

UNICEF Oxygen System Planning Tool

Quick Reference Guide and FAQ

Purpose and use of the UNICEF Oxygen System Planning Tool

1. How do I access the tool?

Use this [link](#) to download a .zip file containing both the Oxygen System Planning Tool (Excel) and the Dataset Template (Excel). This link is to a OneDrive folder containing the .zip file. Please open the link and unzip the 2 Excel documents and save locally. If you experience any difficulties accessing the link or files please [contact us](#).

2. What does the tool do?

The aim of this tool is to: help planners at the national, subnational or health facility level to plan their oxygen supply system, from the oxygen source to the patient delivery device.

To support this objective, the tool can:



Estimate the oxygen demand at each health facility, and give an aggregated view of that demand to facilitate a general understanding of the distribution of total oxygen needs geographically and at various levels of the health system



Provide health facility-level recommendations for appropriate oxygen source options based on health facility characteristics, including proximity to known oxygen plants that provide oxygen in cylinders



Automate the calculation of distances between health facilities and oxygen plants, to help inform appropriate oxygen source options



Estimate the capital and operating costs associated with the oxygen supply system recommendations for each health facility, as well as aggregated costs for different administrative levels or nationally. Where available, indicative pricing for oxygen therapy products from the UNICEF Supply Catalogue is used.



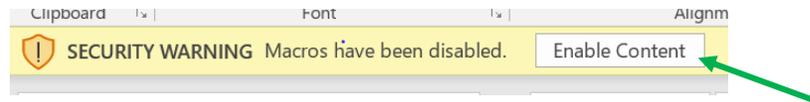
Generate equipment lists for each health facility based on oxygen system recommendations to facilitate discussions around procurement



Aid in planning around placement of new oxygen plants

3. Do I need special software to run to tool?

The tool is built in Excel. There are macros built in (.xlsm) so you will need to “Enable content” when prompted. Some features require an internet connection while using the tool (distance calculations and map generation).



Tool input data and parameter customizations

4. What inputs are required to run the tool?

The tool requires three types of inputs:

- a) Health facility data: a dataset with health facility-specific data including type of facility, number of beds of different types, availability of electricity, etc. At least one health facility needs to be in the dataset in order to use the tool.
- b) Oxygen plant data: a dataset with available oxygen plants that supply oxygen cylinders to health facilities.
- c) Country inputs: these are customizable input parameters that inform different calculations in the tool, such as costing information. There are suggested global defaults for most of these parameters, but the user can override them.

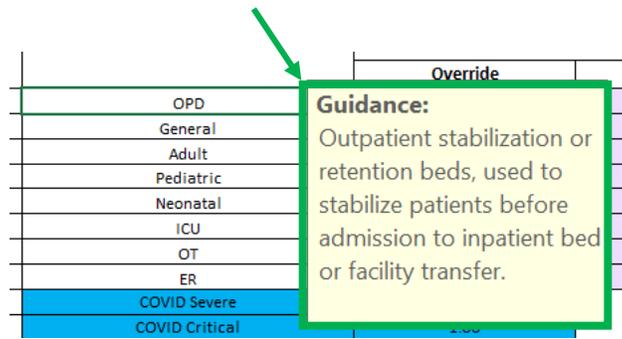
Download the accompanying DATASET_TEMPLATE.xlsx to see complete details of what data points are required for the Health Facility and Oxygen Plant datasets. The *Legend* tab explains which fields are **essential**, **desired** (for certain features to work), and **optional** (i.e., enter if known).

5. What is a *global default* and can it be changed?

The tool includes global default values for many input parameters so that the tool can run with little user customization. All global defaults appear in **purple cells** and are overridable by the user in the *Country Inputs* tab (look for the adjacent **cyan cells**). Global defaults are based on literature, best practice and expert input from the UNICEF Oxygen Therapy Advisory Committee and Technical Review Group.

6. Where can I get help to fill in input parameters?

There are guidance notes included throughout the tool that define the input parameters in more detail and provide additional guidance on how to set a value for that parameter. Click in the cell of the label for the note to appear. If something is still unclear, please contact us so that we can improve the tool. Contact information is at the end of this FAQ.



	Override	100
OPD		
General		
Adult		
Pediatric		
Neonatal		
ICU		
OT		
ER		
COVID Severe		
COVID Critical		

7. Where is the health facility data stored?

In this Excel version of the tool, the health facility data would stay within the Excel file wherever it is saved locally. UNICEF is seeking funding to make a web-based version of this tool such that multiple stakeholders within a country can be granted access to use the tool and all work from the same set of input data and parameters. Other additional features are planned for the web-based version of the tool.

