

Interoperability Guide for Indicator Data Reporting

*Automation of Indicator data
reporting from OpenMRS to
DHIS 2*

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry.

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Introduction

Health Information systems (HIS) are critical for managing health information at all levels for decision making on individual patients or the population. Different systems are used for patient care, disease surveillance, and monitoring services and performance. To get a complete picture of individuals' health status or for monitoring and evaluation, information or data from different systems are combined for analysis. This can be achieved by ensuring that systems managing health information at the patient or aggregate level are interoperable. Interoperability is the ability to exchange data between disparate health information technology systems. Interoperability of health information systems is fundamental to accomplish health care goals through the use of data and information.

This document was developed as a step-by-step guide on how to automate exchange of aggregate data from OpenMRS, an electronic medical records system (EMR), and DHIS 2, which is an aggregate data system. The guide documents the process of transmitting indicator data from OpenMRS to DHIS 2 which was set up at US Centers for Disease Control and Prevention (CDC), Public Health Informatics Research Laboratory, to demonstrate interoperability for indicator reporting [1].

While setting up the demonstration project, we reached out to groups and people who had previously worked on similar projects to get information on what works. Some sections and images in this guide are based on a document that was shared from an OpenMRS to DHIS 2 interoperability demonstration project in the Philippines [2]. This guide has been enhanced to create a step-by-step process to achieving aggregate data reporting in DHIS 2 using OpenMRS data.

Ubuntu 12.04 was used for the demonstration, and so most instructions and commands are based on this operating system. The same process was used to implement interoperability for the two systems on CentOS 5.8. This guide can also be used to guide interoperability setup between OpenMRS and DHIS 2 deployed in Windows server OS.

Most configurations and instructions in this guide assume that the two applications (OpenMRS and DHIS 2) are already deployed and running. Before initiating indicator data exchange between these two

systems in a production environment, we recommend that you use a test environment that is similar to the production environment to make sure that all issues that may affect normal production operations in your setting or implementation are fixed. We also recommend that you work in collaboration with system administrator of both systems during testing.

Requirements

Server infrastructure

- A running server (preferably Linux based) with
 - MySQL
 - Apache Tomcat server
 - PostgreSQL

Note: Although both OpenMRS and DHIS 2 support both MySQL and PostgreSQL, OpenMRS is most thoroughly tested on MySQL and DHIS 2 is most thoroughly tested on PostgreSQL. In the production environment, each application would normally run on its own server along with its associated database, and this is the setup used for demonstration purposes. Additional requirements for deploying the applications can be obtained from DHIS 2 and OpenMRS implementation guides [3, 4].

Applications used

- OpenMRS version 1.9
- DHIS 2 version 2.12
- DHIS 2 reporting module (dhisreport-1.1-SNAPSHOT.omod). The module code is available at: <https://github.com/hispindia/dhisreport>.

Skills/knowledge required

- Familiarity with OpenMRS concept dictionary
- Some knowledge of PostgreSQL and MySQL databases
- MySQL database querying skills
- Compiling OpenMRS module code
- Software installation and configuration
- Indicator reporting

Other requirements

- DHIS 2 implementation guide (For new DHIS 2 instance implementation)
- OpenMRS step-by-step implementation guide for implementers (For new OpenMRS instance implementation)
- OpenMRS demo data for testing or demonstration purposes (optional)
- Internet connectivity, to access instructions for deploying the applications
- SQL editor that is compatible with the OpenMRS database platform, such as MySQL Workbench, phpMyAdmin, etc.

Applications deployment

DHIS 2

Deploy DHIS 2 using the instructions in the [DHIS 2 implementation guide](#) [3]. This guide is available in DHIS 2 website (www.DHIS 2.org). Select server set-up option during DHIS 2 installation if you plan to use the DHIS 2 instance over time. This option ensures that the configurations made are maintained in the database.

