



USAID GLOBAL HEALTH SUPPLY CHAIN PROGRAM
Procurement and Supply Management

Facility Inventory Turnover Analysis

User Guide

August 2024

The USAID Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) project is funded under USAID Contract No. AID-OAA-I-15-0004. GHSC-PSM connects technical solutions and proven commercial processes to promote efficient and cost-effective health supply chains worldwide. Our goal is to ensure uninterrupted supplies of health commodities to save lives and create a healthier future for all. The project purchases and delivers health commodities, offers comprehensive technical assistance to strengthen national supply chain systems, and provides global supply chain leadership.

GHSC-PSM is implemented by Chemonics International, in collaboration with Arbola Inc., Axios International Inc., IDA Foundation, IBM, IntraHealth International, Kuehne + Nagel Inc., McKinsey & Company, Panagora Group, Population Services International, SGS Nederland B.V., and University Research Co., LLC. To learn more, visit ghsupplychain.org

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Facility Inventory Turnover Analysis User Guide

Note:

- **User System setup** and **step 1.6** needs to be done only the first time a user downloads the code.
- If python and the packages to run the tool are already installed, start from step 1.1.

Step 1: User System Setup

Install Python

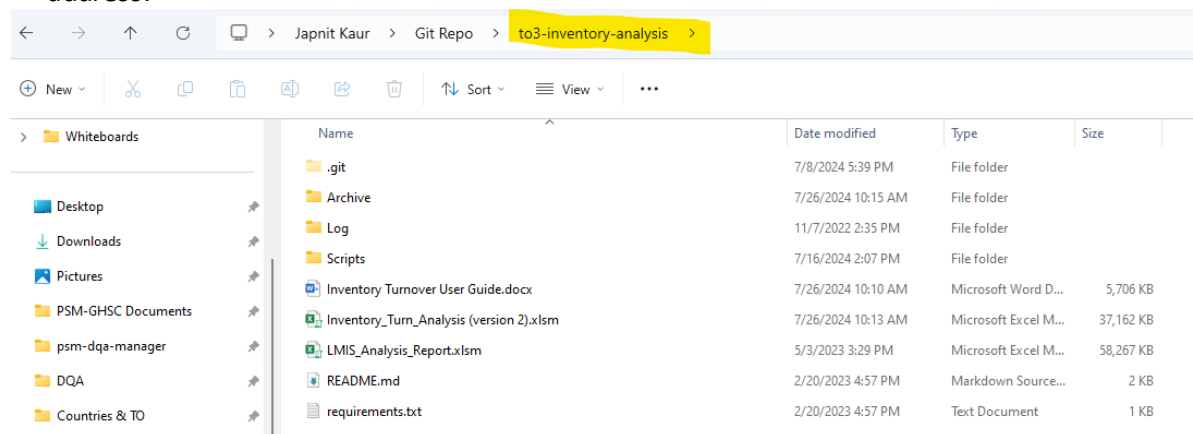
Install the latest version of python from this webpage <https://www.python.org/downloads/> that is appropriate for your computer. Go through the installation prompts on your computer as directed. Alternatively, reach out to your IT department for help installing python.

Install Python Packages

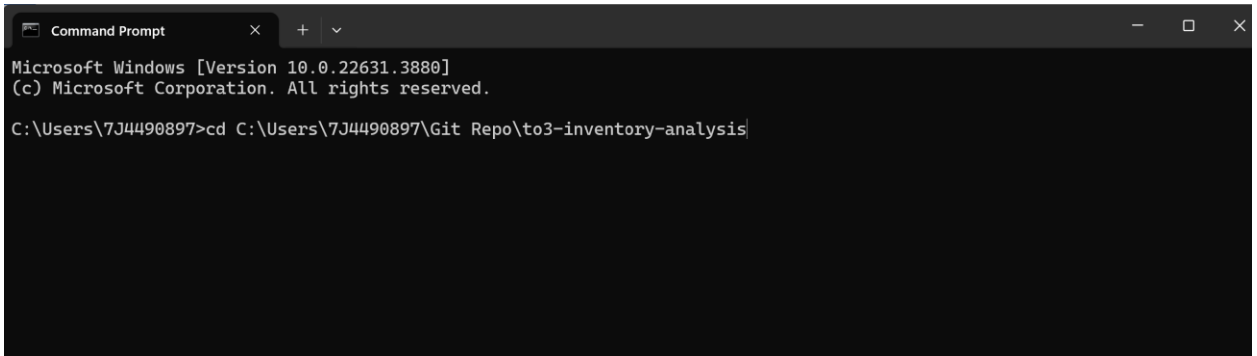
In the folder that contains the tool you will see a document called **requirements.txt**. This document helps to quickly install all the libraries needed to run this program.