Health facility data and oxygen source data

8. Can the tool be used for just one health facility?

Yes, the tool will run with one or more health facilities in the *Health Facility Dataset* tab. If only one facility is entered, the dashboards for aggregated data visualization will just show that one facility. In that case, it is better to view the output in the *Health Facility Dashboard* tab which is designed for single-facility viewing.

9. Can the tool be used with generic or hypothetical health facilities?

Yes, the user just needs to designate one row for each hypothetical health facility in the *Health Facility Dataset* tab. For example: if a user wants to do an analysis for 1 regional hospital, 10 district hospitals and 20 health centres, the dataset should include 31 rows, with “Facility type” set appropriately for the breakdown desired. The “Facility name” column can be filled with placeholder or randomly generated names. As long as there is one row per health facility in the dataset, the facilities will be represented in the analysis. All of the optional data fields can be left blank and filled using the archetype feature, which populates missing input data based on facility type (see question 11).

10. Is there a maximum number of health facilities or oxygen plants that can be entered?

Right now, the maximum number of health facilities is 1000 and the maximum number of oxygen plants is 300. We are working to expand this in future versions.

11. Can the tool be used if I don’t know the locations (i.e., geo-coordinates) of health facilities?

Yes. The tool uses geo-coordinates to automatically calculate the distance (km) from all health facilities to the nearest oxygen plant in the Oxygen Plant Dataset. For any given health facility, it is possible to manually enter the estimated distance to the nearest plant, without knowing the geo-coordinates of the facility (or the plant).

12. Can the tool be used if there are no plants in the oxygen plant dataset, or if I don't know the locations of oxygen plants in the dataset?

Yes. The tool can operate with no plants in the dataset, or with plants that don't have geo-coordinates. In both cases, the user must manually enter an estimated distance (km) from each health facility to the nearest plant.

13. What is a health facility *archetype* and how is it used?

Health facility archetypes are defined in the tool to describe the typical characteristics of various types of health facilities in the country (e.g., district hospital, regional hospital, health centre, etc.). The names of the archetypes are determined from the Health Facility Dataset (i.e., each unique facility type found in the dataset becomes a possible archetype). Archetypes are then used to fill missing data points in the health facility dataset. In the *Country Inputs* tab, the tool suggests archetype values that are based on averages from the available data for that health facility type. The user can override the suggestions or do nothing and the tool will use the suggested archetype values based on averages. Right now, the tool is limited to 20 different health facility types (and thus 20 different archetypes).

Oxygen demand estimations

14. How does the tool estimate oxygen needs?

The approach to oxygen demand quantification is based on number of beds (of different types), and the associated hypoxemia prevalence, typical flowrate, and oxygen therapy duration for each bed type. The tool also takes into account the bed turnover rate of the health facility (if this is not known, estimates can be used via the health facility archetype feature).

From the above inputs, the tool calculates several different metrics that represent oxygen demand in different ways:

Estimation of the number of beds treating hypoxemic patients at any given instant.	→	Used to quantify fixed physical assets that impact a facility's capacity to provide this instantaneous oxygen need at the bedside (e.g., concentrators, flowsplitters, cylinder accessories (flowmeters, regulators, humidifiers), pulse oximeters, etc.)
Estimation of the number of hypoxemic cases per year.	→	Used to quantify consumables (e.g., nasal cannulae) since these devices are for single patient use.
Daily oxygen demand (litres per day):	→	Used to estimate the number of cylinder refills required
Instantaneous oxygen demand (litres per minute (LPM)):	→	Used to inform plant sizing as the demand that a plant should meet

Oxygen source options and equipment quantification

15. What oxygen source options are considered in the planning tool?

Based on oxygen demand and other health facility-specific characteristics like proximity to an oxygen plant, the following are possible oxygen source recommendations given by the tool:

- Consider installing a facility-based plant and dedicated generator
- Facility-based plant is already installed. No change to existing plant is recommended.
- Facility-based plant is recommended. Existing plant is estimated to be undercapacity; consider upgrading existing plant to meet demand.
- Cylinders
- Concentrators w/ cylinders for beds requiring high pressure oxygen only
- Concentrators w/ alternative energy source (or backup oxygen source), and cylinders for beds requiring high pressure oxygen
- Concentrators
- Concentrators w/ alternative energy source (or backup oxygen source)

The recommendation for any given health facility in the dataset can be viewed in the *Health Facility Dashboard* tab.

16. What other equipment is quantified in the tool?

Inline with the *WHO-UNICEF Technical Specifications and Guidance for Oxygen Therapy Devices*¹, the UNICEF Oxygen System Planning tool quantifies equipment and supplies for basic oxygen therapy². While the tool does calculate oxygen demand for *all* areas of a health facility, including critical care and operating theatre areas, in order to make recommendations for the appropriate oxygen source based on total demand, the tool does not currently quantify equipment or consumables for critical care or operating theatre settings.

Equipment included in the tool: oxygen concentrators, flowsplitters, cylinder accessories (regulators, flowmeters, humidifiers), pulse oximeters and probes, nasal cannulae (adult, pediatric, neonatal), oxygen analyzers, surge suppressors, voltage stabilizers, and spare parts for concentrators.

17. Is liquid oxygen considered in the tool?

No, not currently. We are considering including liquid oxygen in future versions of the tool.

18. How is pulse oximetry considered in the tool?

The tool recommends quantities of pulse oximeters and probes, and estimates costs, including upfront capital costs as well as ongoing costs for probe and battery replacements over the desired planning time

¹ WHO-UNICEF Technical Specifications and Guidance for Oxygen Therapy Devices. 2019. Available at: https://www.who.int/medical_devices/publications/tech_specs_oxygen_therapy_devices/en/

² Basic oxygen therapy refers to the administration of oxygen by nasal cannula, nasal catheter or face mask. Basic oxygen therapy does not involve heated humidification, a blender or advanced respiratory support via the use of bubble CPAP, CPAP or mechanical ventilation.

horizon. The approach to pulse oximeter quantification is the same regardless of the oxygen source options recommended by the tool, and so pulse oximetry results are always shown on their own.

19. How can the tool be used to assist planning for new oxygen plants?

It is possible to add a proposed new oxygen plant to the Oxygen Plant Dataset to see how the introduction of that plant would impact the supply availability of surrounding health facilities. For example, a user could enter a hypothetical name (Plant A) with proposed location and refresh the tool. Any health facility within the designated distance radius for cylinder supply from a plant would be assigned to that plant. The output data could be filtered to show all the facilities within the catchment radius of that plant, and their collective oxygen demand could help inform appropriate sizing for the proposed plant.

Cost estimations

20. What is the costing based on?

Where possible, indicative product pricing from current UNICEF Supply Catalogue LTAs is used to inform the costing analysis. The user can override all costing input parameters to match the local context, especially if not procuring through UNICEF. Total cost of ownership considerations such as shipping, customs & tariffs, distribution, installation, maintenance, operational costs (cylinder and oxygen plants, only), and training are also included. All of these overheads costs are calculated as a % of capital equipment costs, and these % can be set by the user.

21. What currency is used for the costing analysis?

All costing is given in \$USD. We plan to incorporate a feature to convert to local currency with a given exchange rate.

Use for planning oxygen during COVID-19 pandemic

22. How can the tool be used to reflect oxygen demand and equipment needs for COVID-19?

The tool can be used to take the COVID19 situation into account as follows:

OPTION 1: Include custom COVID19 beds, with appropriate characteristics. Any facility in the dataset that will be treating COVID patients can enter number of COVID beds.

- COVID-severe bed:
 - hypoxemia prevalence: 100%
 - flowrate: 10 LPM
 - treatment duration: 7 days
- COVID-critical bed:
 - hypoxemia prevalence: 100%
 - flowrate: 30 LPM
 - treatment duration: 14 days

OPTION 2: Include *COVID treatment centre* as a facility type in the health facility dataset. This means entire health facilities can be designated as COVID centres. In this case, existing bed types can be used to reflect the COVID situation:

- Adult bed:
 - hypoxemia prevalence: 100%
 - flowrate: 10 LPM
 - treatment duration: 7 days
- ICU bed:
 - hypoxemia prevalence: 100%
 - flowrate: 30 LPM
 - treatment duration: 14 days

For both options, other COVID-specific input parameters to set accordingly could include:

- setting the analysis time period to something shorter term, to reflect the pandemic scenario, such as between 3 to 6 months.
- consider increasing overheads to reflect the changing supply situation (e.g., shipping 30%-40%)

IMPORTANT NOTE: The UNICEF Oxygen System Planning tool quantifies equipment and supplies for basic (non-invasive) oxygen therapy, which applies to severe cases of COVID19. While the tool *does* calculate oxygen demand for all areas of a health facility, including critical care and operating theatre areas, the tool does not currently quantify equipment or consumables for critical care (i.e., critical COVID19 cases) or operating theatre settings.

Contact information, technical assistance and feedback

23. Who can I contact to get assistance with using the tool, or provide feedback on issues, bugs, or other challenges with using the tool?

Please contact innovateforchildren@unicef.org with *Oxygen System Planning Tool* in the subject. We will be continuously updating the tool and would love to incorporate feedback and improvements.