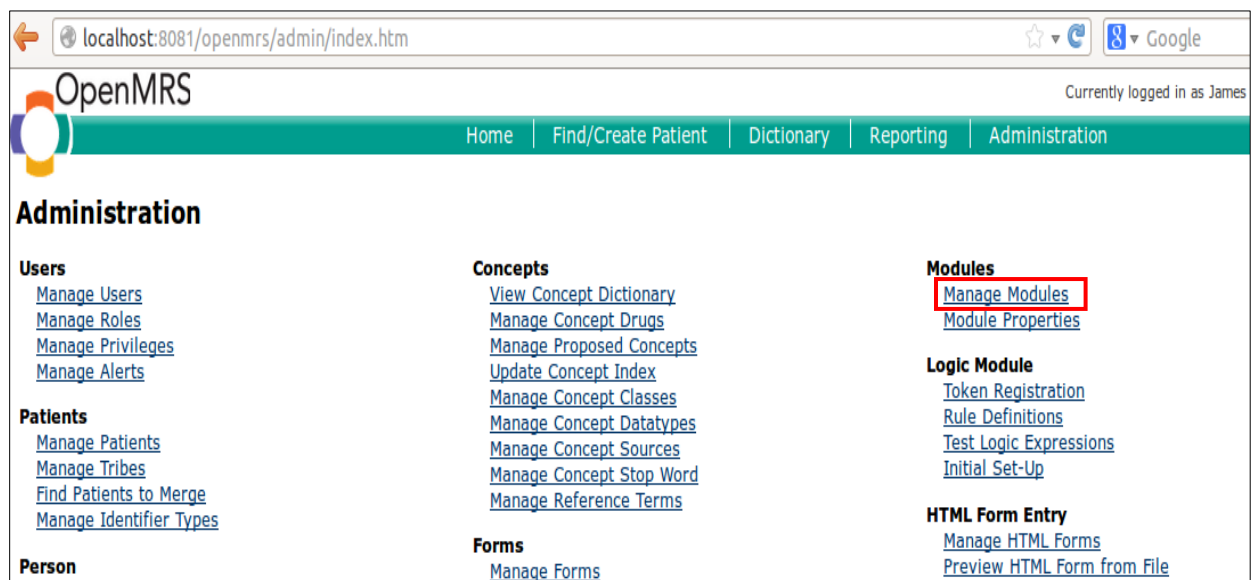
OpenMRS

Deploy OpenMRS using the instructions on [OpenMRS wiki](#) [4]. If the guide is used to deploy OpenMRS for demonstration purposes, add OpenMRS [demo data](#) (preferably with 5,000 patients and 50,000 observations) to the database [5]. This is an anonymized dataset available for OpenMRS.

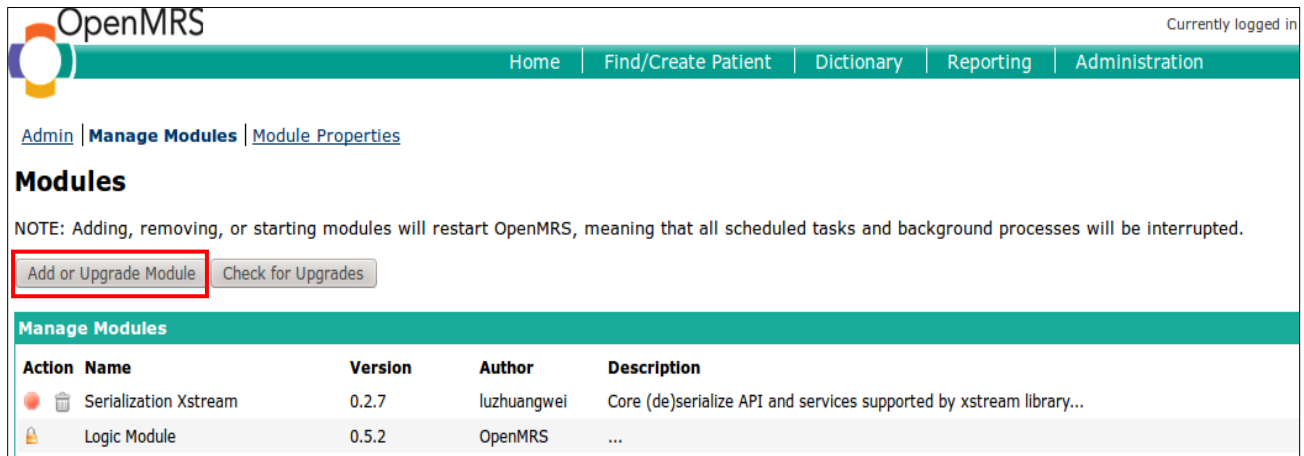
Note: It is necessary to increase Tomcat memory allocation from its defaults to avoid out of memory errors, especially when running reports. Please follow instructions on troubleshooting memory errors.