To do this, open the **command prompt** on your computer by searching for it in your desktop search bar and navigate to the to3-inventory-analysis folder

1.1 Copy the path to the folder – Right click on the folder name (highlighted below) and select Copy address.



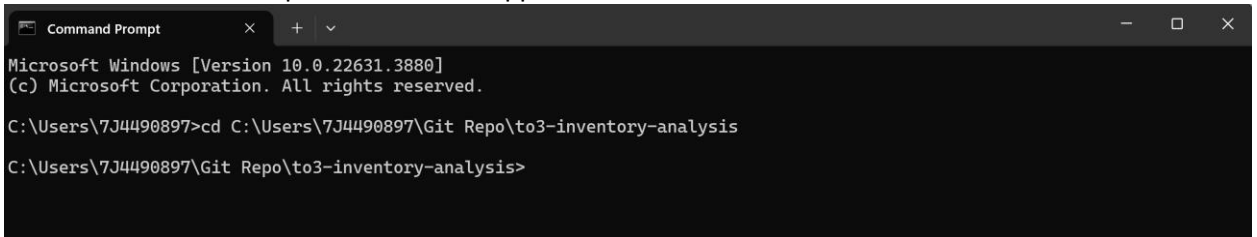
1.2 To navigate to the program folder in the command prompt enter the following code after the >
`cd paste/path/to/the/to3-inventory-analysis/folder`



```
Microsoft Windows [Version 10.0.22631.3880]
(c) Microsoft Corporation. All rights reserved.

C:\Users\7J4490897>cd C:\Users\7J4490897\Git Repo\to3-inventory-analysis\
```

1.3 Press Enter. The folder path should now appear before the >



```
Microsoft Windows [Version 10.0.22631.3880]
(c) Microsoft Corporation. All rights reserved.

C:\Users\7J4490897>cd C:\Users\7J4490897\Git Repo\to3-inventory-analysis
C:\Users\7J4490897\Git Repo\to3-inventory-analysis>
```

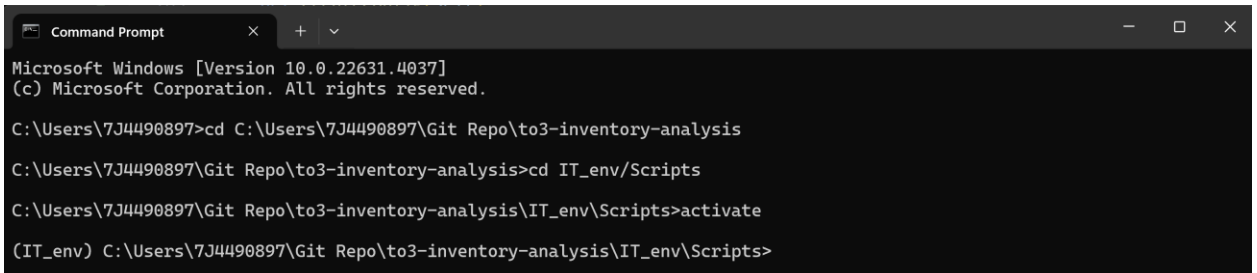
1.4 To activate virtual environment: *(optional step but recommended to avoid dependency conflicts)*

cd IT_env/Scripts press enter then type activate and enter. #On Windows

source IT_env/bin/activate # On Linux or macOS

(IT_env) before your path indicates you are now inside virtual environment

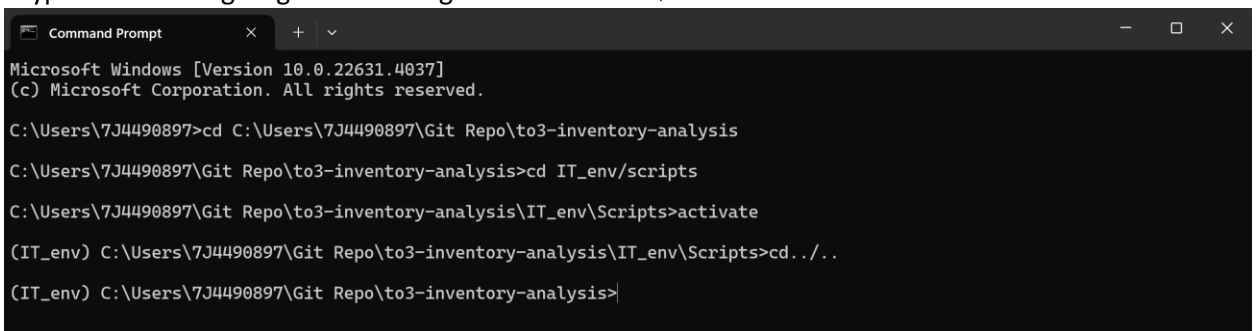
Note: To exit the virtual environment enter deactivate



```
Microsoft Windows [Version 10.0.22631.4037]
(c) Microsoft Corporation. All rights reserved.

C:\Users\7J4490897>cd C:\Users\7J4490897\Git Repo\to3-inventory-analysis
C:\Users\7J4490897\Git Repo\to3-inventory-analysis>cd IT_env\Scripts
C:\Users\7J4490897\Git Repo\to3-inventory-analysis\IT_env\Scripts>activate
(IT_env) C:\Users\7J4490897\Git Repo\to3-inventory-analysis\IT_env\Scripts>
```

1.5 Type the following to go back to original folder: cd . . / . .

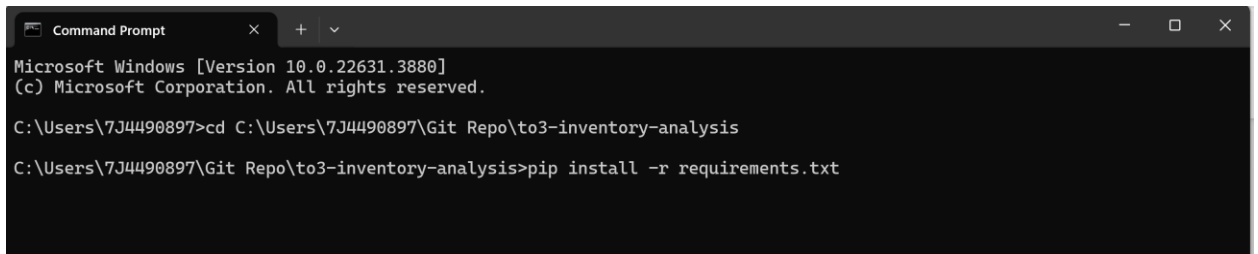


```
Microsoft Windows [Version 10.0.22631.4037]
(c) Microsoft Corporation. All rights reserved.

C:\Users\7J4490897>cd C:\Users\7J4490897\Git Repo\to3-inventory-analysis
C:\Users\7J4490897\Git Repo\to3-inventory-analysis>cd IT_env\scripts
C:\Users\7J4490897\Git Repo\to3-inventory-analysis\IT_env\Scripts>activate
(IT_env) C:\Users\7J4490897\Git Repo\to3-inventory-analysis\IT_env\Scripts>cd ../../
(IT_env) C:\Users\7J4490897\Git Repo\to3-inventory-analysis>
```

1.6 Enter the following text into the command prompt to install dependencies:

pip install -r requirements.txt



```
Command Prompt
Microsoft Windows [Version 10.0.22631.3880]
(c) Microsoft Corporation. All rights reserved.

C:\Users\7J4490897>cd C:\Users\7J4490897\Git Repo\to3-inventory-analysis
C:\Users\7J4490897\Git Repo\to3-inventory-analysis>pip install -r requirements.txt
```

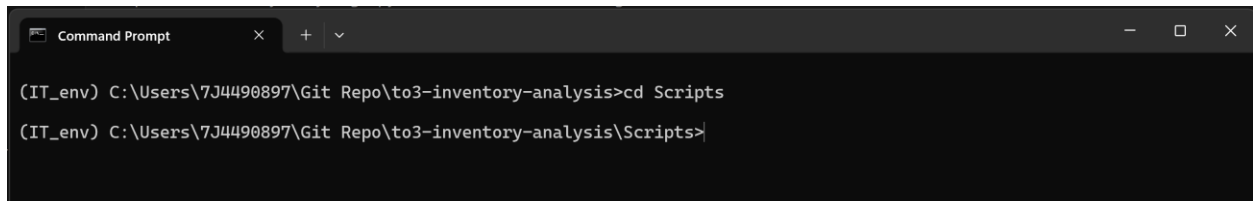
1.7 You will see text running in the command prompt, which is installing each package. Once all libraries are installed you should return to showing the line with your current folder followed by >.

Package installation is now complete.

Step 2: Running the tool

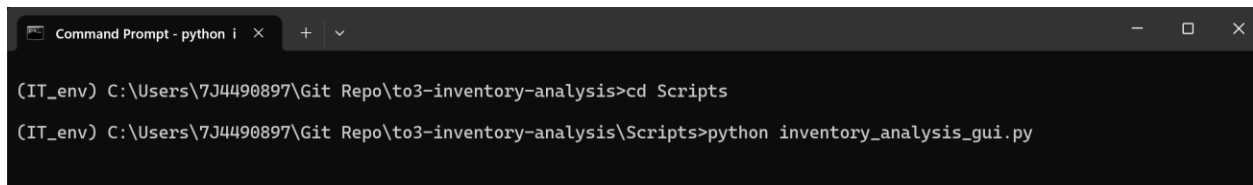
Follow the steps below to run the tool

1. Once the setup is done, navigate to the “Scripts” folder by typing the command `cd Scripts` in the command prompt



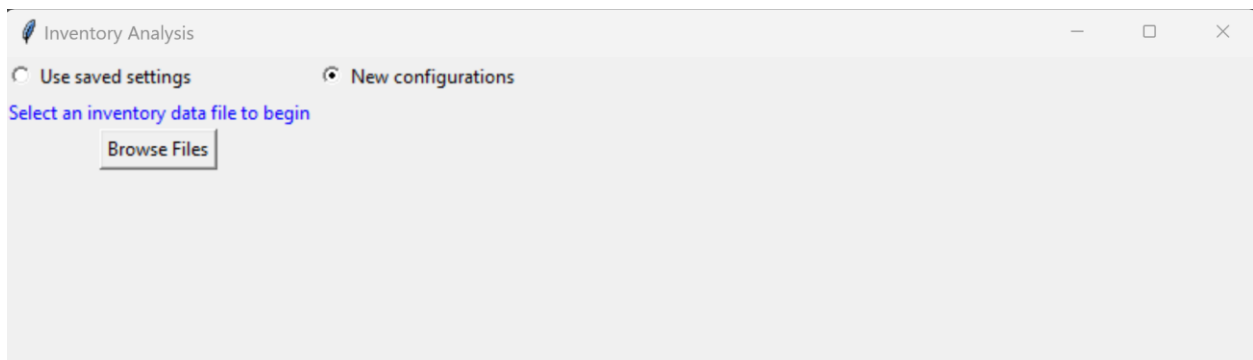
```
Command Prompt
(IT_env) C:\Users\7J4490897\Git Repo\to3-inventory-analysis>cd Scripts
(IT_env) C:\Users\7J4490897\Git Repo\to3-inventory-analysis\Scripts>
```

2. Next run the tool with the following command: `python inventory_analysis_gui.py`



```
Command Prompt - python i
(IT_env) C:\Users\7J4490897\Git Repo\to3-inventory-analysis>cd Scripts
(IT_env) C:\Users\7J4490897\Git Repo\to3-inventory-analysis\Scripts>python inventory_analysis_gui.py
```

3. Press Enter and a graphical user interface will pop up with a prompt to browse a file.



- Click the Browse Files button to navigate to a stock file that contains at least one year of date, region, consumption and stock on hand fields for facility and product-level data. This file usually comes out of an eLMIS system and needs to be either an excel or a csv file. The opened file name will be displayed at the top in blue. Here is an example data:

District Name	Facility Name	Product Name	Dispensed	Closing Balance	Date
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	500	150	1/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	350	250	2/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	100	0	3/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	300	100	4/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	200	0	5/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	100	0	6/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	300	200	7/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	0	0	8/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	450	1000	9/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	0	20	10/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	3600	3600	11/1/2024
District X	Health Centre	Levoplant (Levonogestrel75mg/rod),2rod Implant,	100	0	12/1/2024

Note: Region column is required and can be district/state/province which helps in uniquely identifying a product-facility row.

Inventory Analysis

File Opened: FP_data.csv

Browse Files

Min Value
Max Value

Delivery Frequency

Data Type

Product Name Field
(Additional Product Info)
(Additional Product Info)

Facility Name Field
Region Name Field
(Additional Facility Info)
Select State/District/Province

Date Field
Consumption Field
Stock on Hand Field
Time Window for Rates

Blank fields = 0
Blank fields are missing
Blank fields = 0
Blank fields are missing

Run Analysis

5. Next select values from the drop downs for each field.

- **Min Value:** Select a min months of stock value according to the country's inventory control policies for health facilities
- **Max Value:** Select a max months of stock value according to the country's inventory control policies for health facilities
- **Delivery Frequency:** Select one from Monthly, bimonthly or Quarterly Delivery frequency according to country's policies for delivery to health facilities

Note: The min, max and delivery frequency fields help calculate an ideal Inventory Turn range (called Planned Inventory Turnover in the final dashboard), where all products in a facility are expected to fall.

- **Data Type:** Select transactional if the selected input file contains multiple entries for a single month. If the stock data contains one entry per month for a facility/product combination, select cumulative.
- **Product Field:** Select the field name from the dropdown menu that corresponds to product names column in the input file
- **Facility Name Field:** Select the field name from the dropdown menu that corresponds to facility name column in the input file
- **Region Name Field:** Select the field name from the dropdown menu that corresponds to either State, District or Province or any field that helps narrow down on a geographical grouping of facilities.
- **Date Field:** Select the field name from the dropdown menu that corresponds to date column in the input file
- **Consumption Field:** Select the field name from the dropdown menu that corresponds to consumption data column in the input file (e.g., may be consumed, issues, or in some cases dispensed).
- **Stock on Hand Field:** Select the field name from the dropdown menu that corresponds to stock on hand or closing balance data column in the input file
- **Time Window for Rates:** Select an integer value for calculations of inventory turns over a rolling window. By default, 12 is selected for a rolling window of one year. If the products you are assessing have seasonality, you may want to adjust the window to be approximately the length of the seasons.
- **Blank Fields (radio buttons):** Make selections to handle missing SOH and consumption values. By default, Blank fields are missing is selected.

Once all selections are made, click "Run Analysis" Button. The image below shows an example of what this form may look like after it has been filled out.

Inventory Analysis

File Opened: FP_data.csv

Browse Files

Min Value

1

Max Value

3

Delivery Frequency

Bimonthly

Data Type

cumulative

Product Name Field

Product Name

(Additional Product Info)

(Additional Product Info)

Facility Name Field

Facility Name

Region Name Field

District Name

(Additional Facility Info)

Select State/District/Province

Date Field

Date

Consumption Field

Dispensed

Stock on Hand Field

Closing Balance

Time Window for Rates

12

Blank fields = 0

Blank fields are missing

Blank fields = 0

Blank fields are missing

Run Analysis

Step 3: Open the Final Report

Once the tool is done running, click the “open report in excel” button to open the final dashboard.

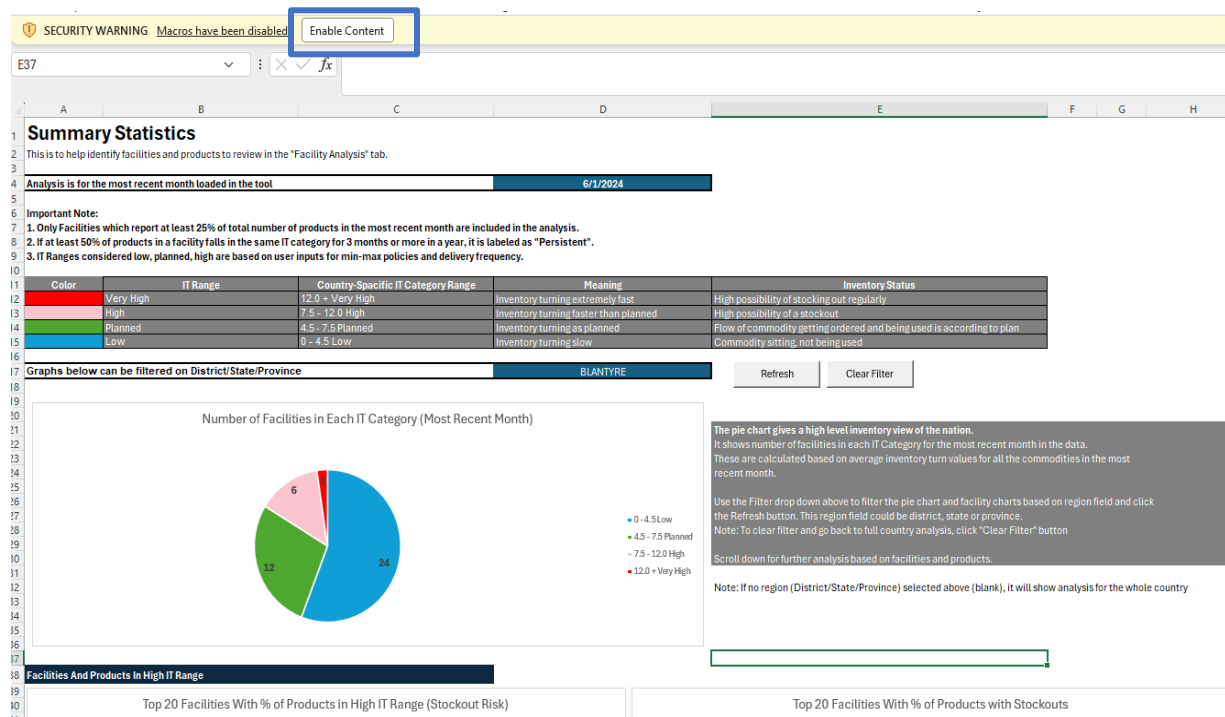
The screenshot shows the 'Inventory Analysis' application window. At the top, it says 'File Opened: FP_data.csv'. Below this is a 'Browse Files' button. The interface is divided into several sections for configuration:

- Min Value:** A dropdown menu set to '1'.
- Max Value:** A dropdown menu set to '3'.
- Delivery Frequency:** A dropdown menu set to 'Bimonthly'.
- Data Type:** A dropdown menu set to 'cumulative'.
- Product Name Field:** A dropdown menu set to 'Product Name'.
- (Additional Product Info):** Two empty dropdown menus.
- Facility Name Field:** A dropdown menu set to 'Facility Name'.
- Region Name Field:** A dropdown menu set to 'District Name'.
- (Additional Facility Info):** One empty dropdown menu.
- Select State/District/Province:** A label next to the 'Region Name Field' dropdown.
- Date Field:** A dropdown menu set to 'Date'.
- Consumption Field:** A dropdown menu set to 'Dispensed'.
- Stock on Hand Field:** A dropdown menu set to 'Closing Balance'.
- Time Window for Rates:** A dropdown menu set to '12'.
- Blank fields = 0:** Two radio buttons, both unselected.
- Blank fields are missing:** Two radio buttons, both selected.

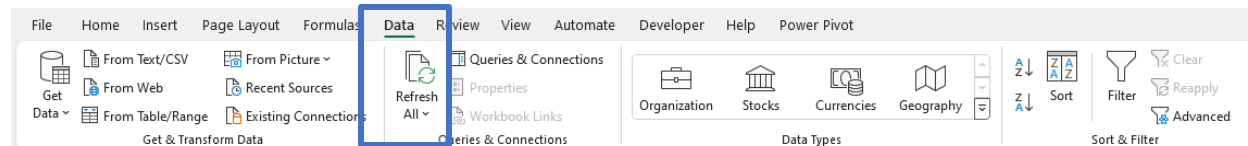
Below the configuration section, there are three buttons: 'Run Analysis', 'Calculating Rates', and 'Rates Calculated'. The 'Open Report in Excel' button is highlighted with a blue border. At the bottom, there are two status lines: 'Total Products: 31' and 'Total Facilities: 769', followed by a 'Save My Settings' button.

Step 4: Analyzing the Final Report

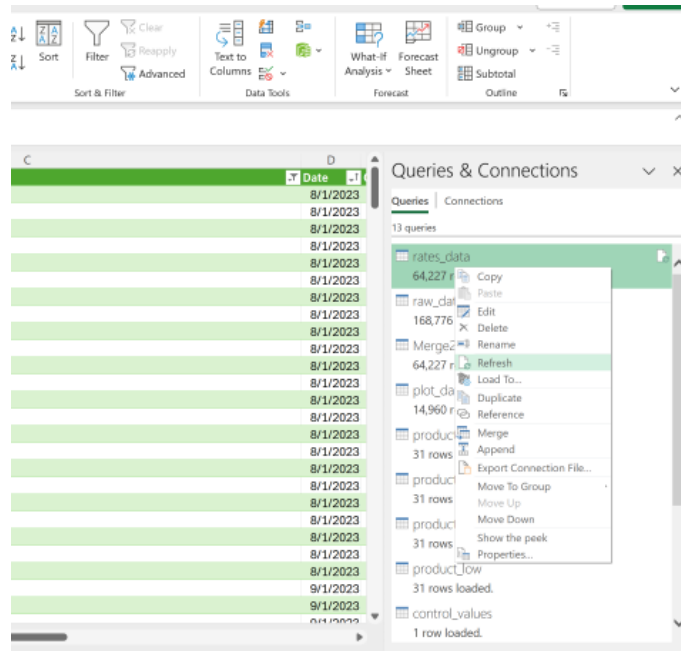
Once the final report opens, click the “Enable Content” button in the yellow warning ribbon. This will enable all the macros and features running in the background in the excel workbook.



Next navigate to Data option on the ribbon at the top and click “Refresh all” to refresh the tool and pull the output files from the most recent run. This may take a few minutes.



Troubleshoot Tips: If an error pop up saying something could not be refreshed, open queries and connections next to refresh all, individually refresh each query by right clicking and selecting refresh



[National Summary Page](#)

User can now analyze the “National Summary” tab for the most recent month in the input stock file. The aim is to identify facilities in the very high, high or low Inventory Turnover range category on this page and do an in-depth analysis on the next page for each of these identified facilities. If you already have a particular facility in mind that you are trying to get more information about, you can skip this page and go to Facility Analysis.

The page displays the month of analysis at the top (based on the final month of data available in the file uploaded in Step 2) followed by a description of each Inventory turn category along with the color it used for each category in the charts below.

The country-specific Inventory Turnover Category Range is calculated based on the min, max and delivery frequency provided by the user when setting up the tool in Step 2. The colors against each category denote the color used in the charts below for each. User can use the region (District/state/province) filter (highlighted in a blue box) to filter for one particular value.

Summary Statistics

This is to help identify facilities and products to review in the "Facility Analysis" tab.

Analysis is for the most recent month loaded in the tool

6/1/2024

Important Note:

- Only Facilities which report at least 25% of total number of products in the most recent month are included in the analysis.
- If at least 50% of products in a facility falls in the same IT category for 3 months or more in a year, it is labeled as "Persistent".
- IT Ranges considered low, planned, high are based on user inputs for min-max policies and delivery frequency.

Color	IT Range	Country-Specific IT Category Range	Meaning	Inventory Status
Red	Very High	12.0 + Very High	Inventory turning extremely fast	High possibility of stocking out regularly
Green	High	7.5 - 12.0 High	Inventory turning faster than planned	High possibility of a stockout
Yellow	Planned	4.5 - 7.5 Planned	Inventory turning as planned	Flow of commodity getting ordered and being used is according to plan
Blue	Low	0 - 4.5 Low	Inventory turning slow	Commodity sitting, not being used

Graphs below can be filtered on District/State/Province

Refresh

Clear Filter

Number of Facilities in Each IT Category (Most Recent Month)



The pie chart gives a high level inventory view of the nation.

It shows number of facilities in each IT Category for the most recent month in the data. These are calculated based on average inventory turn values for all the commodities in the most recent month.

Use the Filter drop down above to filter the pie chart and facility charts based on region field and click the Refresh button. This region field could be district, state or province.

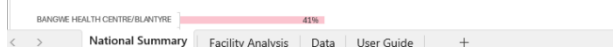
Note: To clear filter and go back to full country analysis, click "Clear Filter" button

Scroll down for further analysis based on facilities and products.

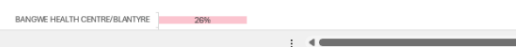
Note: If no region (District/State/Province) selected above (blank), it will show analysis for the whole country

Facilities And Products In High IT Range

Top 20 Facilities With % of Products in High IT Range (Stockout Risk)



Top 20 Facilities With % of Products with Stockouts



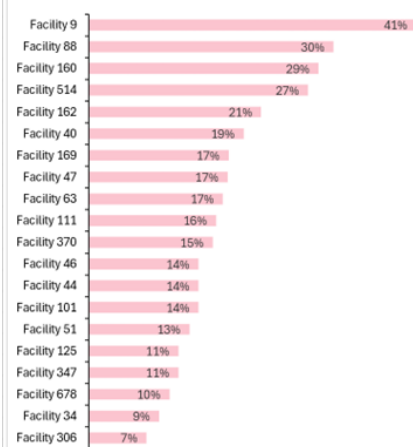
To filter on region:

- Select a value from the drop down and click "Refresh" button
- Use "Clear Filter" button to go back to country-wide analysis

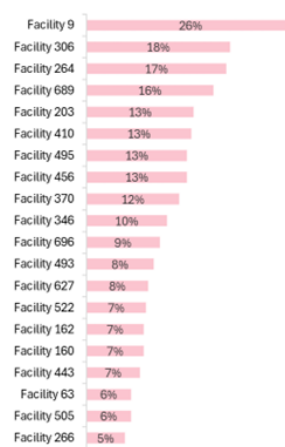
Scroll down to narrow down on facilities not falling in the planned Inventory Turnover Range with the help of bar charts. The gray boxes throughout the screen help define or describe different elements of the analysis and tool. In addition to the charts below, charts on planned and low inventory turnover will be shown.

Facilities And Products In High IT Range

Top 20 Facilities With % of Products in High Inventory Turnover Range (Stockout Risk)



Top 20 Facilities With % of Products with Stockouts





Facility Analysis Page

Step 1

Once the user has identified facilities from the National Summary page they can do further analysis on the Facility Analysis page. On this page the user can find a facility by first selecting a region and then selecting the facility from a filtered drop-down list. The list can be filtered further if you start typing in the name.

They can then see number of products in the selected facility falling in the different Inventory Turnover Ranges over a year through stacked column charts. A change in pattern could indicate reduced capacity at the facility level; for example, maybe the staff who received detailed eLMIS training recently left and the new staff was not as thoroughly changed. In the example below, the facility's stock management is actually improving over time as the green "planned" bar is getting bigger.

Last-Mile Stock Analysis

Step 1: Select a region to narrow on a facilit X

Select a facility to begin analysis ABC

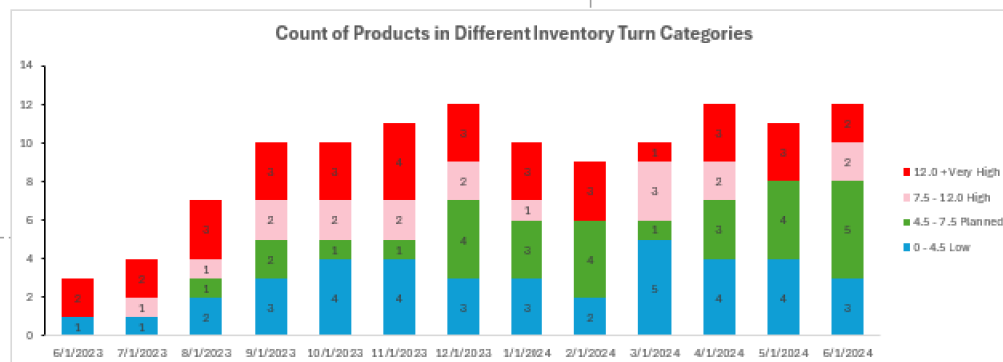
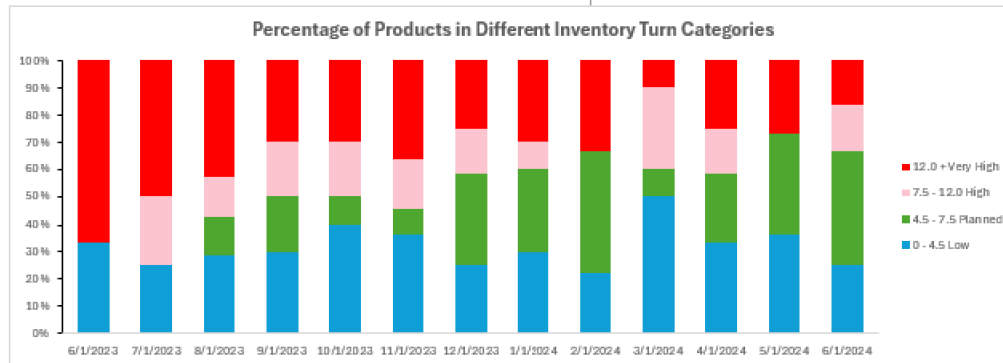
Click the refresh button after selecting a facility from the list

Refresh

Below you can analyze the Inventory Turn Categories of all the products for the selected facility over a year.

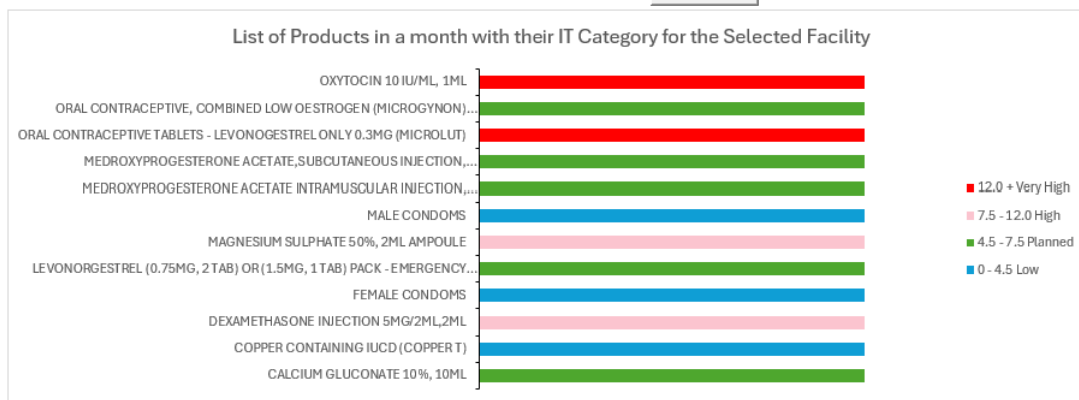
Color	IT Category	Meaning	Inventory Status
Red	Very High	Inventory turning extremely fast	High possibility of stocking out regularly
Pink	High	Inventory turning faster than planned	High possibility of stockout
Green	Planned	Inventory turning as planned	Flow of commodity getting ordered and being used is according to
Blue	Low	Inventory turning slow	Commodity sitting, not being used

Note: The legend values are calculated based on user input for Min Max values



Next the user can filter for one month in a year (typically, the most recent month) and see a list of products with their Inventory Turnover category in a bar chart. This helps user pick problematic products to analyze in the next step.

Select a date 6/1/2024 Refresh



Step 2

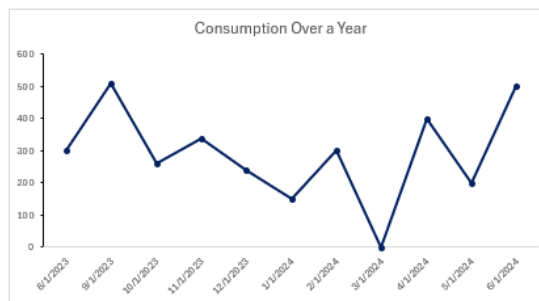
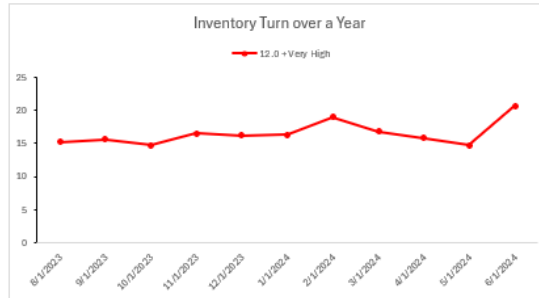
In the next step on the “Facility Analysis” page, user can select a product from the drop-down list and through Inventory Turnover, Consumption and MOS charts over a year, can visualize a potential cause for this product not following a planned Inventory Turnover trend. The descriptions in grey boxes on the side help the user interpret these charts.

Step 2:

Click the refresh button after selecting a product from the list

Below you can analyze the Inventory Turn Value for the one product selected above, in the facility selected in step 1.

Note: The data points do not connect when the IT category changes from one month to the next.
This does not mean missing data but only a change in IT category.
In case of missing data, that month would not appear in the chart.



How to Interpret IT and Consumption over a Year Graphs

1. High Inventory Turn – Variable Consumption

If the most recent months in the IT Graph are pink or red (High IT) and the value of consumption in the graph below ranges from extremely low (lowest point on the graph) to extremely high (highest point on the graph), revisit consumption pattern to identify drivers. If consumption pattern is reasonable, consider changing order frequency or size to prevent stockout.

2. High Inventory Turn – Consistent Consumption

If the most recent months in the IT Graph are pink or red (High IT) and the value of consumption in the graph remains consistent, i.e. almost falls in a straight line, consider increasing order quantity as the facility is falling short in meeting the demand.

3. Low Inventory Turn – Variable Consumption

If the most recent months in the IT graph are blue (Low IT) and the value of consumption in the graph below ranges from extremely low (lowest point on the graph) to extremely high (highest point on the graph), possible sporadic orders are leading to variability. But overall slow movement of stock, need to check consumption and ordering patterns.

4. Low Inventory Turn – Consistent Consumption

If the most recent months in the IT graph are blue (Low IT) and the value of consumption in the graph remains consistent, site in this category are likely ordering more than demand. Need to adjust order quantity.

5. Planned Inventory Turn – Variable Consumption

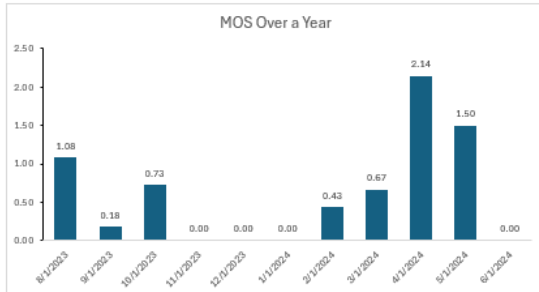
If the most recent months in the IT graph are green (Planned IT) and the value of consumption varies, revisit consumption patterns and follow up on specific orders as necessary. Variability in consumption could also be due to seasonality. If that is the case, continue following the order policies according to season.

6. Planned Inventory Turn – Consistent Consumption

If the most recent months in the IT graph are green (Planned IT) and the value of consumption is consistent along an almost straight line, this facility is turning the selected product at the right rate. Continue monitoring IT and ad policies as and when necessary.

The chart below shows the actual MOS. Planned MOS is between Min **1** and Max **3**

A value of zero indicates a stockout.



How to Interpret IT and MOS Graphs

High Inventory Turn

If the most recent months in the IT graph above are red, the MOS will likely be below the planned MIN MOS limit. In order to prevent future stockouts, site is needed to revisit order policies and adjust frequency or the size of orders. For a site with consistent low MOS (below Min), an order bigger than Max MOS must be placed to replenish and meet the unmet demand of previous months.

Low Inventory Turn

If the most recent months in the IT Graph are blue, the MOS will likely be above the planned MAX MOS limit. This pattern indicates that the site is rationing or overstocking. To avoid waste and expiration, site must review ordering patterns and adjust as necessary.

NOTE: Monitoring Inventory Turn on a regular basis will prevent stockouts and help keep MOS value within the planned MIN-MAX.

The Raw Data tab can also be used to validate these charts and get more insight through additional columns such as, AMC and MOS, by filtering on the facility, region and product that you are investigating.