

Instance Specification and Management Document (ISMD)

DxPulse Instance



Version Approval Control

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|---------------------|---------------------------|-----------------------|
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Version Information

All changes to the instance implementation and management information must be documented in this section. The Instance Data Manager is responsible for keeping this document up to date and ensuring that all changes receive approval from the appropriate parties.

| Name of Person Making Change | Role of Person Making Change | Date of Change | Version Number | Notes |
|-------------------------------------|-------------------------------------|-----------------------|-----------------------|---|
| Hans Naude | Manager Data | 09/12/2024 | Draft 0.1 | First draft of document |
| Elmarie Claasen | Solution Specialist DHIS2 | 12/12/2024 | V1.0 | Review and corrections where needed. |
| Elmarie Claasen | Solution Specialist DHIS2 | 25/03/2025 | V2.0 | <ol style="list-style-type: none"> 1. Added in the intentional audience for this document 2. Ensure that the configuration and design of the system is sufficiently described so that a skilled DHIS2 user will be able to understand it and be able to customize the system and troubleshoot any issues. 3. The linkage of dashboards to the FIND app explained and listed. |

| Name of Person Making Change | Role of Person Making Change | Date of Change | Version Number | Notes |
|------------------------------|------------------------------|----------------|----------------|---|
| | | | | 4. The installation process of apps on DHIS2 explained 5. The training app content made available from the datastore to import into another system as well as the training app with customization for FIND training app. |
| Elmarie Claasen | Solution Specialist DHIS2 | 21/05/2025 | V2.1 | 1. Updated the term FIND or DNO system to DxPulse. |

About this document



This icon is used to highlight specific important information about DxPulse implementation on the FIND instance and should be carefully considered when integrating with country systems.

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1. Abbreviations


| | |
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| API | Application Programming Interface |
| CORS | Cross-Origin Resource Sharing |
| CPU | Central Processing Unit |
| DHIS2 | District Health Information System 2 |
| DNO | Diagnostics Network Optimization |
| FIND | Foundation for Innovative New Diagnostics |
| GIS | Geographic Information System |
| HTTP | HyperText Transfer Protocol |
| IMSD | Instance Management Specification Document |
| ISO | International Organization for Standardization |
| Lab | laboratory |
| OrgUnit | Organizational Unit |
| SMS | Short Message Service |
| SMTP | Simple Mail Transfer Protocol |
| SQL | Structured Query Language |
| SSL | Secure Sockets Layer |
| TLS | Transport Layer Security |
| URL | Uniform Resource Locator |

2. Introduction

This Instance Management Specification Document (IMSD) captures all the information for implementing and managing the DxPulse District Health Information System (DHIS2) instance. It describes what the instance aims to achieve and how the system is configured and managed. This document is intended for DHIS2 administrators (Superusers) who possess extensive knowledge and understanding of DHIS2 configuration and implementation.

What is a DHIS2 instance

DHIS2 is a system that manages aggregated data (e.g. routine health facility data, staffing, equipment, infrastructure, population estimates), and event data (disease outbreaks, survey/audit data, patient satisfaction surveys, longitudinal patient records, etc.). The system supports capturing data linked to any level in an organizational hierarchy, data collection frequency, and a high degree of customization at both the input and output sides. DHIS2 comes with easy-to-use analytics through tailored Dashboards, charts, pivot tables and maps, and can be extended with Apps or used by third-party software through the open Web API. It has been translated into several languages.

 For DxPulse, DHIS2 is used as the database and analytics platform for Diagnostics Network Optimization (DNO) data, which is stored as aggregated records. DHIS also provides the login platform to the system, and further to that, a DxPulse app is installed which provides the user interface for users to interact with their data.

3. Purpose

The purpose of this specification and management document is twofold, first to capture all the general setup information about this instance, and two to document all the necessary information for the maintenance and management of the instance.

4. FIND DHIS2 Instance Information

4.1 System Requirement Overview

Having developed advanced network analytics tools to conduct DNO analysis (such as OptiDx), FIND identified a need for simpler tools that can be country-owned, interoperable with country data systems require lower data input requirements, analyst skills, and time, and can be tailored to individual country needs.

These functional specifications aim to outline the requirements for a simplified and user-friendly visualization tool specifically designed for countries that use the DHIS2 platform. DHIS2 provides an ideal platform to use relevant data for (a) identifying opportunities for improvement of the country's diagnostic testing network in terms of access and efficiency, (b) optimizing the use of existing testing capacity and (c) informing the placement of new testing equipment to improve population accessibility.

It aims to significantly streamline the analysis and planning processes using the standardized DHIS2 data collection, visualization, and analysis tools.

4.2 Instance Information

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|---|--|
| Instance Name | DxPulse |
| Production Instance link | To be added when implemented |
| Training Instance link | Only provisioned when required. |
| Testing and Development environments | Environments are made available for testing and development when required. |
| Current Version | 2.41.1 |

5. DHIS2 Settings

The system settings for the DxPulse instance are described below, however, these settings are not dependent on the DxPulse app functioning properly. The only setting that does affect the system is the landing page which is currently set to the DxPulse app but if a country wants to implement the DxPulse solution in their HMIS the landing page can be customized back to the dashboard and only set for users of the DxPulse solution to immediately land on the DxPulse application or the users can be trained to open the DxPulse application.

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|---|-----------------|-----------------|---------------------------------|--|
| Frontpage login screen | DHIS2 logo | dhis | Yes | Standard setup |
| General Settings | | | | |
| System settings > General > Maximum number of analytics records | Unlimited | Unlimited | Yes | Use the setting Unlimited carefully, it might result in a very high load on your server. |
| System settings > General > Maximum number of SQL view records | Unlimited | Unlimited | Yes | The default value is Unlimited |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|---|-----------------------------------|-----------------------------------|---------------------------------|---|
| System settings > General > Infrastructural indicators | As preferred | As preferred | Yes | Defines an indicator group where the member indicators should describe data about the Organization units' infrastructure. You can view the infrastructural data in the GIS app: right-click a facility and click Show information. |
| System settings > General > Infrastructural data elements | As preferred | As preferred | Yes | Sets the frequency for which the data elements in the infrastructural data elements group are captured. This will typically be yearly. When viewing the infrastructural data you will be able to select the period of the data source. You can view the infrastructural data in the GIS app: right-click a facility and click Show information. |
| System settings > General > Infrastructural period type | As preferred | As preferred | Yes | Sets the frequency for which the data elements in the infrastructural data elements group are captured. This will typically be yearly. When viewing the infrastructural data you will be able to select the period of the data source. You can view the infrastructural data in the GIS app: right-click a facility and click Show information. |
| System settings > General > Feedback recipients | No message recipients | No message recipients | Yes | Defines a user group where the members will receive all messages sent via the feedback function in the Dashboard app. These will typically be members of the super-user team who can support and answer questions coming from end-users. |
| System settings > General > System update notification recipients | No update notification recipients | No update notification recipients | Yes | Defines a user group where the members will receive messages about new system updates available for download, the recipients will only receive the message once for each new patch version of the DHIS2 installation. If no such user group is defined, the system defaults to sending it to all users that have the ALL authority. |
| System settings > General > Max offline Organization unit levels | Lowest level | Facility | No | Defines how many levels in the organization unit hierarchy will be available offline in the organization unit tree widget. Under normal circumstances you can leave this on the lowest level, which is default is the default setting. |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|--|-----------------|-----------------|---------------------------------|---|
| | | | | It can be useful to set it to a higher level to reduce initial load time in cases where you have a large number of Organization units, typically more than 30,000. |
| System settings > General > Data analysis std dev factor | 2 | 2 | Yes | Sets the number of standard deviations used in the outlier analysis performed on the captured data in the Data Entry app. The default value is 2. A high value will catch fewer outlier values than a low value. |
| System settings > General > Phone number area code | As preferred | Not set | Yes | The area code for the area in which your deployment is located. Used for sending and receiving SMS. Typically, this is a country code. +27 (country code for SA) |
| System settings > General > Enable multi-Organization unit forms | Unticked | Unticked | Yes | Enables support to enter data forms for multiple organization units at the same time in the Data Entry app. If you've enabled this setting, you can in the Data Entry app, click on the parent organization unit for the children that you want to enter data for, and the data set list will include data sets that are assigned to the children of that parent. |
| System settings > General > Acceptance required before approval | Unticked | Unticked | Yes | When this setting is selected, acceptance of data will be required first before submission to the next approval level is possible. |
| System settings > General > Gather analytical object statistics in dashboard views. | Unticked | Unticked | Yes | Gather usage analytics data when analytical objects (e.g., maps, charts, etc.) are viewed within a dashboard. Without this setting, analytics data on the objects is gathered only when the objects are viewed outside of a dashboard. |
| System settings > General > Include passive dashboard views in usage analytics statistics. | Unticked | Unticked | Yes | Gather usage analytics data on the first dashboard shown when the Dashboard app is launched (otherwise only explicit dashboard selections are counted). |
| Analytics Settings | | | | |
| System settings > Analytics > Default relative period for analysis | 12 months | 12 months | Yes | Defines the relative period to use by default in analytics app: Data Visualizer, Event Reports, Event Visualizer, GIS, and Pivot Table apps. The relative period will be automatically selected when you open these apps. |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|--|-----------------|-----------------|---------------------------------|--|
| | | | | Recommended setting: the most commonly used relative period among your users. |
| System settings > Analytics > Property to display in analysis modules | Name | Short Name | No | Sets whether you want to display the metadata objects' names or short names in the analytics apps: Data Visualizer, Event Reports, Event Visualizer, GIS, and Pivot Table apps. The user can override this setting in the Settings app: User settings > Property to display in analysis modules. |
| System settings > Analytics > Default digit group separator to display in analysis modules | Space | Space | Yes | Sets the default digit group separator in the analytics apps: Data Visualizer, Event Reports, Event Visualizer, GIS, and Pivot Table apps. |
| System settings > Analytics > Hide daily periods | Unticked | Ticked | No | Hide daily periods in the analysis tools |
| System settings > Analytics > Hide weekly periods | Unticked | Ticked | No | Hide weekly periods in the analysis tools |
| System settings > Analytics > Hide biweekly periods | Unticked | Ticked | No | Hide biweekly periods in the analysis tools |
| System settings > Analytics > Hide monthly periods | Unticked | Unticked | Yes | Hide monthly periods in the analysis tools |
| System settings > Analytics > Hide bimonthly periods | Unticked | Ticked | No | Hide bimonthly periods in the analysis tools |
| System settings > Analytics > Financial year relative start month | April | April | Yes | Define which month (April, July, or October) the relative financial year in the analytics apps should begin on. |
| System settings > Analytics > Cache strategy | No Cache | No Cache | Yes | Decides for how long reports analytics responses should be cached. If you use the scheduled, nightly analytics update, you may want to select Cache until 6 AM tomorrow. This is because data in reports change at that time, and you can safely cache data up to the moment when the analytics tables are updated. If you are loading data continuously into the analytics tables, select No-cache. For other cases select the amount of time you want the data to be cached. |
| System settings > Analytics > Cacheability | Public | Public | Yes | Sets whether analytics data responses should be served with public or private visibility. |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|---|----------------------|----------------------|---------------------------------|---|
| | | | | <p>Private: Any node or server between the DHIS2 server and the end user that can cache can NOT cache the web page. This is useful if the page served can or does contain sensitive information. This means that each time you want a web page, either you get a new page from the DHIS2 server, or the DHIS2 server caches the page. No other server than the DHIS2 server is allowed to cache the page.</p> <p>Public: Any node or server between the DHIS2 server and the end user that can cache the web page. This relieves the traffic to the DHIS2 server and potentially speeds up the subsequent page loading speed.</p> |
| System settings > Analytics > Analytics cache mode | Fixed | Fixed | Yes | <p>Support two different modes:</p> <p>Progressive: this relates to the new progressive caching feature for analytics. When enabled, it OVERRIDES the global caching strategy for analytics requests. This mode will trigger HTTP and data layer caching for all analytics requests. When enabling this mode, the caching factor is MANDATORY.</p> <p>Fixed: the requests will be cached based on the period defined in the cache strategy.</p> |
| System settings > Analytics > Max number of years to hide unapproved data in analytics | Never check approval | Never check approval | Yes | <p>Sets whether and for how long back in time analytics should respect the approval level of the data. Typically, data that is several years old would be considered to be approved by default. To speed up analytics requests, you can choose to ignore the actual approval level of historical data.</p> <p>Never check approval: no data will be hidden, irrespective of its data approval status.</p> <p>Check approval for all data: approval status will always be checked.</p> <p>Other options, for example, Last 3 years: approval status will be checked for data that is newer than 3 years old; older data will not be checked.</p> |
| System settings > Analytics > Respect category option start and end date in analytics table export. | Unticked | Unticked | Yes | <p>If there are problems with the start and end dates of category options, this can be ticked.</p> |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
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| System settings > Analytics > Put analytics in Maintenance mode | Unticked | Ticked | No | This is useful when you need to do maintenance on the database server as the load will decrease. |
| System settings > Analytics > Include zero data values in analytic tables | Ticked | Ticked | No | Excluding the zero data values from analytic tables export will reduce the time to export and the size of the tables. |
| System settings > Analytics > Allow users to switch items view type | Ticked | Ticked | Yes | Allows users to switch dashboard favourites' view between charts, pivot tables, and maps, using the dashboard item menu |
| System settings > Analytics > Allow users to open dashboard items in the relevant app. | Ticked | Ticked | Yes | Allows users to open dashboard items in the app for that type of item, using the dashboard item menu |
| System settings > Analytics > Allow users to show dashboard favourite interpretations and details. | Ticked | Ticked | Yes | Allows users to see dashboard favourites' interpretations and details, using the dashboard item menu |
| System settings > Analytics > Allow users to view dashboard favourites in full screen. | Ticked | Ticked | Yes | Allows users to view dashboard favourites in full screen, using the dashboard item menu |
| System settings > Analytics > Org unit group set in facility map layers | Blank | Blank | Yes | Set the default Org unit group set for map layers |
| System settings > Analytics > Org unit level in facility map layers | As preferred | Hospital | No | Set the default Org unit level for map layers |
| System settings > Analytics > Default base map | As preferred | Bing Road | No | Select which base map will be selected by default in the Maps app. If no value is selected, then OSM Light will be used. |
| Server Settings | | | | |
| System settings > Server > Number of database server CPUs | Automatic | Automatic | Yes | Sets the number of CPU cores of your database server. This allows the system to perform optimally when the database is hosted on a different server than the application server, since analytics in DHIS2 scales linearly with the number of available cores. |
| System settings > Server > System | Email of the person | elmarie@hisp.org | Yes | Defines the email address that will receive system notifications. |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|---|-----------------------|---|---------------------------------|--|
| notifications email address | managing the database | | | Notifications about failures in processes such as analytics table generation will be sent here. This is useful for application monitoring. |
| System settings > Server > Google Analytics (Universal Analytics) key | None | None | Yes | Sets the Google UA key to provide usage analytics for your DHIS2 instance through the Google Analytics platform. It should be noted that currently, not all apps in DHIS2 support Google Analytics, so certain activities of your users may not appear on this platform. You can read more about Google Analytics at google.com/analytics . |
| System settings > Server > Google Maps API key | If required | If required | Yes | Defines the API key for the Google Maps API. This is used to display maps within DHIS2. |
| System settings > Server > Bing Maps API key | If required | If required | Yes | Defines the API key for the Bing Maps API. This is used to display maps within DHIS2. |
| Appearance Settings | | | | |
| System settings > Appearance > Select Language | English | English | Yes | Sets the language for which you can then enter translations of the following settings: * Application introduction * Application title * Application notification * Application left-side footer * Application right-side footer Note: Before each of these settings can accept a translated value, they first need to have a default/fallback value. This value can be set by selecting System default (fallback) in this dropdown. |
| System settings > Appearance > Application title | Name of database | Diagnostic Network Analysis And Tracking Application | No | Sets the application title on the top menu. The naming must be clear as defined and indicate the type of instance. |
| System settings > Appearance > Application Introduction | Type of database | Add (Production / Staging / Training) where applicable | No | Sets an introduction of the system which will be visible on the top-left part of the login page. The naming must be clear as defined and indicate the type of instance. The type name of the instance must contain the word Production /Staging/Training etc. |
| System settings > Appearance > Application Notification – English | As preferred | Welcome to FIND Diagnostic Network Analysis And Tracking Application. The | No | The text can be modified according to instance but should at least contain some information on how to gain access or any other special messages required. Add text that should appear on the login |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
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| | | user name convention for the system is Firstname_Surname. Users who provide emails when registering can make use of the 'recover password' functionality later. Please note that the system is NOT compatible with Internet Explorer - use Firefox, Chrome or Edge. | | screen providing information to users such as below this table. |
| System settings > Appearance > Application left side footer | DHIS2 | An initiative by FIND | No | Sets a text in the left-side footer area of the login page. |
| System settings > Appearance > Application right side footer | Blank | Blank | Yes | Sets a text in the left-side footer area of the login page. |
| System settings > Appearance > Style | Green | Green | Yes | Sets the style (look and feel) of the system. The user can override this setting in the Settings app: User settings > Style. Note: Due to technical reasons, it's not possible to change the colour of the newest version of the header bar. The apps with the newest header bar will retain the blue header bar. |
| System settings > Appearance > Start page | Dashboard | FIND Diagnostic Network Optimisation | No | Sets the page or app which the user will be redirected to after login. Recommended setting: the Dashboard app |
| System settings > Appearance > Help page link | ../dhis-web-commons-about/help.action | https://dhis2.github.io/dhis2-docs/master/en/user/html/dhis2_user_manual_en.html | No | Defines the URL which users will see when they click Profile >Help |
| System settings > Appearance > Flag | Blank | Kenya | No | Sets the flag which is displayed in the left menu of the Dashboard app. |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
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| System settings > Appearance > Interface Language | English | English | Yes | Sets the language used in the user interface. The user can override this setting in the Settings app: User settings > Interface language. |
| System settings > Appearance > Database Language | Database Language | Database Language | Yes | Sets the language used in the database. The user can override this setting in the Settings app: User settings > Database language. |
| System settings > Appearance > Require authority to add to view object lists. | Unticked | Unticked | Yes | If you select this option, you'll hide the menu and index page items and links to lists of objects if the current user doesn't have the authority to create the type of objects (privately or publicly). |
| System settings > Appearance > Custom login page logo | Unticked | Unticked | Yes | Select this option and upload an image to add your logo to the login page |
| System settings > Appearance > Custom top menu logo | Unticked | Unticked | Yes | Select this option and upload an image to add your logo to the left in the top menu. |
| Email Settings | | | | |
| (All email settings will need to be changed when a system is transferred to another hosting environment) | | | | |
| System settings > Email > Hostname | Setup name on the host server | smtp.hispza.org | No | Sets the hostname of the SMTP server. When you use Google SMTP services, the host name should be smtp.gmail.com. |
| System settings > Email > Port | Setup port on the host server | 587 | No | Sets the port to connect to the SMTP server |
| System settings > Email > User name | Setup user name on the host server | dhis2@hispza.org | No | The user name of the user account with the SMTP server. mail@dhis2.org |
| System settings > Email > Password | Setup password on the host server | ***** | No | The password of the user account with the SMTP server |
| System settings > Email > TLS | As preferred | Ticked | No | Select this option if the SMPT server requires TLS for connections |
| System settings > Email > Email sender | Setup email on the host server | FIND.dhis@dhmis.org | No | The email address to use as sender when sending out emails |
| Access Settings | | | | |
| System settings > Access > Self-registration account user role | Disable self-registration | Disable self-registration | Yes | Defines which user role should be given to self-registered user accounts. To enable self-registration of users: select any user role from the list. A link |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|--|---------------------------|---------------------------|---------------------------------|--|
| | | | | to the self-registration form will be displayed on the login page. Note: To enable self-registration, you must also select a Self-registration account organization unit. To disable the self-registration of users: select Disable self-registration. |
| System settings > Access > Self-registration account organization unit | Disable self-registration | Disable self-registration | Yes | Defines which organization unit should be associated with self-registered users. Note: To enable self-registration, you must also select a Self-registration account user role. |
| Do not require reCAPTCHA for self-registration | Unticked | Unticked | Yes | Defines whether you want to use reCAPTCHA for user self-registration. This is enabled by default. |
| System settings > Access > Enable user account recovery | Ticked | Ticked | Yes | Defines whether users can restore their passwords. When this setting is enabled, a link to the account recovery form will be displayed on the front page. Note: User account recovery requires that you have configured email settings (SMTP) |
| System settings > Access > Lock user account temporarily after multiple failed login attempts. | Ticked | Ticked | Yes | Defines whether the system should lock user accounts after five successive failed login attempts over 15 minutes. The account will be locked for 15 minutes, then the user can attempt to log in again. |
| System settings > Access > Allow users to grant their own user roles | Ticked | Ticked | Optional | Defines whether users can grant user roles that they have themselves to others when creating new users |
| System settings > Access > Allow assigning objects to related objects during add or update | Unticked | Unticked | Optional | Defines whether users should be allowed to assign an object to a related object when they create or edit metadata objects. You can allow users to assign an organization unit to data sets and organization unit group sets when creating or editing the organization unit. |
| System settings > Access > Require user account password change | 3 months | 3 months | Yes | Defines whether users should be forced to change their passwords every 3, 6, or 12 months. If you don't want to force users to change passwords, select Never. |
| System settings > Access > Enable password expiry alerts | Ticked | Ticked | Yes | When set, users will receive a notification when their password is about to expire. |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|---|----------------------------|---|---------------------------------|---|
| System settings > Access Minimum characters in password | 10 | 10 | Yes | Defines the minimum number of characters users must have in their passwords. You can select 8 (default), 10, 12 or 14 |
| System settings > Access > CORS whitelist | If required | http://127.0.0.1 http://127.0.0.1:501 http://127.0.0.1:502 http://127.0.0.1:503 http://127.0.0.1:504 http://localhost:501 http://localhost:502 http://localhost:503 http://localhost:504 http://localhost:8087 | No | Whitelists are a set of URLs that can access the DHIS2 API from another domain. Each URL should be entered on separate lines. Cross-origin resource sharing (CORS) is a mechanism that allows restricted resources (e.g. javascript files) on a web page to be requested from another domain outside the domain from which the first resource was served. |
| System settings > Access > reCAPTCHA Site Key | If required | None | No | Setup when self-registration is enabled A reCAPTCHA key is a unique alphanumeric string of 40 characters that needs to be installed on web pages, in mobile applications, or at the WAF layer to integrate reCAPTCHA Enterprise |
| System settings > Access > reCAPTCHA Secret key | If required | None | No | The reCAPTCHA secret key is a unique code provided by Google to website owners who want to integrate reCAPTCHA into their website |
| Calendar Settings | | | | |
| System Settings > Calendar > Calendar | ISO 8601 | ISO 8601 | Yes | Defines which calendar the system will use. The system supports the following calendars: Coptic, Ethiopian, Gregorian, Islamic (Lunar Hijri), ISO 8601, Julian, Nepali, Persian (Solar Hijri), and Thai. This is a system-wide setting. It is not possible to have multiple calendars within a single DHIS2 instance |
| System Settings > Calendar > Date format | 1981-03-31 (yyyy-MM-dd) | 1981-03-31 (yyyy-MM-dd) | Yes | Defines which date format the system will use |
| Data import Settings | | | | |
| System Settings > Data import > Require | Ticked | Unticked | No | Require period of data value to be of the same period type as the data sets for |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|--|-----------------|-----------------|---------------------------------|--|
| periods to match the period type of data set | | | | which the data element of data value is assigned to |
| System Settings > Data import > Require data elements to be part of the data set | Ticked | Unticked | No | Require the data element of a data value to be assigned to a data set. If a specific data set is specified on import, the system will check that data values are associated with the specified data set |
| System Settings > Data import > Require category option combos to match the category combo of the data element | Unticked | Unticked | Yes | Require category option combination of data value to be part of the category combination of the data element of the data value |
| System Settings > Data import > Require Organization units to match the assignment of the data set | Unticked | Unticked | Yes | Require Organization unit of data value to be assigned to one or more of the data sets to which the data element of data value is assigned to |
| System Settings > Data import > Require attribute option combos to match the category combo of the data set | Unticked | Unticked | Yes | Require attribute option combination of data value to be part of the category combination of the data set to which the data element of data value is assigned to |
| System Settings > Data import > Require category option combo to be specified | Unticked | Unticked | Yes | Require category option combination of data value to be specified. By default, it will fall back to the default category option combination if not specified |
| System Settings > Data import > Require attribute option combo to be specified | Unticked | Unticked | Yes | Require attribute option combination of data value to be specified. By default, it will fall back to the default attribute option combination if not specified |
| Synchronization Settings | | | | |
| Systems Settings > Synchronization > Remote server URL | If required | None | No | Defines the URL of the remote server running DHIS2 to upload data values to. It is recommended to use SSL/HTTPS since the user name and password are sent with the request (using basic authentication). The system will attempt to synchronize data once every minute. The system will use this setting for metadata synchronization too. Note: To enable data and metadata synchronization, you must also enable jobs for Data synchronization and |

| Path | Default Setting | Current Setting | Setting Meeting default setting | Rationale |
|--|-----------------|-----------------|---------------------------------|--|
| | | | | Metadata synchronization in the Scheduler app |
| Systems Settings > Synchronization > Remote server user name | If required | None | No | The user name of the DHIS2 user account on the remote server to use for data synchronization. Note: If you've enabled metadata versioning, you must make sure that the configured user has the authority "F_METADATA_MANAGE" |
| Systems Settings > Synchronization > Remote server password | If required | None | No | The password of the DHIS2 user account is on the remote server. The password will be stored encrypted |
| Systems Settings > Synchronization > Enable versioning for metadata sync | If required | Unticked | Yes | Defines whether to create versions of metadata when you synchronize metadata between central and local instances |
| Systems Settings > Synchronization > Don't sync metadata if DHIS versions differ | If required | Unticked | Yes | The metadata schema changes between versions of DHIS2 which could make different metadata versions incompatible. When enabled, this option will not allow metadata synchronization to occur if the central and local instance(s) have different DHIS2 versions. This applies to metadata synchronization done both via the user interface and the API. The only time it might be valuable to disable this option is when synchronizing basic entities, for example, data elements, that have not changed across DHIS2 versions |
| OAuth2 Clients Settings | | | | |
| Systems Settings > Oauth2 clients | If required | Not set | No | You create, edit, and delete OAuth2 clients |

6. CORS whitelisting

Whitelists are a set of URLs that can access the DHIS 2 API from another domain. Cross-origin resource sharing (CORS) is a mechanism that allows restricted resources (e.g. JavaScript files) on a web page to be requested from another domain outside the domain from which the first resource was served.

Below is a table capturing the whitelisted URLs for this instance:


| The Purpose | URL | Application Name |
|-------------|-----------------------|------------------|
| | http://127.0.0.1 | |
| | http://127.0.0.1:5501 | |


| The Purpose | URL | Application Name |
|-------------|-----------------------|------------------|
| | http://127.0.0.1:5502 | |
| | http://127.0.0.1:5503 | |
| | http://127.0.0.1:5504 | |
| | http://localhost:5501 | |
| | http://localhost:5502 | |
| | http://localhost:5503 | |
| | http://localhost:5504 | |
| | http://localhost:8087 | |

Note: The CORS whitelist above may only reside on staging or development instances. When the system is moved to Production these CORS whitelists must be removed. If any CORS whitelists need to continue to exist, they need to be formally requested via a user access form.

7. Organizational Structure

The Organizational structure begins with an Organizational Unit (OrgUnit) at Level 1, designated as "World." This serves as the initial OrgUnit for any country implementing the DNO package. Level 2 represents the "Country," after which implementing countries adapt the structure to align with their respective health Organizational hierarchies. In the default package, the reporting level is configured at Level 6. This should be considered during implementation and adjusted as necessary to match the country-specific requirements.


 Should the DxPulse metadata need to be imported into the country HMIS the orgunit levels need to be determined and aligned with the DxPulse app in terms of pulling reports at a specific level.

 Maps in the DxPulse application rely heavily on GIS coordinates for boundary layers of the district/county level, and also the laboratory and referring facilities. If there are missing coordinates, these will be flagged under the validation section in the app because maps will be affected by showing different numbers than the actual data, since maps are only counting values which are extracted via maps.

7.1 Organization Unit Group

The table below outlines the Organizational Unit Groups along with their respective purposes. If additional disease types are introduced at the facility level, they can be incorporated into the system as needed.

Organization unit groups need to be updated in DHIS2 from the DxPulse Excel Import Template once data is submitted to the system to keep these groups updated as certain reports use these group members to count appropriate values.

 Should the system be expanded to other diseases similar orgunit groups need to be created and assigned for the disease filters to be added in visualizations and placed on dashboards and then linked to work on the application.

| Organisation Unit Group Name | Purpose |
|------------------------------|---|
| Health Facility_Cancer | Facilities referring Cancer tests to Labs |
| Health Facility_HIV | Facilities referring HIV tests to Labs |


| | |
|-------------------------|--|
| Health Facility_Malaria | Facilities referring Malaria tests to Labs |
| Health Facility_TB | Facilities referring TB tests to Labs |
| Health Facility_Total | Facilities referring any tests to Labs |
| Lab_Cancer | Laboratories conducting Cancer tests |
| Lab_HIV | Laboratories conducting HIV tests |
| Lab_Malaria | Laboratories conducting Malaria tests |
| Lab_TB | Laboratories conducting TB tests |
| Lab_Total | Laboratories conducting any tests |

7.2 Organization Unit Group Set

The table below provides an overview of the Organizational Unit Group Sets and the Organizational Groups associated with them. Should more Organizational unit groups be added in the section above they need to be allocated to the group sets below accordingly for the system reports to correctly filter diseases based on indicators in reports.

| Organization Unit Group Set | Organization Groups Allocated |
|------------------------------|-------------------------------|
| DNO_Health Facility | Health Facility_Cancer |
| | Health Facility_HIV |
| | Health Facility_Malaria |
| | Health Facility_TB |
| DNO_Labs | Lab_Cancer |
| | Lab_HIV |
| | Lab_Malaria |
| | Lab_TB |
| Total Labs/Health Facilities | Health Facility_Total |
| | Lab_Total |

7.3 Organization Unit Level

 The table below outlines the organizational unit levels and their default names. While countries may use different names for these levels, it's important to note that for the DxPulse application to function effectively as a plug-and-play system, Laboratories and Facilities must be set to level 6. Therefore, it is recommended to adjust the hierarchy by either adding an additional level above the country, such as "Region" (e.g., Africa), or by removing a level from the hierarchy, if feasible.

If a different organization unit level is desired for the reporting level, adjustments will be required on the application for visualizations to reflect correctly in the DxPulse application.

| Organization Unit Level | Organization Unit Level Name |
|-------------------------|------------------------------|
| Level 1 | World |
| Level 2 | Country |
| Level 3 | County |
| Level 4 | SubCounty |
| Level 5 | Ward |
| Level 6 | Hospital |

8. Requirements

The requirements for the DxPulse DNO application are detailed in a separate Business Requirements Specification document. However, this document provides a summary, including data collection methods and visualization requirements. These elements together guide the configuration decisions made for the DHIS metadata.

The system is aimed at being able to get an analysis of the current laboratory diagnostic network, including:

- 1) Where laboratories are located;
- 2) Facilities that refer specimens to specific laboratories and what the referral paths are;
- 3) Which devices are located at laboratories;
- 4) Strategic Network Design calculations for laboratory capacity, utilisation, historical testing and demand;
- 5) Network Performance calculations for Quality and Human resource allocation
- 6) What-if scenario planning if demand were to increase;
- 7) Ability to apply filters on Organization unit, disease, device and test types.
- 8) The ability to download reports

All of the above are required using graphs, tables and maps.

The data collection process should be as simple as possible, and HISP started by working from the OptiDx data collection templates to understand if data is already available and then customized a template file, which is included below.



Blank_TB_Malaria_H
IV_Cancer_Input_Ter

A decision was made to focus on 4 diseases only for the first iteration – TB, HIV, Malaria and Cancer. While devices and tests were included for other diseases from the template provided of possible devices and tests, we only focused on full system configuration for the 4 diseases specifically for the category groups and category group sets, so if those are to be included configuration for those are required and many-relationship issues between devices and tests needs to be solved so that reports are congruent.

| Data input template (tab) | |
|---------------------------|---|
| Sheet name | Usage |
| Master_AdminAreas | Provide custom names for the country admin areas |
| Master_FacilityList | Select the County for which data is captured |
| Master_Lab_Device | Configure the Device<->->Laboratory linkage |
| Master_Device_Test | Configure the Disease<->->Laboratory linkage |
| MFL search | Lookup a Facility name or MFL code |
| Data Input sheets | Data capturing on sheets for TB, Malaria, HIV, Cancer |

Note that the template file has several sheets, including Master sheets determining the period of data collection and a download of the organization unit hierarchy that corresponds with DHIS, including the facility code. The facility code is important for mapping data from the input sheet into the DHIS. Lab and Device Master data is also required. In addition, data input sheets are required for each

disease. Validations on the input sheets guide data on erroneous data input.

Figure 1: Master_Lab_Device input sheet

Figure 1 above shows details of the data required for each laboratory.

The data input template is currently processed by HISP through several macros existing in another Excel document. Plans are afoot to automate this process through Python and an upload of the document into

a folder in the system but that is not yet finalized so in the interim HISP will need to process any uploads on behalf of a client.

The screenshot shows a data entry form with the following structure:

- Header:** "Referrant and Test input" and "Disease type: TB".
- Legend:**
 - Incorrect data (Red)
 - Duplicate record (Yellow)
 - No values captured (Orange)
- Form Fields:**
 - MFL, TF(Destination Facility): Please provide a MFL code
 - Testing Facility
 - County, TF
 - MFL, RF(Origin): Please provide a MFL code
 - Referred Facility
 - County, RF
 - Text type
 - Mode of transport
- Monthly Grid:** Columns for Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec, and Total.

Figure 2: Example of the input sheets for tests by disease

Figure 2 above is an example of the TB input sheet for tests received by a testing facility from a referral facility by test type and indicating the mode of transport. It should be noted that data is only captured by users for tests performed and these are linked to devices and disease through categories in the DHIS. This is because users do not want to repeatedly capture that a specific test is done through a specific device for a disease since this is knowledge that already exists and frustrates users.

9. Data Elements

Data Elements are fundamental building blocks used to capture, store, and analyse health-related information. They represent specific pieces of data that are collected at facilities or administrative levels within a health system. Each data element has a clear definition and is used to track specific metrics, ensuring standardisation and consistency across datasets.

9.1 Data Element List

The table below provides a list of the current Data Elements available in the system.


| Name | Description | Aggregation type | Value type | Option set name |
|----------------------------|---|------------------|--------------------------|---------------------|
| DNO_Accredited | Laboratories that are accredited in the country captured as a 1 if accredited and 0 if not accredited | LAST | INTEGER_ZERO_OR_POSITIVE | DNO_Zero_One |
| DNO_Accredited type | Type of laboratory accreditation using an option set of National, International or None | NONE | TEXT | DNO_Accredited type |
| DNO_Biosafety level | The current Biosafety level - a value between 0 and 4 | LAST | INTEGER_ZERO_OR_POSITIVE | DNO_Zero_Four |
| DNO_Biosafety level group | The current Biosafety level - a value between 0 and 4 | NONE | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Capacity maximum tests | Capacity maximum tests are calculated as round (number of tests conducted times utilization factor). | SUM | NUMBER | |
| DNO_Chemistry expert | The number of skilled Chemistry experts in a laboratory | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Destination | The destination facility where samples are being sent to store as a UID | NONE | TEXT | |

| Name | Description | Aggregation type | Value type | Option set name |
|----------------------------|---|------------------|--------------------------|-----------------|
| DNO_Device numbers | How many devices are in the country/region by Lab captured by device type | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_EQA enrolled | How many laboratories are enrolled in EQA programs captured as a 1 if the lab is enrolled and 0 if not enrolled. External Quality Assessment (EQA) program is aimed at medical laboratories and point-of-care testing sites. The program includes more than 250 clinically relevant external quality assessment schemes and it is compliant with ISO 15189 standard requirements. | LAST | INTEGER_ZERO_OR_POSITIVE | DNO_Zero_One |
| DNO_EQA passed | How many laboratories passed EQA programs. The external quality assessment (EQA) program is aimed at medical laboratories and point-of-care testing sites. The program includes more than 250 clinically relevant external quality assessment schemes and it is compliant with ISO 15189 standard requirements. | LAST | INTEGER_ZERO_OR_POSITIVE | DNO_Zero_One |
| DNO_Haematology expert | The number of Haematology experts in a laboratory | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Health Facility demand | Health facility demand per test type | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Histology expert | The number of skilled Histology experts in a laboratory | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_HIV expert | The number of skilled HIV experts in a laboratory | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Lab Cancer testing | Number of Laboratory testing Cancer | SUM | INTEGER_POSITIVE | |

| Name | Description | Aggregation type | Value type | Option set name |
|---|--|------------------|--------------------------|-----------------------|
| DNO_Lab device capacity hours per month | Calculated field expressing the number of hours of testing capacity a laboratory has per month. The calculation is the Number of existing devices multiplied by the maximum number of shifts (per day) multiplied by the available hours per shift multiplied by the number of working days per month. Working days are calculated excluding weekends and public holidays. | SUM | NUMBER | |
| DNO_Lab HIV testing | Number of laboratories testing HIV | SUM | INTEGER_POSITIVE | |
| DNO_Lab Malaria testing | Number of laboratories testing Malaria | SUM | INTEGER_POSITIVE | |
| DNO_Lab TB testing | Number of laboratories testing TB | SUM | INTEGER_POSITIVE | |
| DNO_Maximum number of shifts | What is the maximum number of shifts each device is operational per day | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Microbiologist | The number of skilled Microbiologists in the laboratory | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Mode of transport | The mode of transport used to transfer a specimen from the facility to the hub or laboratory using a standard option set | NONE | TEXT | DNO_Mode of transport |
| DNO_Projected Capacity maximum tests | Capacity maximum tests are calculated as round (number of tests conducted times utilization factor). This is inserted from the template based on scenario calculations and inserted against the Test type and "Scenario" catoptionCombos | SUM | NUMBER | |
| DNO_Projected Lab test demand | The number of projected demand per test type in laboratories. | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Projected Spare capacity test | Projected Spare capacity tests are calculated as the capacity maximum tests minus the number of tests conducted per month disaggregated by device type. The data is inserted by Test type and with the Attribute "Scenario" | SUM | NUMBER | |

| Name | Description | Aggregation type | Value type | Option set name |
|--|---|------------------|--------------------------|-----------------|
| DNO_Projected Time total per month (hrs) | Projected Time total per month | SUM | NUMBER | |
| DNO_Projected Utilization factor | The projected Utilization factor is a calculated field based on time total divided by capacity hours. This is inserted based on Scenario planning into future periods based on Future test demand against the test type and "Scenario" | AVERAGE | NUMBER | |
| DNO_Referral distance (straight line) | The straight-line referral distance for specimens between a facility and a lab or hub is based on the mathematical difference between latitude and longitude between two points and disaggregated by test type. The formula used is $=ACOS(COS(RADIANS(90-Lat1)) * COS(RADIANS(90-Lat2)) + SIN(RADIANS(90-Lat1)) * SIN(RADIANS(90-Lat2)) * COS(RADIANS(Long1-Long2))) * 6371$ | AVERAGE | NUMBER | |
| DNO_Samples referred | The number of samples referred by the facility by test type | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Spare capacity (hours) | Spare capacity in hours is calculated as capacity in hours minus time total. | SUM | NUMBER | |
| DNO_Spare capacity test | Spare capacity tests are calculated as the capacity maximum tests minus the number of tests conducted per month disaggregated by device type | SUM | NUMBER | |
| DNO_TB expert | The number of skilled TB experts in a laboratory | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Tests performed | The number of tests performed | SUM | INTEGER_ZERO_OR_POSITIVE | |
| DNO_Time total per month (hrs) | Time total per month | SUM | NUMBER | |
| DNO_Unique laboratory expert | The number of unique laboratory experts in a laboratory | SUM | INTEGER_ZERO_OR_POSITIVE | |

| Name | Description | Aggregation type | Value type | Option set name |
|------------------------|--|------------------|------------|-----------------|
| DNO_Utilisation band | An indication of which utilization band a facility falls in for the period in question. Utilization bands are 0-<25%, 25-<50%, 50-<80%, 80-100% and >100%. A value of 1 is inserted through a predictor based on the utilization factor calculation. | SUM | NUMBER | |
| DNO_Utilization factor | The utilization factor is a calculated field based on time total divided by capacity hours. | AVERAGE | NUMBER | |
| DNO_WorldPop 2020 | Data pulled from the WorldPop dataset for 2020 | SUM | NUMBER | |

 It should be noted that Data collection occurs in the Excel Template file into which certain data fields are entered. This Excel file is then processed through another Excel File which processes macros and calculates several fields with their disaggregation. The decision was made to process data in this manner because DHIS2 indicators cannot be disaggregated by categories and thus would make both calculation and visualization suboptimal.

9.2 Data Element Groups

The table below presents a list of the current Data Element Groups configured in the system.

| Data Element Group Name | Purpose |
|-------------------------|--|
| DNO_Calculations | A group of data elements representing calculations performed externally and subsequently imported into DHIS2 |
| DNO_Capacity | A group of data elements representing the capacity to perform tests |
| DNO_Demand | A group of data elements representing the demand for tests |
| DNO_Human resource | A group of data elements representing the experts conducting tests |
| DNO_Quality | A group of data elements representing the quality of Labs |
| DNO_Sample Tracking | A group of data elements representing the tracking of sample data |

9.3 Calculated Data Elements

The table below represents the input data tables used for calculations.

| Table name | Element | Value Type |
|-------------------|---------------------------|------------|
| Device parameters | Device Name | Text |
| | Available hours per shift | Integer |

| Table name | Element | Value Type |
|-----------------------------|-------------------------------------|------------|
| Test parameters | Test name | Text |
| Device Lab parameters | Device Name | Text |
| | No of existing devices (in the lab) | Integer |
| | Max number of shifts (in the lab) | Integer |
| | Lab code (MFL) | Integer |
| | Lab Name | Text |
| | Hours per shift | Integer |
| | Is Health Facility | True/False |
| | Is Hub | True/False |
| | Is Lab | True/False |
| | Lab Accredited | True/False |
| | Accreditation Type | Text |
| | Biosafety Level | Integer |
| | EQA Enrolled | True/False |
| | EQA Passed | True/False |
| | Chemistry expert (count) | Integer |
| | Haematology expert (count) | Integer |
| | Histology expert (count) | Integer |
| | HIV expert (count) | Integer |
| Microbiology expert (count) | Integer | |
| TB expert (count) | Integer | |
| Device Test parameters | Disease | Text |
| | Device | Text |
| | Test | Text |
| | Period | Integer |
| | Simultaneous tests | Integer |
| | Duration of test | Integer |
| | Modules | Integer |
| | MFL Code | Integer |
| | Max no of shifts | Integer |

Using the tables above, the following elements are calculated.

| Data element | Formula | Value Type |
|---|--|------------|
| <i>Max tests per shift</i> | $(8 / [\text{Duration of test}]) * [\text{Simultaneous tests}]$ | Integer |
| <i>Maximum device capacity (per Device & Lab)</i> | $[\text{no of existing devices}] * [\text{max no of shifts}] * [\text{available hours per shift}] * [\text{working days in period}]$ | Integer |
| <i>Record Count 1 (Capacity)</i> | Count of records - Data records grouped by Period, MFL, Test type | Integer |
| <i>Time per test</i> | $[\text{Available hours per shift}] / [\text{Max tests per shift}]$ | Integer |

| Data element | Formula | Value Type |
|--|---|-------------------|
| <i>Total Time</i> (per grouped record set) | [Time per test] * [Record Count Capacity] | Integer |
| <i>Record Count 2</i> (Labs without tests history) | Count of records – data grouped by Device Type | Integer |
| <i>Average Max tests per shift</i> | [Max tests per shift] / [Record Count 2] | Integer |
| <i>Average time per test</i> | [Available hours per shift] / [Average Max tests per shift] | Decimal (2) |
| <i>Utilization Rate</i> | [Total Time] / [Max device capacity] | Decimal (2) |
| <i>Spare capacity</i> | [Max device capacity] – [Total Time] | Integer |
| <i>Capacity Max tests</i> | [Record Count 2] / [Utilization rate] | Integer |
| <i>Spare Capacity tests</i> | [Capacity Max tests] – [Record Count 2] | Integer |

10. Data Sets

Datasets are predefined collections of data elements organized for data entry, reporting, or aggregation purposes. They are designed to facilitate the systematic collection of data at regular intervals, such as monthly or annually, and are linked to specific organizational units and reporting periods. Datasets streamline the data collection process by grouping relevant data elements, ensuring consistency and simplifying workflows for users.

10.1 Dataset List

The table below outlines the datasets currently configured in the system and their respective purposes.

| Dataset | Purpose |
|------------------------------|---|
| DNO_Dataset Monthly | This dataset includes all data elements with a monthly data collection period |
| DNO_Dataset YY | This dataset includes all data elements with a yearly data collection period |
| Lab dataset for manual entry | This dataset includes all Lab data elements with a monthly data collection period |
| Sample Referral | This dataset includes all Sample Referral data elements with a monthly data collection period |

11. Option Sets

An option Set is a collection of predefined options that are used to standardize the values for a data element or attribute. It defines a set of possible values from which users can select when entering data, ensuring consistency and reducing errors in data collection. Option Sets are commonly used for data elements that require categorical input, such as yes/no responses, geographical regions, or types of health conditions. By associating an Option Set with a data element, the system restricts the input to only the available options, improving data quality and ensuring that the values are consistent across

different datasets and reporting levels. Option Sets can be reused across multiple data elements, making them a flexible and efficient tool for managing categorical data.


11.1 Option Set List

The following Option Sets, along with their respective options, are utilized in the system. Option sets can be added where needed.

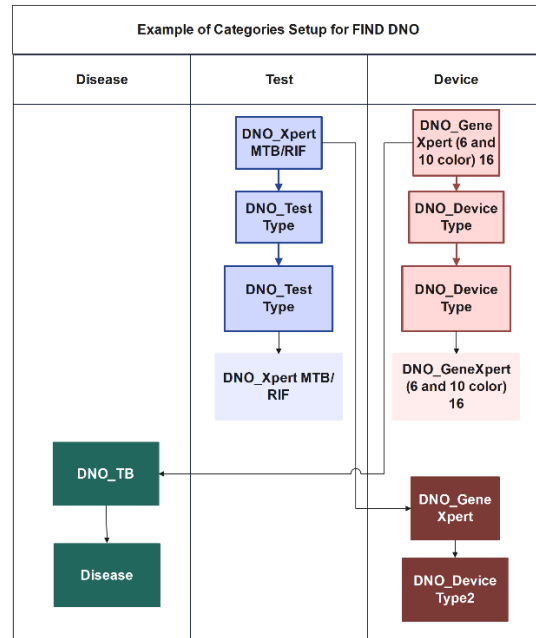
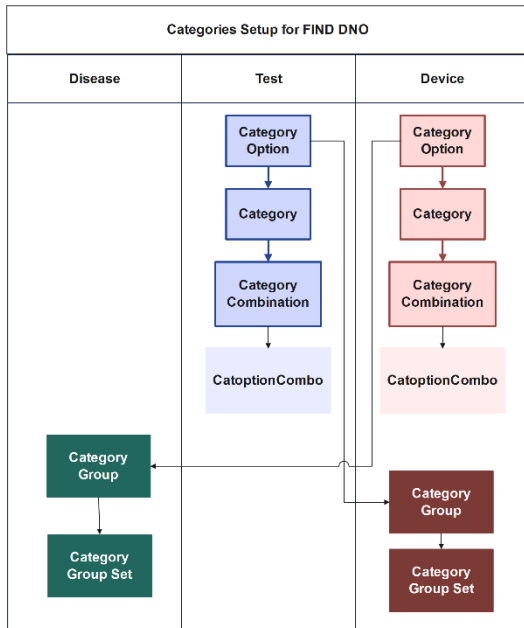
| Option Set | Options |
|-----------------------|--------------------------|
| DNO_Accredited type | National |
| | International |
| | None |
| DNO_Mode of transport | Vehicle |
| | Motorcycle |
| | Bicycle |
| DNO_Zero_Four | 0 |
| | 1 |
| | 2 |
| | 3 |
| | 4 |
| DNO_Zero_One | 0 |
| | 1 |
| Dashboard Group | Data Management |
| | General Summary |
| | Maps |
| | Strategic Network Design |
| | Network Performance |
| | Reports |
| | What-if scenarios |

12. Categories

Categories are used to organize and group data elements based on specific characteristics or attributes, enabling more granular analysis and reporting. Categories allow data to be disaggregated by factors such as disease type, test type or device type. By assigning data elements to categories, users can capture more detailed information and generate reports that reflect variations within a specific dataset.

 For the DxPulse instance, particular attention needs to be paid to the configuration of categories and all their related metadata, including category groups and category groupsets, as these are critical to the behavior of filters in the FIND application.

The 2 graphics below attempt to explain the conceptual design of categories, category groups and groupsets to determine how data is visualized in the FIND application.



12.1 Category Combinations

The following tables detail the current linkage of category options to categories and the assignment of categories to category combinations. These configurations result in the creation of Category Option Combinations, where multiple categories within a Category Combination generate collective option combinations.


In DHIS2, while category options can be assigned to multiple categories, the current setup allocates each category option to a specific category. Additionally, multiple categories can be combined into category combinations, enabling aggregated data reporting. In our configuration, there is predominantly a one-to-one relationship between categories and category combinations, except the "DNO_LabRef" category combination, which includes both the "Lab Referral Sites" and "DNO_DNO" categories.

| Category Combination | Category | Category Option | Category Option Combination |
|----------------------|------------------------------|----------------------------------|----------------------------------|
| DNO_Biosafety level | DNO_Biosafety Level Grouping | DNO_Level 0 | DNO_Level 0 |
| | | DNO_Level 1 | DNO_Level 1 |
| | | DNO_Level 2 | DNO_Level 2 |
| | | DNO_Level 3 | DNO_Level 3 |
| | | DNO_Level 4 | DNO_Level 4 |
| DNO_DNO | DNO_DNO | DNO_Baseline | DNO_Baseline |
| | | DNO_Scenario | DNO_Scenario |
| DNO_Device type | DNO_Device type | DNO_Alere Q | DNO_Alere Q |
| | | DNO_BD Max | DNO_BD Max |
| | | DNO_COBAS AmpliPrep/COBAS | DNO_COBAS AmpliPrep/COBAS |
| | | DNO_GeneXpert (6 and 10 color) 2 | DNO_GeneXpert (6 and 10 color) 2 |