Installing the DHIS 2 reporting module

1. Make sure the following are in place:
 - a. A running instance of OpenMRS
 - b. DHIS 2 reporting module file (dhisreport-1.1-SNAPSHOT.omod)
 - c. Access to OpenMRS administration privileges
2. Login to OpenMRS and open the Administration page by clicking on **Administration** tab.
3. Select **Manage Modules** link.

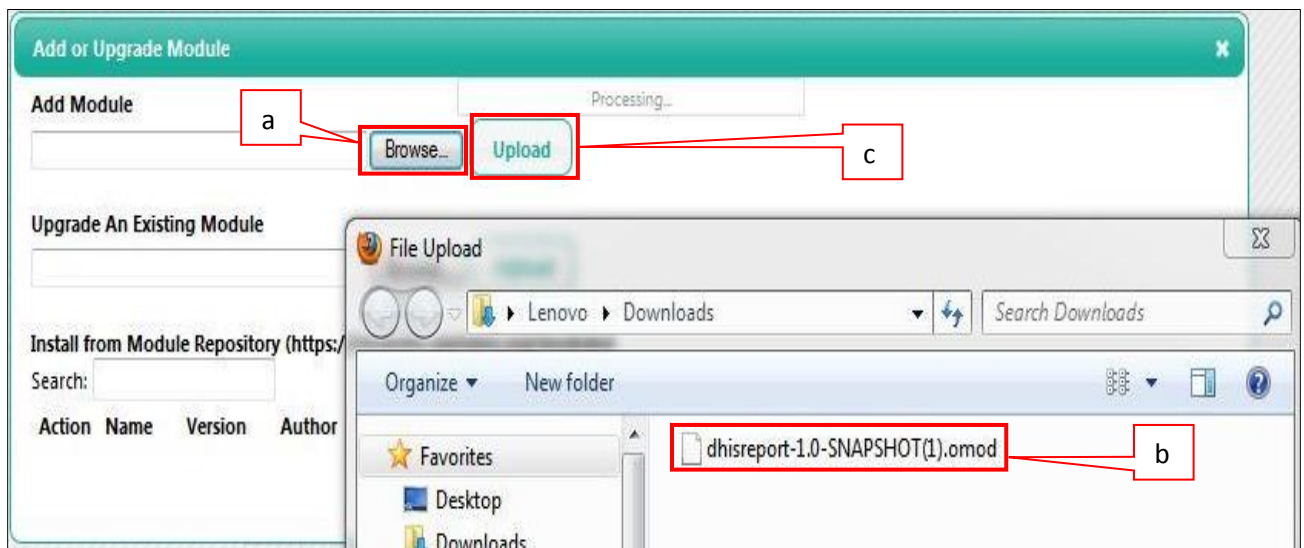


4. On Manage Modules page, Click **Add or Upgrade Module** button.



A dialog box for adding or upgrading module will open.

5. Upload DHIS 2 reporting module into OpenMRS following the steps below.
 - a) Click **Browse...** button under the Add Module title.
 - b) Browse to the folder that contain the module and select the **dhisreport-1.0-SNAPSHOT.omod** file.
 - c) Click **Upload** button to add the module to OpenMRS.



6. Once DHIS 2 Reporting Module is uploaded, it will appear on the Manage Modules page.

[Admin](#) | [Manage Modules](#) | [Module Properties](#)

Modules

NOTE: Adding, removing, or starting modules will restart OpenMRS, meaning that all scheduled tasks and background processes will be affected.

[Add or Upgrade Module](#) [Check for Upgrades](#)

Action	Name	Version	Author	Description
	Serialization Xstream	0.2.7	luzhuangwei	Core (de)serialize API and services supported by xstream library...
	Logic Module	0.5.2	OpenMRS	...
	Reporting	0.7.2.2	Partners In Health	The Reporting Module provides a user interface for defining and managing core object dimensions, and report designs. The module also provides...
	HTML Form Entry	2.0	Darius Jazayeri	FormEntry in-webapp, using HTML forms...
	DHIS2 Reporting Module	1.0-SNAPSHOT	Bob Jolliffe et al.	Posts aggregate reports to dhis2 based on dataelements bound to sql queries...
	SDMX-HD Integration Module	0.7.0-SNAPSHOT	Jembi, PIH	Allows SDMX-HD reports to be generated from SDMX-HD Data Set Definitions...
	HTML Widgets	1.6.4	Partners In Health	HTML Form widget library...

7. When you go back to the Administration page, you will be able to see the DHIS 2 Reporting Module link.

OpenMRS Currently logged in as J

[Home](#) | [Find/Create Patient](#) | [Dictionary](#) | [Reporting](#) | [Administration](#)

Administration

Users

- [Manage Users](#)
- [Manage Roles](#)
- [Manage Privileges](#)
- [Manage Alerts](#)

Patients

- [Manage Patients](#)
- [Find Patients to Merge](#)
- [Manage Identifier Types](#)
- [Manage Patient Identifier Sources](#)
- [Auto-Generation Options](#)
- [View Log Entries](#)

Person

- [Manage Persons](#)
- [Manage Relationship Types](#)
- [Manage Person Attribute Types](#)

Visits

- [Manage Visit Types](#)
- [Manage Visit Attribute Types](#)
- [Configure Visits](#)

Encounters

- [Manage Encounters](#)
- [Manage Encounter Types](#)
- [Manage Encounter Roles](#)

Providers

- [Manage Providers](#)
- [Manage Provider Attribute Types](#)

Locations

- [Manage Locations](#)

Concepts

- [View Concept Dictionary](#)
- [Manage Concept Drugs](#)
- [Manage Proposed Concepts](#)
- [Update Concept Index](#)
- [Manage Concept Classes](#)
- [Manage Concept Datatypes](#)
- [Manage Concept Sources](#)
- [Manage Concept Stop Word](#)
- [Manage Reference Terms](#)

Forms

- [Manage Forms](#)
- [Manage Fields](#)
- [Manage Field Types](#)
- [Merge Duplicate Fields](#)

HL7 Messages

- [Manage HL7 Sources](#)
- [Manage Queued Messages](#)
- [Manage Held Messages](#)
- [Manage HL7 Errors](#)
- [Manage HL7 Archives](#)
- [Migrate HL7 Archives](#)

Maintenance

- [Set Implementation Id](#)
- [System Information](#)
- [View Quick Reports](#)
- [Settings](#)
- [Advanced Settings](#)
- [View Server Log](#)
- [View Database Changes](#)
- [Manage Locales And Themes](#)
- [View Logged In Users](#)

Modules

- [Manage Modules](#)
- [Module Properties](#)

Logic Module

- [Token Registration](#)
- [Rule Definitions](#)
- [Test Logic Expressions](#)
- [Initial Set-Up](#)

ID Generation

- [Manage Patient Identifier Sources](#)
- [Auto-Generation Options](#)
- [View Log Entries](#)

Module Distro Management

- [Module Distro Management](#)

Calculation Module

- [Manage Calculation Registrations](#)

Metadata Mapping

- [Configure *required*](#)

HTML Form Entry

- [Manage HTML Forms](#)
- [Preview HTML Form from File](#)

REST Web Services

- [Settings](#)
- [Test](#)
- [Help](#)

DHIS2 Reporting Module

- [DHIS Reporting Home](#)
- [Manage module](#)

DHIS 2 Reporting Module features

This module has four main features.

- Import/Export report definitions
- Configure DHIS 2 connections
- Reports
- Synchronize reports

To view these features click the **Manage module** link under the DHIS 2 Reporting Module on the administration page. This will open DHIS 2 reporting module page.

OpenMRS

Home | Find/Create Patient | Dictionary

Admin | Manage module | Manage Reports

DHIS2 Reporting Module

Action	Link
Import/Export report definitions	Link
Configure DHIS2 connection	Link
Reports	Link
Synchronize Reports	Link

Each feature has a [link](#) associated with its function.

Import/Export report definitions - to upload the XML file to create the report definition.

Configure DHIS2 connection - to configure connection between OpenMRS and DHIS 2 server.

Reports link - to access available reports that can be sent to DHIS 2.

Synchronize Reports – to update reporting template with DHIS 2 instance

NOTE: The module will only display reports whose definitions have been uploaded in the XML file using Import/Export report definitions link.

OpenMRS to DHIS 2 interoperability process

To send aggregate data from OpenMRS to DHIS 2, there a number of steps to follow to successfully exchange data. These steps are carried out in OpenMRS server and DHIS 2 server, and some are outside the two applications. Figure 1 show the interoperability process flow developed when setting up automation of indicator data reporting from OpenMRS to DHIS 2.

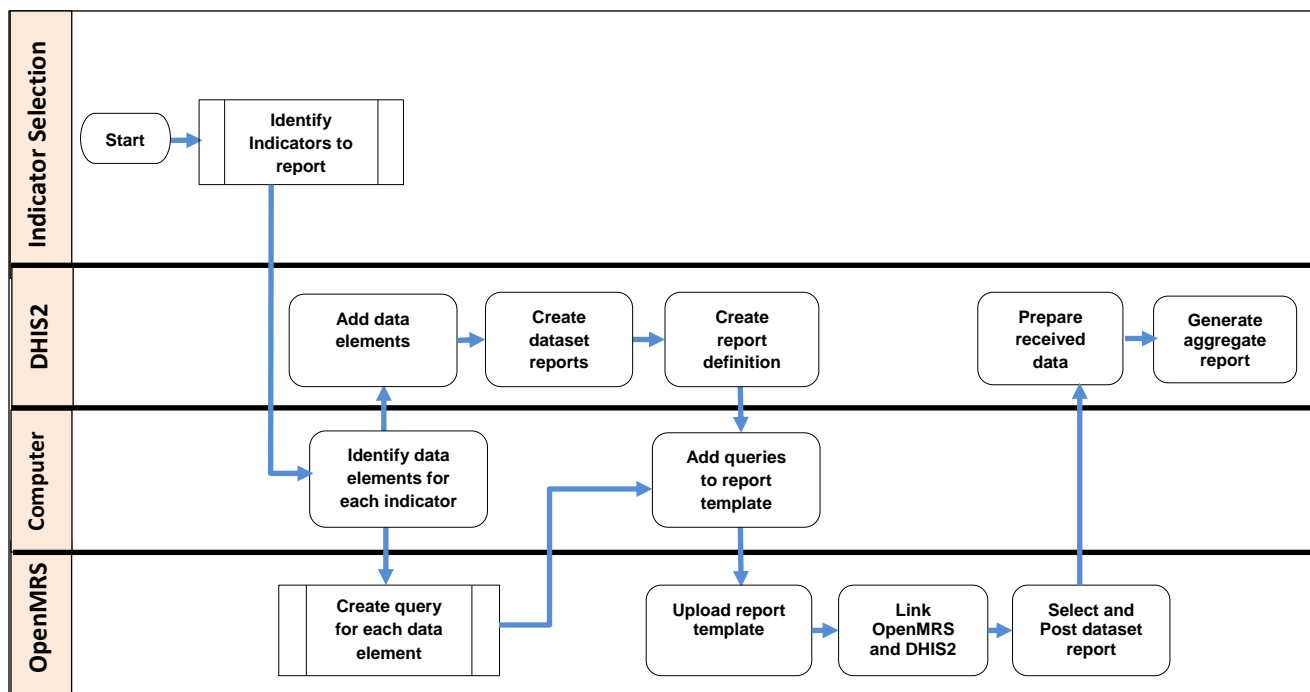


Figure 1: OpenMRS to DHIS2 interoperability process flow diagram

Identify indicators for the exchange

This is the first and key step in achieving interoperability between any two systems, as it helps answer the question, “What data are we exchanging?” Later it helps to measure whether we have successfully exchanged data between the two systems.

When developing this guide, the following indicators based on PEPFAR Next Generation indicators (NGI) [6] were used to demonstrate interoperability between OpenMRS and DHIS 2.

- Number of patients on ARVs
- Number of patients with HIV-positive result
- Number of patients receiving one care service
- Number of HIV patients receiving clinical services
- Number of patients with advanced HIV infection newly enrolled on ART
- Number of patients with advanced HIV infection receiving ART
- Infants born to HIV-positive mothers (exposed)
- Number of HIV-positive persons receiving cotrimoxazole prophylaxis

OpenMRS demo (mock) data was used for the demonstration. Some indicators were modified for testing purposes and based on the data available. Data elements for these indicators are generated from OpenMRS using DHIS reporting module and automatically sent to DHIS 2.

Create queries for each indicator data

Once the indicators to use are identified, review each indicator to identify the concepts in OpenMRS that will be used to generate data. In production environment (real setting), these are the indicators that are reported to the Ministry of Health or funders.

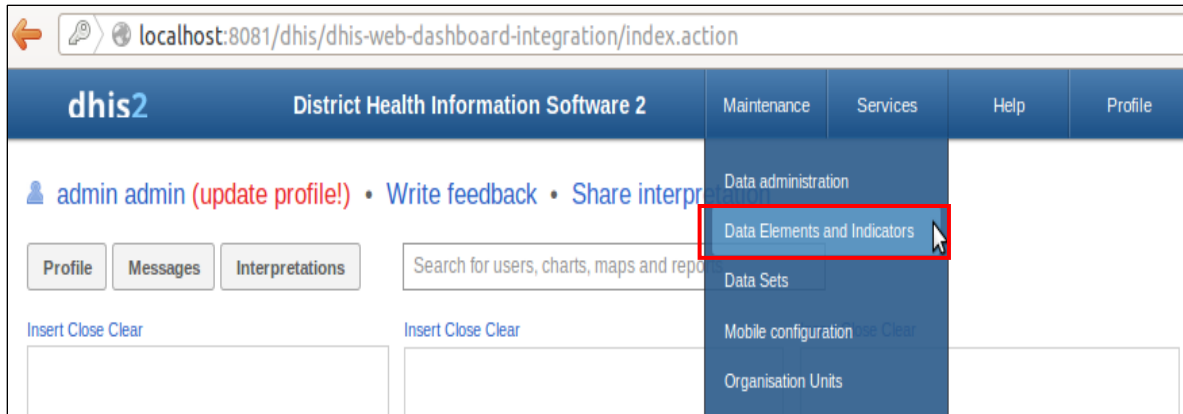
Once the concepts and their values have been identified, create SQL statements from the OpenMRS database using an SQL editor and test each statement to make sure that it is correct.

DHIS 2 configuration

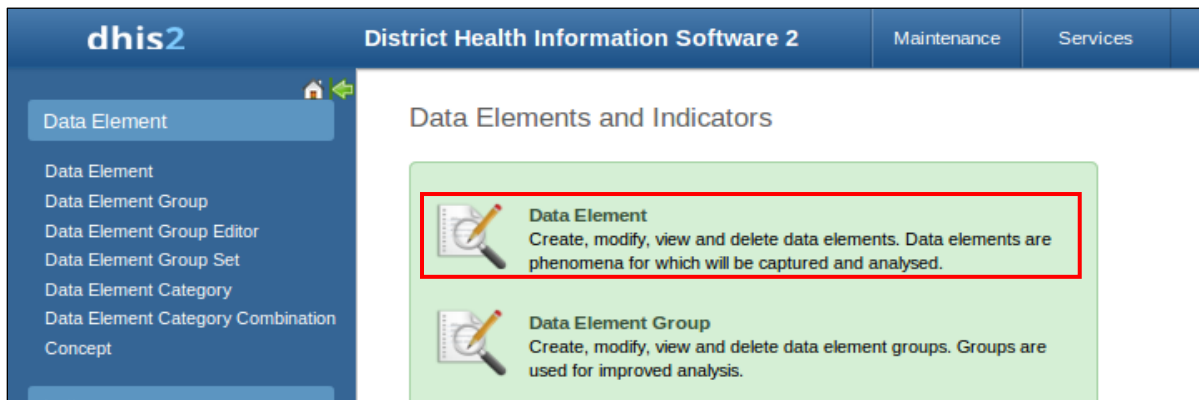
Log in to DHIS 2 and make sure that there is an organization unit in DHIS 2 that matches a location in OpenMRS.

Step 1: Add data elements into DHIS 2.

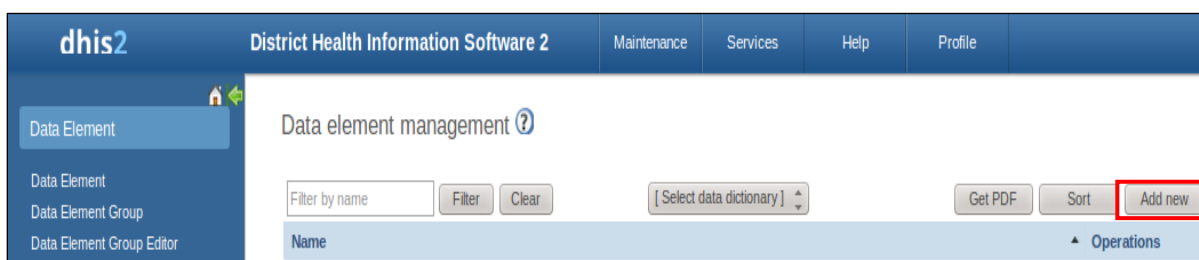
1. On DHIS 2 home page, move the cursor to the **Maintenance** tab and scroll through the dropdown list to select **Data Elements and Indicators** as shown in the figure below.



2. Data Elements and Indicators page will be displayed. Click on **Data Element** to open data element management page.



3. On the Data Element Management page, click on **Add New** to add a data element.



4. On Create New Data Element page, fill in details on the new data element then click **Add**. This will save the data element in DHIS 2.

dhis2 District Health Information Software 2 Maintenance Services

Create new data element

Details

Name *

Short name *

Code

Description

Form name

Domain Type *

Value Type *

Number type

Aggregation operator *

Store Zero Data Value

URL

Combination of categories *

Aggregation levels

Option set

Legend set

Add

5. Data elements created will be displayed in DHIS 2 Data Element Management page.

dhis2 District Health Information Software 2 Maintenance Services Help Profile

Data element management ?

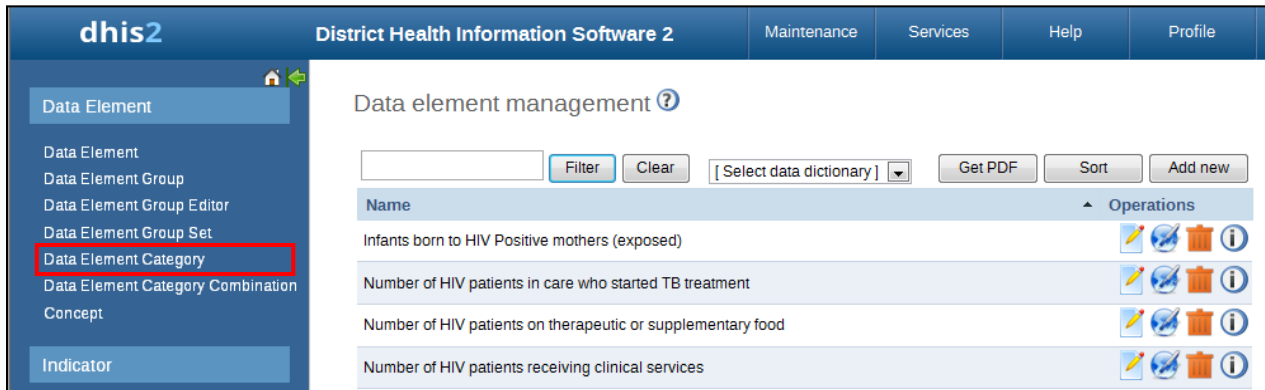
[Select data dictionary]

Name	Operations
Infants born to HIV Positive mothers (exposed)	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of HIV patients in care who started TB treatment	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of HIV patients on therapeutic or supplementary food	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of HIV patients receiving clinical services	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of HIV patients screened for TB in HIV care	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of HIV-positive persons receiving cotrimoxazole prophylaxis	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of individuals who received Testing and counseling services for HIV	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of male clients circumcised	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of patients on ARVs	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>
Number of patients receiving one care service	<input type="button" value="Edit"/> <input type="button" value="Refresh"/> <input type="button" value="Delete"/> <input type="button" value="Info"/>

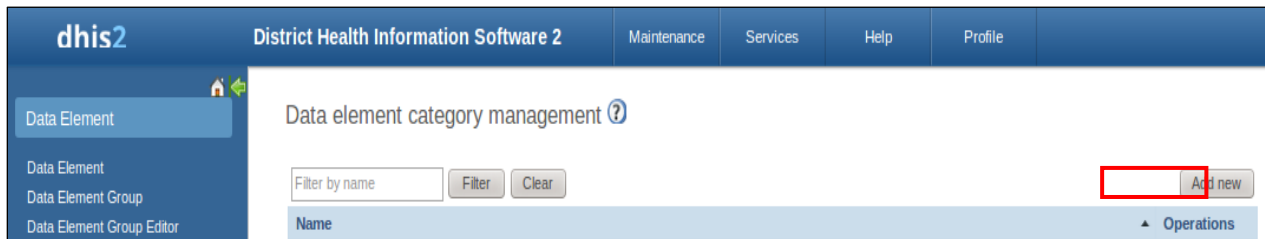
Step 2: Add data element category and data element category combination

Data element category and data element category combination enable disaggregation of data elements in DHIS 2. The data can be disaggregated by gender, age, or another category, depending on data needs.

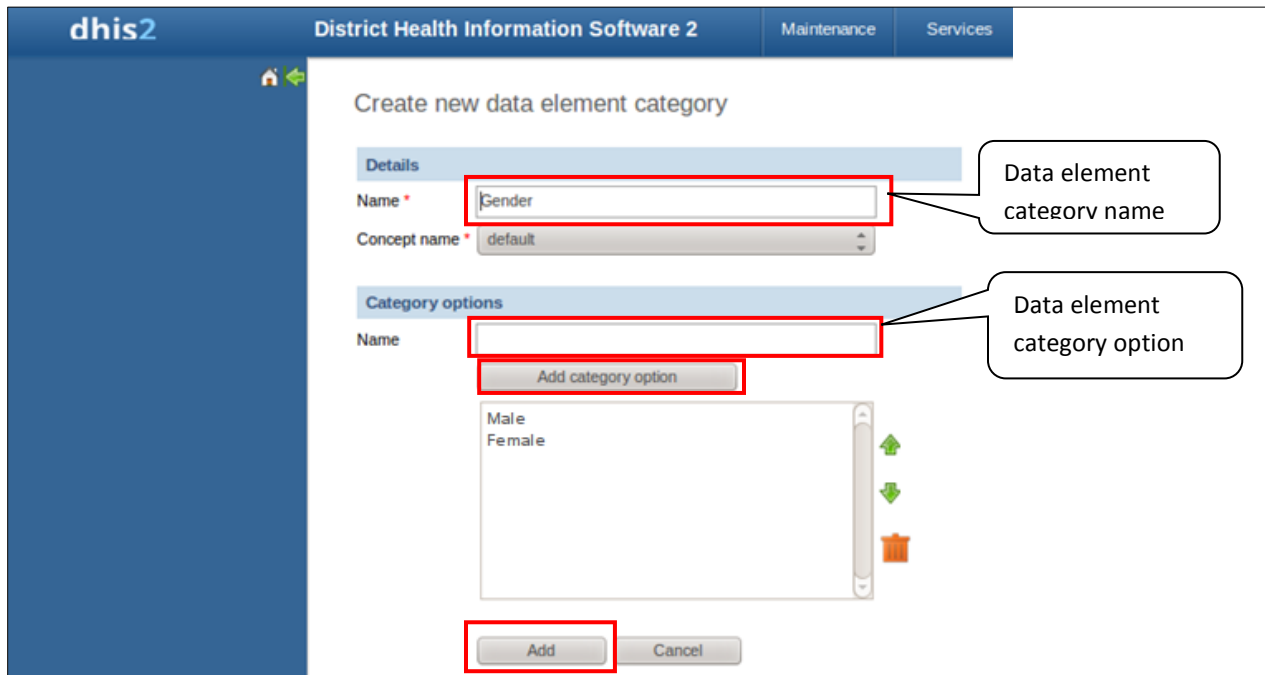
1. To add data element categories, click on **Data Element Category** link.



2. This will open Data Element Category Management page.



3. Click on **Add New** button to create a new data element category.

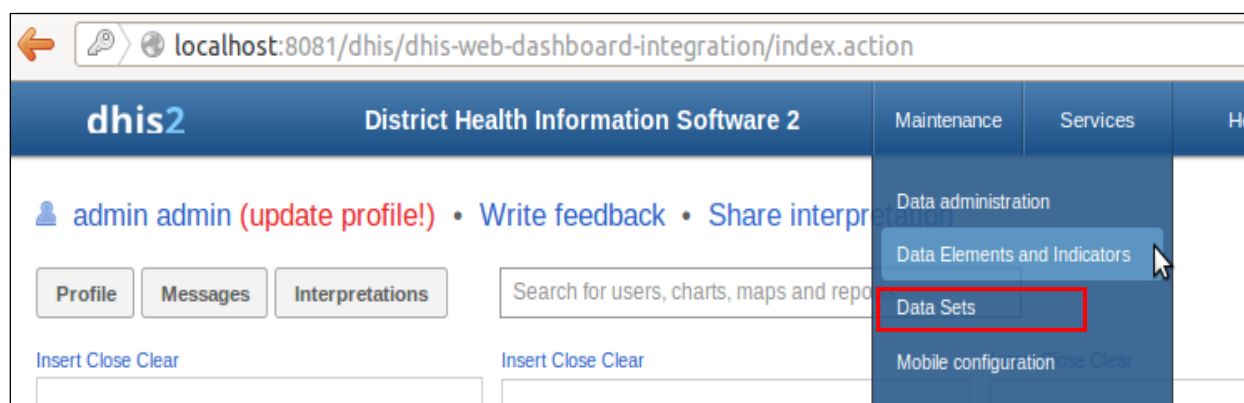


4. Fill in the details on Create New Data Element Category page following these steps:
 - a) