patients, clinical treatment guidelines, physicians' orders, availability of electricity, and more. This complexity grows when planning across multiple facilities. These Excel-based tools combine baseline data from market research and expert opinion with user data to approximate long-term need within a single facility or across multiple facilities.

### Costing overview

Quantified need can be addressed through a variety of devices. Determining the optimal mix of devices often requires a holistic consideration of associated costs. Generally, associated costs can be broken down into two components: capital expenditure (CAPEX) and operating expenditure (OPEX). CAPEX refers to the total cost associated with purchasing and deploying devices and include the device purchase price, shipping, installation, training, and replacement units. OPEX refers to the total cost associated with operating the device over its useful

## At a glance

**Tools:** [Quantification and Costing Tool: Oxygen Delivery Sources](#) and [Quantification and Costing Tool: Pulse Oximetry Devices](#)

**Who are these tools for:**



Decision-makers



Implementers

**What are these tools for:** Excel-based tools to help users determine the total need for oxygen or pulse oximetry, evaluate which mix of device types best meets this need, and calculate the long-term costs associated with purchasing and operating these devices.

**How can these tools be used:** The tools leverage user-provided data on number of facilities being planned for, number of beds, facility conditions, device costs, and other inputs to calculate outputs such as amount of oxygen needed, number of recommended pulse oximeters or oxygen delivery devices to meet that need, and long term costs associated with a custom device mix over a selected time frame.

life and include power, maintenance, refill, and spare part costs. These Excel-based tools enable procurement decision-maker to compare the long-term costs associated with different procurement choices to meet quantified need for oxygen delivery and pulse oximetry devices.

## Takeaways

### Oxygen delivery sources

Oxygen need in a single or group of health facilities can vary significantly over time and is dependent on bed use and patient volume. Additionally, different types of oxygen delivery devices (oxygen production devices vs. storage devices) must be planned for separately, and each type of device has unique considerations in terms of output. From a cost perspective, the division of CAPEX and OPEX for

Oxygen Delivery Toolkit

Resources to plan and scale medical oxygen

**Quantification and Costing Tool: Oxygen Delivery Sources | Data Inputs**

← Go back to User Guide

Go to Oxygen

**INSTRUCTIONS:** Select country and enter/adjust user inputs below.

**DATA ENTRY**

*DIRECTIONS: Follow the step-by-step instructions below in the gray boxes. Data entry points that say 'select' ask you to select a response from a drop-down menu within the yellow box. Data entry points that say 'enter' ask you to type in a number into the yellow box. Data should only be entered into yellow boxes. Read all instructions and data inputs carefully as you follow Steps 1 to 4. DO NOT GO TO PLAN AND BUDGET UNTIL ALL DATA HERE ARE COMPLETE.*

**STEP 1: Enter general information about your country and oxygen planning goals in the order below. You can choose to plan for a single facility or for multiple facilities (i.e., in one district, county, or region).**

|  |          |     |        |  |
|--|----------|-----|--------|--|
| Select your country from the drop-down menu.                         | Kenya    | Ksh | 106.10 | <i>Note: Enter '1' if USD is the preferred currency. Entry should be a number. Suggested source: OANDA.com.</i>                    |
| Select the current exchange rate of local currency to 1 USD.         |          |     |        |  |
| Select whether you are planning for a single or multiple facilities. | Multiple |     |        | <i>Note: If you enter data for multiple facilities and then switch to single, be sure to clear excess data in the table below.</i> |

**STEP 2: Enter the number of facilities and the average number of beds per facility for the facility level(s) that you are planning for. If you are planning for a single facility, enter information for that individual facility.**

*Fill in all yellow boxes here before moving on to Step 3.*

|  | Level 3: Health Centers | Level 4: Primary Referral | Level 5: Secondary Referral | Level 6: Tertiary Referral |
|--|-------------------------|---------------------------|-----------------------------|----------------------------|
| Enter the number of facilities for each facility level that you wish to plan for.    | 5                       | 5                         | 2                           | 2                          |
| Enter the average number of GENERAL beds per facility by facility level.             | 10                      | 10                        | 10                          | 10                         |
| Enter the average bed occupancy rate (as a percent) for GENERAL beds.                | 50%                     | 50%                       | 50%                         | 50%                        |
| Enter the average number of beds with ADDED SERVICES per facility by facility level. | 2                       | 2                         | 2                           | 2                          |
| Enter the average bed occupancy rate (as a percent) for beds with ADDED SERVICES.    | 50%                     | 50%                       | 50%                         | 50%                        |
| Enter the average number of CRITICAL CARE beds per facility by facility level.       | 1                       | 0                         | 0                           | 0                          |
| Enter the average bed occupancy rate (as a percent) for CRITICAL CARE beds.          | 100%                    |                           |                             |                            |

**DEFINITION OF GENERAL BEDS:** Beds that are used in health facilities for inpatients (or possibly outpatients) that do not require a high level of oxygen (see flow rates below).

**DEFINITION OF BEDS WITH ADDED SERVICES:** Beds that are often located near nurses' stations and offer more services and care than typical general beds, but not as much as critical care beds.

**DEFINITION OF CRITICAL CARE BEDS:** Beds that require higher amounts of oxygen. This may include intensive care unit (ICU) beds, surgical ward/operating theater beds, or other critical care beds.

**DEFINITION OF BED OCCUPANCY RATE:** For one year, bed occupancy rate = (sum of the total number of patients in the facility each day for 365 days) / (total number of beds X 365).

*Note: If you would like to enter the total number of beds for each facility level instead of the number of facilities and average number of beds for each level, enter '1' for number of facilities (for each level you are planning for) and enter the TOTAL number of general, added services, and critical care beds instead of the average for each facility level. You do not need to plan for all levels of facilities or all types of beds in your country.*

**STEP 3: Enter information about the hours of operation, power availability, and location that are most typical to each facility level. If you are planning for a single facility, enter information about that individual facility.**

*Fill in all yellow boxes here before moving on to Step 4.*

|   | Level 3: Health Centers | Level 4: Primary Referral | Level 5: Secondary Referral | Level 6: Tertiary Referral |
|---|-------------------------|---------------------------|-----------------------------|----------------------------|
| Enter the average number of hours of operation per day for each facility level. | 8                       | 8                         | 8                           | 8                          |
| Select the primary source of power for each facility level.                     | Generator               | Solar power               | No power                    | No power                   |

**Working With these customizable tools, users can carefully consider long-term need and costs as part of the planning process.**

various types of oxygen delivery devices is an important consideration. For example, gas cylinders require minimal up-front costs (CAPEX) but requires routine refill and distribution which incur relatively high OPEX. In contrast, oxygen concentrators and gas cylinder-filling plants have a much higher CAPEX, but OPEX costs, largely driven by electricity, are lower over time. This is a good example of why long-term OPEX should be considered, alongside up-front CAPEX costs.

**Pulse oximetry devices**

For pulse oximetry devices, both the type of device (fingertip, tabletop, or handheld) as well as how it is used (for spot check or continuous monitoring) are important considerations. The types of beds available in a facility/facilities will affect the both the number, type, and use case of the devices that are needed. Additionally, this breakdown of devices can affect the long-term cost structure. For spot checks, fingertip pulse oximeters have a lower overall cost than handheld devices. These fingertip pulse oximeters have a low CAPEX but much higher OPEX (driven by replacement battery costs). However, handheld and tabletop devices, which are mostly used for continuous monitoring, have higher CAPEX expenses due to the device and probe costs, while the OPEX represents a lower portion of the cost over time. Due to the large number of manufacturers in this space, both the CAPEX and OPEX (due to different power requirements) could vary substantially over time across specific products.

**Impact**

Although considerations will vary by region or facility, evaluating the need and the long-term costs for oxygen delivery sources and pulse oximetry devices can help procurement decision-makers make the best use of resources. These factors should not be considered in isolation, as many other factors go into device selection, including quality, performance, technical specifications, and availability of spare parts and maintenance support. Additionally, administrators may want to consider if specific devices are best suited for different levels of health facility, and then plan separately for each level.

With these tools, users can carefully consider long-term need and costs as part of the planning process. By planning appropriately for medical device need and maximizing the use of equipment that is purchased, a facility budget can be utilized most efficiently. Looking at long-term costs will ensure that decision-makers consider things like power sources and device maintenance over time, so that the appropriate budget and resources are allocated to these activities. Ultimately, better planning can lead to increased access to oxygen and pulse oximetry, benefiting across all levels of the health system.

**For more information**

[www.path.org/oxygen-delivery-toolkit](http://www.path.org/oxygen-delivery-toolkit)  
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