| Category Combination | Category | Category Option | Category Option Combination |
|----------------------|---------------|--|--|
| | | DNO_GeneXpert (6 and 10 color) 4 | DNO_GeneXpert (6 and 10 color) 4 |
| | | DNO_GeneXpert (6 and 10 color) 16 | DNO_GeneXpert (6 and 10 color) 16 |
| | | DNO_Histology Microscope | DNO_Histology Microscope |
| | | DNO_Hologic Panther System | DNO_Hologic Panther System |
| | | DNO_m2000 RealTime System | DNO_m2000 RealTime System |
| | | DNO_Other | DNO_Other |
| | | DNO_Malaria Microscope | DNO_Malaria Microscope |
| | | DNO_Microscope | DNO_Microscope |
| | | DNO_Roche Cobas TaqMan MTB Test | DNO_Roche Cobas TaqMan MTB Test |
| | | DNO_TrueLab | DNO_TrueLab |
| DNO_TestType | DNO_Test type | DNO_Abbott RealTime MTB | DNO_Abbott RealTime MTB |
| | | DNO_Alere Q HIV-1/2 Detect | DNO_Alere Q HIV-1/2 Detect |
| | | DNO_Aptima HIV-1 Quant Dx Assay | DNO_Aptima HIV-1 Quant Dx Assay |
| | | DNO_Aptima HIV-1 RNA Qualitative Assay | DNO_Aptima HIV-1 RNA Qualitative Assay |
| | | DNO_BD Max MDR | DNO_BD Max MDR |
| | | DNO_CareStart Malaria HRP2 (Pf) | DNO_CareStart Malaria HRP2 (Pf) |
| | | DNO_CareStart Malaria HRP2/pLDH (Pf/PAN) Combo Test | DNO_CareStart Malaria HRP2/pLDH (Pf/PAN) Combo Test |
| | | DNO_Chembio_DPP HIV 1/2 Assay | DNO_Chembio_DPP HIV 1/2 Assay |
| | | DNO_Determine HIV-1/2 | DNO_Determine HIV-1/2 |
| | | DNO_Determine_TB LAM Ag | DNO_Determine_TB LAM Ag |
| | | DNO_FalciVax | DNO_FalciVax |
| | | DNO_First Response_HIV 1-2.0 | DNO_First Response_HIV 1-2.0 |
| | | DNO_First Response Malaria Ag P. falciparum (HRP2) Card Test | DNO_First Response Malaria Ag P. falciparum (HRP2) Card Test |
| | | DNO_GenoType MTBDRplus | DNO_GenoType MTBDRplus |
| | | DNO_Histology | DNO_Histology |
| | | DNO_INSTI_HIV-1/HIV-2 Antibody Test | DNO_INSTI_HIV-1/HIV-2 Antibody Test |
| | | DNO_OptiMAL-IT | DNO_OptiMAL-IT |
| | | DNO_OraQuick_ADVANCE Rapid HIV-1/2 Antibody Test | DNO_OraQuick_ADVANCE Rapid HIV-1/2 Antibody Test |
| | | DNO_Paracheck Pf | DNO_Paracheck Pf |
| | | DNO_RealTime HIV-1 | DNO_RealTime HIV-1 |

| Category Combination | Category | Category Option | Category Option Combination |
|-----------------------|-------------------------------|------------------------------------|------------------------------------|
| | | DNO_RealTime HIV-1 Qualitative | DNO_RealTime HIV-1 Qualitative |
| | | DNO_RealTime IDH1 | DNO_RealTime IDH1 |
| | | DNO_Malaria Microscopy | DNO_Malaria Microscopy |
| | | DNO_Roche COBAS Malaria Test | DNO_Roche COBAS Malaria Test |
| | | DNO_SD Bioline_HIV-1/2 3.0 | DNO_SD Bioline_HIV-1/2 3.0 |
| | | DNO_SD Bioline Malaria Ag P.f | DNO_SD Bioline Malaria Ag P.f |
| | | DNO_SD Bioline Malaria Ag P.f/Pan | DNO_SD Bioline Malaria Ag P.f/Pan |
| | | DNO_SD Bioline Malaria Ag P.v | DNO_SD Bioline Malaria Ag P.v |
| | | DNO_Sure Check_HIV 1/2 Assay | DNO_Sure Check_HIV 1/2 Assay |
| | | DNO_TaqMan HIV-1 Qual Test | DNO_TaqMan HIV-1 Qual Test |
| | | DNO_TaqMan HIV-1 Test | DNO_TaqMan HIV-1 Test |
| | | DNO_TaqMan MTB Test | DNO_TaqMan MTB Test |
| | | DNO_TrueNat Malaria Pf | DNO_TrueNat Malaria Pf |
| | | DNO_TrueNat Malaria Pv/Pf | DNO_TrueNat Malaria Pv/Pf |
| | | DNO_TrueNat@ MTB-RIF Dx | DNO_TrueNat@ MTB-RIF Dx |
| | | DNO_Uni-Gold_Recombigen HIV Test | DNO_Uni-Gold_Recombigen HIV Test |
| | | DNO_Xpert BCR-ABL Ultra | DNO_Xpert BCR-ABL Ultra |
| | | DNO_Xpert Bladder Cancer Detection | DNO_Xpert Bladder Cancer Detection |
| | | DNO_Xpert Breast Cancer STRAT4 | DNO_Xpert Breast Cancer STRAT4 |
| | | DNO_Xpert HIV-1 Qual | DNO_Xpert HIV-1 Qual |
| | | DNO_Xpert HIV-1 VL | DNO_Xpert HIV-1 VL |
| | | DNO_Xpert MTB/RIF | DNO_Xpert MTB/RIF |
| | | DNO_Xpert MTB/XDR | DNO_Xpert MTB/XDR |
| | | DNO_Xpert NPM1 Mutation | DNO_Xpert NPM1 Mutation |
| DNO_Utilization bands | DNO_Utilization band | DNO_0 - <25 | DNO_0 - <25 |
| | | DNO_25 - <50 | DNO_25 - <50 |
| | | DNO_50 - <80 | DNO_50 - <80 |
| | | DNO_80 - 100 | DNO_80 - 100 |
| | | DNO_100+ | DNO_100+ |
| DNO_LabRef | Lab Referral Sites DNO_DNO | Referral 1 | DNO_Baseline, Referral 1 |
| | | Referral 2 | DNO_Baseline, Referral 2 |
| | | Referral 3 | DNO_Baseline, Referral 3 |
| | | Referral 4 | DNO_Baseline, Referral 4 |
| | | Referral 5 | DNO_Baseline, Referral 5 |
| | | Referral 6 | DNO_Baseline, Referral 6 |

| Category Combination | Category | Category Option | Category Option Combination |
|----------------------|----------|-----------------|-----------------------------|
| | | DNO_Baseline | DNO_Scenario, Referral 1 |
| | | DNO_Scenario | DNO_Scenario, Referral 2 |
| | | | DNO_Scenario, Referral 3 |
| | | | DNO_Scenario, Referral 4 |
| | | | DNO_Scenario, Referral 5 |
| | | | DNO_Scenario, Referral 6 |


 It should be noted that the DNO_Baseline category option is used for most reported data in the system and DNO_Scenario is used for Scenario planning. When data is imported both of these sets of data is imported into the system and the Scenario planning is imported assuming a 10% increase in services and then when the scenario planning is run by the user, depending on the percentage increase selected by the user the data will be updated once the selection is stored.


12.2 Category Option Groups / Group Sets

Category Option Groups are used to organize category options into logical groupings, facilitating more efficient management and assignment of options within categories. The primary purpose of a Category Option Group is to simplify the process of associating multiple category options with a category or data element, allowing for easier management and consistency across the system.

Category Option Group Sets serve to organize and group related Category Option Groups under a common framework. It enables more structured and flexible management of category options, particularly when analyzing or visualizing data across multiple related dimensions.

The two tables below represent the Category Option Groups in Category Option Sets configured in the system:

 DNO_Device Type2 Category Option Group Set: This group set organizes devices and tests, enabling visualizations that represent tests performed per device.

 DNO_Disease Type Category Option Group Set: This group set categorizes devices based on the diseases they are used to test for, facilitating disease-specific analysis.

| DNO_Device Type2 | |
|-----------------------|----------------------------|
| Category Option Group | Category Options |
| DNO_Access | DNO_Access |
| | DNO_T3 T4 TSH |
| DNO_Alere Q | DNO_Alere Q HIV-1/2 Detect |
| | DNO_Alere Q |
| DNO_Alinity C | DNO_Alinity C |
| | DNO_Alinity Quant Assay |
| | DNO_Chemistry |
| DNO_Architect | DNO_Architect |
| | DNO_T3 T4 TSH |
| DNO_BC-6800 | DNO_BC-6800 |
| | DNO_Haematology |
| DNO_BD Max | DNO_BD Max |

| DNO_Device Type2 | |
|---------------------------|-------------------------------------|
| Category Option Group | Category Options |
| | DNO_BD Max MDR |
| | DNO_BD Onclarity HPV Assay |
| | DNO_BD MAX SARS-CoV-2 assay |
| | DNO_BD MAX T CT/GC/TV |
| DNO_BS-200E | DNO_BS-200E |
| | DNO_Chemistry |
| DNO_COBAS AmpliPrep/COBAS | DNO_COBAS AmpliPrep/COBAS |
| | DNO_Roche COBAS Malaria Test |
| | DNO_TaqMan HIV-1 Qual Test |
| | DNO_TaqMan HIV-1 Test |
| | DNO_RealTime IDH1 |
| | DNO_AmpliScreen HCV Test |
| | DNO_AmpliScreen HBV Test |
| DNO_Cobas c513 Analyzer | DNO_Cobas c513 Analyzer |
| | DNO_cobas HbA1c Test |
| DNO_Cobas c702 | DNO_Cobas c702 |
| | DNO_Chemistry |
| DNO_Cobas e series | DNO_Cobas e series |
| | DNO_T3 T4 TSH |
| DNO_Cobas Mira | DNO_Cobas Mira |
| | DNO_Haematology |
| DNO_CS-5100 | DNO_CS-5100 |
| | DNO_Chemistry |
| DNO_DxC 700 AU | DNO_DxC 700 AU |
| | DNO_Chemistry |
| DNO_Genexpert | DNO_Xpert BCR-ABL Ultra |
| | DNO_Xpert Bladder Cancer Detection |
| | DNO_Xpert Breast Cancer STRAT4 |
| | DNO_Xpert CT/NG |
| | DNO_Xpert Factor II & Factor V |
| | DNO_Xpert GBS LB XC |
| | DNO_Xpert HBV Viral Load |
| | DNO_Xpert HCV Viral Load |
| | DNO_Xpert HIV-1 Qual |
| | DNO_Xpert HIV-1 VL |
| | DNO_Xpert HPV |
| | DNO_Xpert Mpox |
| | DNO_Xpert MTB/RIF |
| | DNO_Xpert MTB/XDR |
| | DNO_Xpert NPM1 Mutation |
| | DNO_Xpert TV |
| | DNO_Xpert Xpress CoV-2/Flu/RSV plus |
| | DNO_Xpert Xpress GBS |
| | DNO_Xpert Xpress MVP |
| | DNO_Xpert Xpress Strep A |
| | DNO_GeneXpert (10 color only) |
| | DNO_GeneXpert (6 and 10 color) |


| DNO_Device Type2 | |
|----------------------------|---|
| Category Option Group | Category Options |
| | DNO_GeneXpert (6 and 10 color) 2 |
| | DNO_GeneXpert (6 and 10 color) 4 |
| | DNO_GeneXpert (6 and 10 color) 16 |
| DNO_Histology Microscope | DNO_Histology |
| | DNO_Histology Microscope |
| DNO_Hologic Panther System | DNO_Hologic Panther System |
| | DNO_Aptima HBV Quant assay |
| | DNO_Aptima HCV Quant assay |
| | DNO_Aptima HIV-1 Quant Dx Assay |
| | DNO_Aptima HIV-1 RNA Qualitative Assay |
| | DNO_Aptima HPV +ThinPrep Cervical Health |
| | DNO_Aptima Trichomonas vaginalis Assay |
| | DNO_Fusion RSV Assay |
| DNO_LH 780 | DNO_LH 780 |
| | DNO_Haematology |
| DNO_m2000 Real Time System | DNO_m2000 Real Time System |
| | DNO_Abbott RealTime MTB |
| | DNO_RealTime CT/NG Assay |
| | DNO_RealTime HBV assay |
| | DNO_RealTime HCV assay |
| | DNO_RealTime High Risk HPV Assay |
| | DNO_RealTime HIV-1 |
| | DNO_RealTime HIV-1 Qualitative |
| DNO_Malaria Microscope | DNO_Malaria Microscope |
| | DNO_Malaria Microscopy |
| DNO_Other Cancer | DNO_BD Onclarity HPV Assay |
| | DNO_BCR-ABL1 MbcR RGQ RT-PCR |
| | DNO_therascreen KRAS RGG |
| | DNO_therascreen PIK3CA RGG |
| | DNO_therascreen EGFR RGG |
| | DNO_ipsogen MPL W515L/K |
| | DNO_Histology Microscope |
| | DNO_ipsogen BCR-ABL1 |
| DNO_Other HIV | DNO_Alere Q HIV-1/2 Detect (m-Pima) |
| | DNO_SD Bioline HIV-1/2 3.0 |
| | DNO_Trinscreen HIV-1/2 Assay |
| | DNO_Sanger Sequencing HIV DR |
| | DNO_RealTime HIV-1 |
| | DNO_HIV-1 Lag-Avidity EIA |
| | DNO_Visitek CD4 |
| | DNO_New m-PIMA HIV 1/2 VL Cartridges |
| | DNO_INSTI HIV-1/HIV-2 Antibody Test |
| | DNO_Standard Q HIV/Syphilis Combo test |
| | DNO_Uni-gold Recombigen HIV Test |
| | DNO_OralQuick ADVANCE Rapid HIV-1/2 Antibody Test |
| DNO_One step HIV-1/2 Assay | |

| DNO_Device Type2 | |
|---------------------------------|---|
| Category Option Group | Category Options |
| | DNO_Aptima HIV-1 Quant Dx Assay |
| DNO_Other Malaria | DNO_ParaHit Ag.Pf |
| | DNO_SD Bioline Malaria Ag.P.f |
| | DNO_SD Bioline Malaria Ag P.f/Pan |
| | DNO_Truenat Malaria Pf |
| | DNO_Paracheck Pf |
| | DNO_Truenat Malaria Pv/Pf |
| | DNO_SD Bioline Malaria Ag P.v |
| DNO_Other TB | DNO_Geno Type MTBDRplus |
| | DNO_Abbott RealTime MTB |
| | DNO_Geno type MTBDRsl |
| | DNO_TB IGRA |
| | DNO_TB LAMP |
| | DNO_TB Culture and DST |
| | DNO_Hain Lifescience GenoType MTBDRplus |
| | DNO_Xpert MTB/RIF |
| | DNO_Truenat@ MTB-RIF Dx |
| | DNO_TB Genomic Sequencing |
| | DNO_TB Microscopy |
| | DNO_T.SPOT.TB |
| DNO_Roche Cobas Taqman MTB Test | DNO_Roche Cobas Taqman MTB Test |
| | DNO_TaqMan MTB Test |
| DNO_Tosoh HLC-723 G11 Analyser | DNO_Tosoh HLC-723 G11 Analyser |
| | DNO_Haematology |
| DNO_TOSOH HLC-723 GX ANALYSER | DNO_TOSOH HLC-723 GX ANALYSER |
| | DNO_Haematology |
| DNO_TrueLab | DNO_TrueLab |
| | DNO_Truenat Chikungunya |
| | DNO_Truenat@ COVID-19 |
| | DNO_Truenat CT |
| | DNO_Truenat@ CT/NG |
| | DNO_Truenat Dengue |
| | DNO_Truenat Dengue/Chikungunya |
| | DNO_Truenat GBS |
| | DNO_Truenat@ H1N1 |
| | DNO_Truenat HAV |
| | DNO_Truenat HBV |
| | DNO_Truenat HCV |
| | DNO_Truenat HEV |
| | DNO_Truenat HPV-HR |
| | DNO_Truenat Influenza A/B |
| | DNO_Truenat Malaria Pf |
| | DNO_Truenat Malaria Pv/Pf |
| | DNO_Truenat@ MTB-RIF Dx |
| | DNO_Truenat NG |
| | DNO_Truenat SARS CoV-2 |
| DNO_Truenat Trich | |

| DNO_Device Type2 | |
|-----------------------|------------------|
| Category Option Group | Category Options |
| DNO_XE-5000 | DNO_XE-5000 |
| | DNO_Haematology |
| DNO_XN-Series | DNO_XN-Series |
| | DNO_Haematology |

| DNO_Disease type | |
|--------------------------------|--|
| Category Option Group | Category Options |
| DNO_HIV | DNO_Sure Check_HIV 1/2 Assay |
| | DNO_Abbot Architect HIV Ag/Ab combo |
| | DNO_Xpert HIV-1 Qual |
| | DNO_Chembio DPP HIV 1/2 Assay |
| | DNO_m2000 RealTime System |
| | DNO_INSTI HIV-1/HIV-2 Antibody Test |
| | DNO_Alere Q HIV-1/2 Detect |
| | DNO_First Response HIV 1-2.0 |
| | DNO_INSTI HIV-1/HIV-2 Antibody Test |
| | DNO_OraQuick ADVANCE Rapid HIV-1/2 Antibody Test |
| | DNO_Alere Determine HIV-1/2 |
| | DNO_OraQuick ADVANCE Rapid HIV-1/2 Antibody Test |
| | DNO_Xpert HIV-1 VL |
| | DNO_Uni-Gold Recombigen HIV Test |
| | DNO_SD Bioline HIV-1/2 3.0 |
| | DNO_SD Bioline HIV-1/2 3.0 |
| | DNO_First Response HIV 1-2.0 |
| | DNO_Sure Check HIV 1/2 Assay |
| | DNO_TaqMan HIV-1 Test |
| | DNO_Cobas e series |
| | DNO_RealTime HIV-1 |
| | DNO_TaqMan HIV-1 Qual Test |
| | DNO_Chembio DPP HIV 1/2 Assay |
| | DNO_Determine HIV-1/2 |
| | DNO_Uni-Gold Recombigen HIV Test |
| | DNO_Asanté HIV-1 Rapid Recency Assay |
| | DNO_Alere Q |
| | DNO_Alinity C |
| | DNO_Architect |
| | DNO_Hologic Panther System |
| | DNO_COBAS AmpliPrep/COBAS |
| | DNO_Aptima HIV-1 Quant Dx Assay |
| DNO_RealTime HIV-1 Qualitative | |
| DNO_Malaria | DNO_FalciVax |
| | DNO_SD Bioline_Malaria Ag P.f/Pan |
| | DNO_Roche COBAS Malaria Test |
| | DNO_OptiMAL_IT |
| | DNO_CareStart_Malaria HRP2 (Pf) |

| DNO_Disease type | |
|-----------------------------------|--|
| Category Option Group | Category Options |
| | DNO_CareStart Malaria HRP2/pLDH (Pf/PAN) Combo Test |
| | DNO_CareStart_Malaria HRP2/pLDH (Pf/PAN) Combo Test |
| | DNO_SD Bioline Malaria Ag P.f/Pan |
| | DNO_Malaria Microscopy |
| | DNO_Paracheck_Pf |
| | DNO_First Response Malaria Ag P. falciparum (HRP2) Card Test |
| | DNO_First Response_Malaria Ag P. falciparum (HRP2) Card Test |
| | DNO_Truenat Malaria Pf |
| | DNO_Truenat Malaria Pv/Pf |
| | DNO_Biocredit Malaria Ag Pf (pLDH/HRPII) |
| | DNO_CareStart Malaria HRP2 (Pf) |
| | DNO_SD Bioline_Malaria Ag P.v |
| | DNO_BinaNOW_Malaria |
| | DNO_SD Bioline Malaria Ag P.f |
| | DNO_SD Bioline_Malaria Ag P.f |
| | DNO_Malaria Microscope |
| | DNO_SD Bioline Malaria Ag P.v |
| | DNO_TB |
| DNO_BD Max | |
| DNO_Truelab | |
| DNO_Abbott RealTime MTB | |
| DNO_m2000 RealTime System | |
| DNO_Xpert MTB/XDR | |
| DNO_Determine TB LAM Ag | |
| DNO_GeneXpert (10 color only) | |
| DNO_GeneXpert (6 and 10 color) | |
| DNO_GeneXpert (6 and 10 color) 16 | |
| DNO_GeneXpert (6 and 10 color) 2 | |
| DNO_GeneXpert (6 and 10 color) 4 | |
| DNO_TaqMan MTB Test | |
| DNO_GenoType MTBDRplus | |
| DNO_COBAS AmpliPrep/COBAS | |
| DNO_Determine_TB LAM Ag | |
| DNO_Xpert MTB/RIF | |
| DNO_Truenat@ MTB-RIF Dx | |
| DNO_Cancer | DNO_Xpert HPV |
| | DNO_BD Onclarity HPV Assay |
| | DNO_Truenat HPV-HR |
| | DNO_Histology |
| | DNO_Aptima HPV +ThinPrep Cervical Health |
| | DNO_Histology Microscope |
| | DNO_Xpert Bladder Cancer Detection |
| | DNO_Xpert Breast Cancer STRAT4 |
| | DNO_BD VIPER |
| DNO_RealTime High Risk HPV Assay | |

 Note that for Disease type only 4 diseases were initially mapped in the system as a more sleek solution needs to be developed to cater more efficiently for all diseases. This is because a specific device can test for multiple tests and these relationships between device and test are not one-one which is complex to cater for in the DHIS data model.

13. Indicators

An indicator is a calculated metric used to measure and evaluate specific aspects of health program performance, service delivery, or population health outcomes. Indicators are derived from one or more data elements or category option combinations using mathematical formulas (e.g., sums, ratios, or percentages). They provide meaningful insights by aggregating raw data into interpretable metrics, enabling health managers and decision-makers to monitor progress, assess performance, and make informed decisions.

13.1 Indicator List

The table below provides a comprehensive list of the indicators currently utilized in the system.

| Indicator name | Indicator description | Indicator type | Numerator description | Denominator description |
|---|--|----------------|---|-------------------------|
| DNO_Projected Utilisation rate Hologic Panther System | The Projected Utilisation rate for Hologic Panther System calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Hologic Panther System x 100 | One |
| DNO_Number of Malaria Labs | The number of Orgunits with the Malaria Labs OrgunitType assigned which is an indication of the number of labs. | Number | No of Labs | 1 |
| DNO_Projected Utilisation rate Malaria Microscopy | The Projected Utilisation rate for Malaria Microscopy calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Malaria Microscopy x 100 | One |
| DNO_Projected Utilisation rate m2000 RealTime System | The Projected Utilisation rate for m2000 RealTime System calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_m2000 RealTime System x 100 | One |

| Indicator name | Indicator description | Indicator type | Numerator description | Denominator description |
|--|---|----------------|---|-------------------------|
| DNO_Total number of Labs | The total number of Orgunits with the Labs OrgunitType assigned which is an indication of the number of labs. | Number | No of Labs | 1 |
| DNO_Projected Utilisation rate COBAS AmpliPrep/COBAS | The Projected Utilisation rate for COBAS AmpliPrep/COBAS device with 4 modules calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_COBAS AmpliPrep/COBAS x 100 | One |
| DNO_Utilisation rate Truelab | The Utilisation rate for Truelab calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Truelab x 100 | One |
| DNO_Projected Utilisation rate GeneXpert (6 and 10 color) 16 | The Projected Utilisation rate for Genexpert device with 16 modules calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_GeneXpert (6 and 10 color) 16 x 100 | One |
| DNO_Projected Utilisation rate GeneXpert (6 and 10 color) 2 | The Projected Utilisation rate for Genexpert device with 2 modules calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_GeneXpert (6 and 10 color) 2x 100 | One |
| DNO_Number of TB Labs | The number of Orgunits with the TB Labs OrgunitType assigned which is an indication of the number of labs. | Number | No of Labs | 1 |
| DNO_Utilisation rate COBAS AmpliPrep/COBAS | The Utilisation rate for COBAS AmpliPrep/COBAS device with 4 modules calculated as | Percentage | Utilization factor DNO_COBAS AmpliPrep/COBAS x 100 | One |

| Indicator name | Indicator description | Indicator type | Numerator description | Denominator description |
|--|--|----------------|--|-------------------------|
| | the Utilisation factor multiplied by 100 | | | |
| DNO_ Number of HIV Labs | The number of Orgunits with the HIV Labs OrgunitType assigned which is an indication of the number of labs. | Number | No of Labs | 1 |
| DNO_ Utilisation rate Alere Q | The Utilisation rate for Genexpert device with 4 modules calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_ Alere Q x 100 | One |
| DNO_ Overall utilisation rate | Overall utilisation rate | Percentage | Utilisation factor | One |
| DNO_ Number of TB health facility | The number of Orgunits with the TB Health Facility OrgunitType assigned which is an indication of the number of Health Facility. | Number | No of Health Facility | 1 |
| DNO_ Utilisation rate Other | The Utilisation rate for Other calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_ Other x 100 | One |
| DNO_ Utilisation rate Hologic Panther System | The Utilisation rate for Hologic Panther System modules calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_ Hologic Panther System x 100 | One |
| DNO_ Projected Utilisation rate Truelab | The Projected Utilisation rate for Truelab calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_ Truelab x 100 | One |
| DNO_ Number of Cancer health facility | The number of Orgunits with the Cancer Health Facility OrgunitType assigned which is an indication | Number | No of Health Facility | 1 |

| Indicator name | Indicator description | Indicator type | Numerator description | Denominator description |
|---|--|----------------|--|-------------------------|
| | of the number of Health Facility. | | | |
| DNO_Utilisation rate Roche Cobas TaqMan MTB Test | The Utilisation rate for Roche Cobas TaqMan MTB Test calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Roche Cobas TaqMan MTB Test x 100 | One |
| DNO_Total number of Health Facilities | The total number of Orgunits with the Health Facility OrgunitType assigned which is an indication of the number of labs. | Number | No of Labs | 1 |
| DNO_Utilisation rate Genexpert (6 and 10 colour) 16 | The Utilisation rate for Genexpert device with 16 modules calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_GeneXpert (6 and 10 color) 16 x 100 | One |
| DNO_Utilisation rate Genexpert (6 and 10 colour) 4 | The Utilisation rate for Genexpert device with 4 modules calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_GeneXpert (6 and 10 color) 4 x 100 | One |
| DNO_Utilisation rate BD Max | The Utilisation rate for BD Max device with 4 modules calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Alere Q x 100 | One |
| DNO_Projected Utilisation rate Alere Q | The Projected Utilisation rate for Alere Q calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Alere Q x 100 | One |
| DNO_Not accredited labs | | Number | Total labs minus accredited labs | One |
| DNO_Projected Utilisation rate Other | The Projected Utilisation rate for Other calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Other x 100 | One |

| Indicator name | Indicator description | Indicator type | Numerator description | Denominator description |
|--|---|----------------|---|-------------------------|
| DNO_Utilisation rate m2000 RealTime System | The Utilisation rate for m2000 RealTime System calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_m2000 RealTime System x 100 | One |
| DNO_Number of Cancer Labs | The number of Orgunits with the Cancer Labs OrgunitType assigned which is an indication of the number of labs. | Number | No of Labs | 1 |
| DNO_Utilisation rate Genexpert (6 and 10 colour) 2 | The Utilisation rate for Genexpert device with 2 modules calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_GeneXpert (6 and 10 color) 2 x 100 | One |
| DNO_Projected Utilisation rate Histology Microscope | The Projected Utilisation rate for Histology Microscope calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Histology Microscope | One |
| DNO_Utilisation rate DNO_Histology Microscope | The Utilisation rate for Histology Microscope calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Histology Microscope x 100 | One |
| DNO_Projected Utilisation rate Microscope | The Projected Utilisation rate for Microscope calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Microscope x 100 | One |
| DNO_Number of Malaria health facility | The number of Orgunits with the Malaria Health Facility OrgunitType assigned which is an indication of the number of Health Facility. | Number | No of Health Facility | 1 |
| DNO_Projected Utilisation rate Roche Cobas TaqMan MTB Test | The Projected Utilisation rate for Roche Cobas TaqMan MTB Test calculated | Percentage | Utilization factor DNO_Roche Cobas TaqMan MTB Testx 100 | One |

| Indicator name | Indicator description | Indicator type | Numerator description | Denominator description |
|--|---|----------------|---|-------------------------|
| | as the Projected Utilisation factor multiplied by 100 | | | |
| DNO_Projected Utilisation rate Genexpert (6 and 10 colour) 4 | The Projected Utilisation rate for Genexpert device with 4 modules calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_GeneXpert (6 and 10 color) 4 x 100 | One |
| DNO_Utilisation rate Malaria Microscopy | The Utilisation rate for Malaria Microscopy calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Malaria Microscopy x 100 | One |
| DNO_Utilisation rate Microscope | The Utilisation rate for Microscope calculated as the Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_Microscope x 100 | One |
| DNO_Projected Utilisation rate BD Max | The Projected Utilisation rate for BD Max device with 4 modules calculated as the Projected Utilisation factor multiplied by 100 | Percentage | Utilization factor DNO_BD Max x 100 | One |
| DNO_Number of HIV health facility | The number of Orgunits with the HIV Health Facility OrgunitType assigned which is an indication of the number of Health Facility. | Number | No of Health Facility | 1 |

13.2 Indicator Groups

Indicator Groups are used to organize related indicators into logical collections based on common themes, programs, or areas of interest. They simplify the management and analysis of indicators by grouping them, making it easier to navigate and use them in reports, visualizations, and analytics.

The table below shows a list of the indicator groups used in the system.

| Indicator group name | Indicator name |
|----------------------|---|
| DNO_TB | DNO_ Number of TB health facility |
| DNO_TB | DNO_ Number of TB Labs |
| DNO_HIV | DNO_ Number of HIV health facility |
| DNO_HIV | DNO_ Number of HIV Labs |
| DNO_Malaria | DNO_ Number of Malaria health facility |
| DNO_Malaria | DNO_ Number of Malaria Labs |
| DNO_Cancer | DNO_ Number of Cancer health facility |
| DNO_Cancer | DNO_ Number of Cancer Labs |
| DNO_Devices | DNO_ Utilisation rate Alere Q |
| DNO_Devices | DNO_ Utilisation rate Genexpert (6 and 10 colour) 4 |
| DNO_Devices | DNO_ Projected Utilisation rate Genexpert (6 and 10 colour) 4 |
| DNO_Devices | DNO_ Overall utilisation rate |
| DNO_Devices | DNO_ Utilisation rate Genexpert (6 and 10 colour) 2 |
| DNO_Devices | DNO_ Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_Devices | DNO_ Projected Utilisation rate BD Max |
| DNO_Devices | DNO_ Utilisation rate BD Max |
| DNO_Devices | DNO_ Projected Utilisation rate GeneXpert (6 and 10 color) 2 |
| DNO_Devices | DNO_ Projected Utilisation rate GeneXpert (6 and 10 color) 16 |
| DNO_Devices | DNO_ Projected Utilisation rate Hologic Panther System |
| DNO_Devices | DNO_ Utilisation rate Hologic Panther System |
| DNO_Devices | DNO_ Projected Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_Devices | DNO_ Utilisation rate Genexpert (6 and 10 colour) 16 |
| DNO_Devices | DNO_ Projected Utilisation rate Truelab |
| DNO_Devices | DNO_ Utilisation rate Roche Cobas TaqMan MTB Test |
| DNO_Devices | DNO_ Utilisation rate Microscope |
| DNO_Devices | DNO_ Utilisation rate Other |
| DNO_Devices | DNO_ Projected Utilisation rate Malaria Microscopy |
| DNO_Devices | DNO_ Projected Utilisation rate Histology Microscope |
| DNO_Devices | DNO_ Projected Utilisation rate m2000 RealTime System |
| DNO_Devices | DNO_ Projected Utilisation rate Microscope |
| DNO_Devices | DNO_ Utilisation rate DNO_ Histology Microscope |
| DNO_Devices | DNO_ Projected Utilisation rate Other |
| DNO_Devices | DNO_ Utilisation rate m2000 RealTime System |
| DNO_Devices | DNO_ Utilisation rate Truelab |
| DNO_Devices | DNO_ Utilisation rate Malaria Microscopy |
| DNO_Devices | DNO_ Projected Utilisation rate Roche Cobas TaqMan MTB Test |
| DNO_HIV | DNO_ Projected Utilisation rate GeneXpert (6 and 10 color) 16 |
| DNO_HIV | DNO_ Utilisation rate m2000 RealTime System |
| DNO_HIV | DNO_ Projected Utilisation rate Genexpert (6 and 10 colour) 4 |
| DNO_HIV | DNO_ Projected Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_HIV | DNO_ Projected Utilisation rate GeneXpert (6 and 10 color) 2 |
| DNO_HIV | DNO_ Utilisation rate Alere Q |
| DNO_HIV | DNO_ Projected Utilisation rate m2000 RealTime System |
| DNO_HIV | DNO_ Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_HIV | DNO_ Projected Utilisation rate Alere Q |
| DNO_HIV | DNO_ Projected Utilisation rate Hologic Panther System |
| DNO_HIV | DNO_ Utilisation rate Hologic Panther System |

| Indicator group name | Indicator name |
|----------------------|--|
| DNO_TB | DNO_Utilisation rate Genexpert (6 and 10 colour) 2 |
| DNO_TB | DNO_Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_TB | DNO_Projected Utilisation rate BD Max |
| DNO_TB | DNO_Projected Utilisation rate Truelab |
| DNO_TB | DNO_Utilisation rate m2000 RealTime System |
| DNO_TB | DNO_Projected Utilisation rate Genexpert (6 and 10 colour) 4 |
| DNO_TB | DNO_Utilisation rate Truelab |
| DNO_TB | DNO_Utilisation rate BD Max |
| DNO_TB | DNO_Projected Utilisation rate GeneXpert (6 and 10 color) 2 |
| DNO_TB | DNO_Projected Utilisation rate GeneXpert (6 and 10 color) 16 |
| DNO_TB | DNO_Projected Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_TB | DNO_Projected Utilisation rate m2000 RealTime System |
| DNO_TB | DNO_Utilisation rate Genexpert (6 and 10 colour) 16 |
| DNO_TB | DNO_Utilisation rate Genexpert (6 and 10 colour) 4 |
| DNO_Cancer | DNO_Utilisation rate DNO_Histology Microscope |
| DNO_Cancer | DNO_Projected Utilisation rate Histology Microscope |
| DNO_Malaria | DNO_Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_Malaria | DNO_Projected Utilisation rate Truelab |
| DNO_Malaria | DNO_Projected Utilisation rate COBAS AmpliPrep/COBAS |
| DNO_Malaria | DNO_Utilisation rate Truelab |
| DNO_Malaria | DNO_Projected Utilisation rate Malaria Microscopy |
| DNO_Malaria | DNO_Utilisation rate Malaria Microscopy |

14. Predictors

Predictors are used to automatically generate or estimate data values based on historical data or predefined logic. They are often used for tasks such as forecasting, identifying trends, or generating data for routine monitoring when direct data collection is unavailable or impractical. Predictors work by applying mathematical formulas, algorithms, or logic to existing data within the DHIS2 system.

The table below provides an overview of the predictors used in the system, including the groups they belong to and the formulas that define their functionality.

| Predictor Group | Predictor Name | Description | Period | Generator Formula |
|--|---------------------------|---|--------|------------------------------------|
| Biosafety levels (This group of predictors should run before analytics runs after import of data in order to convert number values) | Biosafety Level Group - 0 | Inserts the biosafety level 0 into Level 0 Biosafety level group data element | Yearly | if(DNO_Biosafety level==0,1,null) |
| | Biosafety Level Group - 1 | Inserts the biosafety level 1 into Level 1 Biosafety level group data element | Yearly | if(DNO_Biosafety level==1,1,null) |
| | Biosafety Level Group - 2 | Inserts the biosafety level 2 into Level 2 | Yearly | if(DNO_Biosafety level==2,1,null) |

| Predictor Group | Predictor Name | Description | Period | Generator Formula |
|-------------------------------------|---------------------------|---|--------|--|
| to the optionset for visualisation) | | Biosafety level group data element | | |
| | Biosafety Level Group - 3 | Inserts the biosafety level 3 into Level 3 Biosafety level group data element | Yearly | if(DNO_Biosafety level==3,1,null) |
| | Biosafety Level Group - 4 | Inserts the biosafety level 4 into Level 4 Biosafety level group data element | Yearly | if(DNO_Biosafety level==4,1,null) |
| Lab flag for diseases | DNO Lab Cancer testing | Inserts a 1 into DE Lab Cancer test if the lab has done any of the Cancer tests | Yearly | if(DNO_Spare capacity test DNO_Histology Microscope +BCR-ABL1 MbcR RGQ RT-PCR + ipsogen BCR-ABL1 + ipsogen JAK2 RGQ PCR Kit +therascreen PIK3CA RGQ +therascreen EGFR RGQ + theascreen KRAS RGG + ipsogen MPL W515L/K + BD Onclarity™ HPV Assay >0,1,0) |
| | DNO Lab HIV testing | Inserts a 1 into DE Lab HIV test if the lab has done any of the HIV tests | Yearly | if(DNO_Tests performed DNO_Alere Q HIV-1/2 Detect + DNO_Tests performed DNO_Aptima HIV-1 Quant Dx Assay + DNO_Tests performed DNO_Aptima HIV-1 RNA Qualitative Assay + DNO_Tests performed DNO_Chembio_DPP HIV 1/2 Assay + DNO_Tests performed DNO_Determine HIV-1/2 + DNO_Tests performed DNO_First Response_HIV 1-2.0 + DNO_Tests performed DNO_INSTI_HIV-1/HIV-2 Antibody Test + DNO_Tests performed DNO_RealTime HIV-1 + DNO_Tests performed DNO_RealTime HIV-1 Qualitative + DNO_Tests performed DNO_SD Bioline_HIV-1/2 3.0 + DNO_Tests performed DNO_Sure Check_HIV 1/2 Assay + DNO_Tests |

| Predictor Group | Predictor Name | Description | Period | Generator Formula |
|-----------------|-------------------------|---|--------|---|
| | | | | <p>performed DNO_TaqMan HIV-1 Qual Test + DNO_Tests performed DNO_TaqMan HIV-1 Test + DNO_Time total per month (hrs) DNO_INSTI_HIV-1/HIV-2 Antibody Test + DNO_Time total per month (hrs) DNO_OraQuick_ADVANCE Rapid HIV-1/2 Antibody Test + DNO_Time total per month (hrs) DNO_TaqMan HIV-1 Qual Test + DNO_Time total per month (hrs) DNO_TaqMan HIV-1 Test + DNO_Time total per month (hrs) DNO_Uni-Gold_Recombigen HIV Test>0,1,null)</p> |
| | DNO Lab Malaria testing | Inserts a 1 into DE Lab Malaria test if the lab has done any of the Malaria tests | Yearly | <p>if(DNO_Tests performed DNO_CareStart Malaria HRP2 (Pf) + DNO_Tests performed DNO_CareStart Malaria HRP2/pLDH (Pf/PAN) Combo Test + DNO_Tests performed DNO_FalciVax + DNO_Tests performed DNO_First Response Malaria Ag P. falciparum (HRP2) Card Test+ DNO_Tests performed DNO_OptiMAL-IT + DNO_Tests performed DNO_Parachek Pf+ DNO_Tests performed DNO_Roche COBAS Malaria Test + DNO_Tests performed DNO_SD Bioline Malaria Ag P.f + DNO_Tests performed DNO_SD Bioline Malaria Ag P.f/Pan + DNO_Tests performed DNO_SD Bioline Malaria Ag P.v + DNO_Tests performed DNO_TrueNat Malaria Pf + DNO_Tests performed DNO_TrueNat Malaria Pv/Pf</p> |

| Predictor Group | Predictor Name | Description | Period | Generator Formula |
|---|------------------------------------|--|---------|---|
| | | | | +DNO_Tests performed DNO_TrueNat@ MTB-RIF Dx + DNO_Tests performed DNO_Malaria Microscopy + BinaNOW® Malaria + MerilScreen Ag.Pf + Paracheck Ag.Pf + ParaHit Ag.Pf + Biocredit Malaria Ag Pf (pLDH/HRP11) + PCR Malaria + Sequencing Malaria>0,1,null) |
| | DNO Lab TB testing | Inserts a 1 into DE Lab TB test if the lab has done any of the TB tests | Yearly | if(DNO_Tests performed DNO_Abbott RealTime MTB + DNO_Tests performed DNO_BD Max MDR + DNO_Tests performed DNO_Determine_TB LAM Ag + DNO_Tests performed DNO_GenoType MTBDRplus + DNO_Tests performed DNO_TaqMan MTB Test + DNO_Tests performed DNO_TrueNat@ MTB-RIF Dx + DNO_Tests performed DNO_Xpert MTB/RIF + DNO_Tests performed DNO_Xpert MTB/XDR>0,1,null) |
| Utilization bands (This predictor should run after importing of data. It inserts a 1 value into the Utilisation band for a lab based on the range within which the utilisation falls) | DNO_Utilization band insert 00-<25 | A predictor that inserts a one (1) value based on the band a specific facility falls in within the specific range of 0-<25. | Monthly | if(DNO_Utilization factor> 0 and DNO_Utilization factor < 0.25,1,0) |
| | DNO_Utilization band insert 25-<50 | A predictor that inserts a one (1) value based on the band a specific facility falls in within the specific range of 25-<50. | Monthly | if(DNO_Utilization factor>=0.25 and DNO_Utilization factor < 0.5,1,0) |
| | DNO_Utilization band insert 50-<80 | A predictor that inserts a one (1) value based on the band a specific facility falls in within the specific range of 50-<80. | Monthly | if(DNO_Utilization factor>= 0.5 and DNO_Utilization factor < 0.8,1,0) |

| Predictor Group | Predictor Name | Description | Period | Generator Formula |
|-----------------|------------------------------------|--|---------|---|
| | DNO_Utilization band insert 80-100 | A predictor that inserts a one (1) value based on the band a specific facility falls in within the specific range of 80-100. | Monthly | if(DNO_Utilization factor >= 0.8 and DNO_Utilization factor <= 1,1,0) |
| | DNO_Utilization band insert 100+ | A predictor that inserts a one (1) value based on the band a specific facility falls in within the specific range of 100+ | Monthly | if(DNO_Utilization factor > 1,1,0) |

15. System user roles and groups

The following user roles (together with user groups) control access to functionality within the FIND system.

| User Role | Description |
|---|---|
| DNO_Administrator | Full access to all system functionality and configuration related (and limited) to the specified country |
| DNO_Create User | To create and manage users for the DxPulse app |
| DNO_Data Analyst | For users who analyse DNO data |
| DNO_Data Manager | This role is responsible for the standardized importing of data from various data sources using defined templates to populate the data. |
| Superuser | Has access to everything, no access controls. To be used with caution for highly qualified people |
| User Groups | Description |
| DNO_Admin DNO_All Metadata DNO_Cancer DNO_Create User DNO_Data Manager DNO_HIV DNO_Malaria DNO_Support DNO_TB | These user groups are utilized to establish the sharing of metadata objects or notifications. |

Should more diseases be implemented the list of user groups needs to be expanded and users assigned accordingly based on the services they need to monitor.

16. Scheduled Jobs

The Scheduler is an application for managing background jobs in DHIS2. Background jobs can perform several automated tasks, such as running analytics, synchronizing data and metadata, or sending a push analysis report. The application provides the ability to create, modify and delete such jobs.

The Scheduler comes bundled with DHIS2 and is accessed through the App Menu.

| Name | Type | Schedule | Next run | Status | On/off | Actions |
|--------------------------------------|-----------------|-------------|---|-----------|-------------------------------------|---------|
| Run Resource tables | Resource table | At 12:00 AM | 2024-12-13 00:00:00 (Africa/Johannesburg) | Scheduled | <input checked="" type="checkbox"/> | Actions |
| Run predictor for Biosafety Level | Predictor | At 12:00 AM | 2024-12-13 00:00:00 (Africa/Johannesburg) | Scheduled | <input checked="" type="checkbox"/> | Actions |
| Run Predictors Utilization bands | Predictor | At 12:10 AM | 2024-12-13 00:10:00 (Africa/Johannesburg) | Scheduled | <input checked="" type="checkbox"/> | Actions |
| Run Predictor Health Facility Demand | Predictor | At 12:15 AM | - | Disabled | <input type="checkbox"/> | Actions |
| Run Predictor for Lab Testing | Predictor | At 12:30 AM | 2024-12-13 00:30:00 (Africa/Johannesburg) | Scheduled | <input checked="" type="checkbox"/> | Actions |
| Run Analytics | Analytics table | At 01:00 AM | 2024-12-13 01:00:00 (Africa/Johannesburg) | Scheduled | <input checked="" type="checkbox"/> | Actions |

Figure 3: DHIS2 Scheduled Jobs



The graphic above indicates the current scheduled jobs and their status and routine runtime. In particular, the following jobs should be taken careful note of:

1. Resource Tables is necessary to run once the value for Scenario planning save action is confirmed by the user in the frontend of the DNO app. This will update the constant which is stored and used for calculations of the scenario values.
2. Predictors for Biosafety levels, Utilisation Bands and Lab Testing must be run before analytics run or analytics need to run again after these predictors are run so that the values inserted through the predictor are included in analytics.
3. The predictor for health facility demand is currently disabled as testing to import these values rather than generating them through a predictor is ongoing.

These predictors can also be triggered manually or through an API call in addition to the scheduled runs. Since Scheduled Queues cannot be triggered through the API these jobs have not and should not be added in a queue.

17. System Applications

External apps are applications developed outside of the DHIS2 core development team. These apps use the DHIS2 Application Programming Interface (API) to interact with the platform and extend its functionality.

17.1 DxPulse Training App



The original training application has been replicated, the branding aligned to DxPulse and content developed and integrated into the database to support users in self-paced learning on specific topics through instructional videos.

The table below provides an overview of the training videos available within the app. The configuration of this app is contained in the datastore, and the videos are packaged with the installation of the app.

| Name of Training Tutorial | Description |
|--|--|
| Dx Pulse Input template | Data input template demonstration |
| Dx Pulse Navigate data import tutorial | Data import and import app demonstration |
| Dx Pulse Filter | Exploring the functionality of the filter and filter options |
| Dx Pulse Dashboards | This section covers a tutorial on the General Summary, Welcome and Data Management pages of the application. |
| Dx Pulse Maps | This section shows how to view data in a map. It shows how different maps can be manipulated and some of the features |
| Dx Pulse Strategic Network Design | This section shows visualizations and maps related to Strategic Network Design and covers Capacity, Utilization, Historic Testing and Demand |
| Dx Pulse Network Performance | This section shows visualizations and maps related to Network Performance and covers Quality and Human Resources |
| Dx Pulse Reports | This section has various reports which can be visualized or downloaded |
| Dx Pulse What-if Scenarios | This section has the start of the ability to plan device capacity, referral paths and network optimization. Currently it allows you to view what the result of a percentage increase in testing would be on the test demand. |

17.2 DxPulse DNO App



The DxPulse DNO App is deployed as a DHIS2 custom app in the DxPulse instance. Standard practices that govern the deployment and maintenance of DHIS2 custom apps also apply to the DxPulse DNO App. The DxPulse DNO App is packed into a zip file and uploaded to the host DHIS2 instance via the App Management tool. Once successfully installed in DHIS2, the app will be displayed in the Custom Apps section in the App Management tool

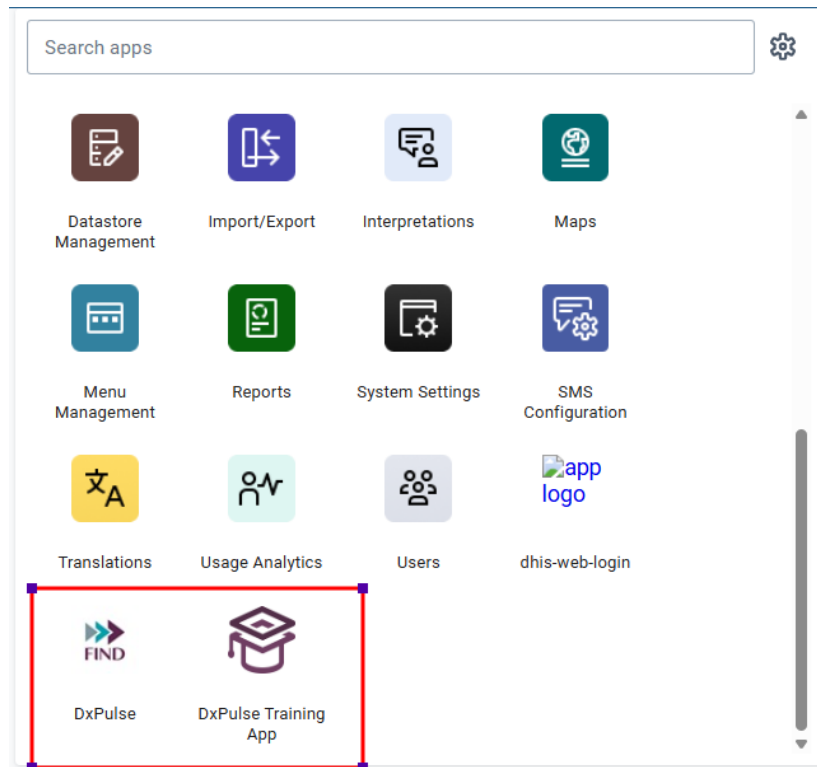


Figure 4: FIND apps

A key requirement in successfully deploying a DHIS2 web app is to ensure the presence of the manifest file in the root folder of the web app. The absence of this file will prevent the installation of the web app in DHIS2. The manifest.webapp file is key for version control of the web app as part deployment of newer features of the app. A sample of this manifest.webapp is shown below in Fig 1.2. A key dependency of the manifest.webapp file is the presence of icon files (pictures) in the paths listed in the icons section.

```
manifest.webapp X
manifest.webapp
1  {
2    "version": "1.0.37",
3    "name": "DxPulse",
4    "description": "Find DxPulse",
5    "launch_path": "index.html",
6    "appType": "APP",
7    "icons": {
8      "16": "assets/images/icon-16.jpg",
9      "48": "assets/images/icon-48.jpg",
10     "128": "assets/images/icon-128.jpg"
11   },
12   "developer": {
13     "name": "HISP South Africa",
14     "url": "http://www.hisp.org/"
15   },
16   "default_locale": "en",
17   "activities": {
18     "dhis": {
19       "href": "../..../"
20     }
21   }
22 }
23
```

Figure 5: Manifest.webapp sample

17.3 Installation of the DxPulse Instance as well as the DxPulse Training and DxPulse DNO apps

A blank DxPulse instance with the configurations can be obtained from HISP-SA by sending a mail to info@hisp.org. This will include all the metadata as well as the training videos.

There are 2 main applications to install for the DxPulse project.

The DxPulse applications have not yet been approved for loading on the DHIS2 app hub. Therefore, they can be obtained from FIND.

1. DxPulse DNO app
2. DxPulse training app



The DxPulse Diagnostic Optimization App should, by default, be configured as the landing page app in DHIS2. This setting is important to ensure the app is easily accessible by end users. This setting is configured under: System Settings -> Appearance -> Start Page.

However, if this app is not suitable as the landing page for all users in a country HMIS alternative apps can be used to define the landing (home) page app for different user groups or to teach users to navigate to and open the FIND application.

The process to [install DHIS2 apps](#) can be found in the DHIS2 documentation.

18. Dashboards



Dashboards configured in the DHIS are critical to the functioning of the FIND DNO application as the application reads directly from the visualizations on the dashboards therefore, these dashboards should be installed and the visualizations should not be changed other than perhaps reviewing the periods for existing data and the period on the respective visualizations on the dashboard and changing those accordingly for data to populate on the dashboard.

The following table shows how different sections of the app is linked to dashboards.

| DNO app | DHIS Dashboard |
|---|--------------------------|
| General Summary > General Dashboard | General Dashboard |
| General Summary > Historical Demand | Historical Demand |
| Data Management > Thresholds and Alerts | Thresholds and Alerts |
| Strategic network design > Capacity | SND - Capacity |
| Strategic network design > Utilization | SND - Utilization |
| Strategic network design > Historical Testing | SND – Historical Testing |
| Strategic network design > Demand | SND - Demand |
| Network Performance > Quality | NP - Quality |
| Network Performance > Human Resources | NP – Human Resources |
| Reports | Reports |
| What if scenarios | What-if scenarios |

Note again that there is a category combination called DNO with 2 options – baseline and scenario and users should pay attention to what data is being viewed and filter only for the correct option in favorites. Baseline data is data that is collected from actual activities and scenario is for predictions.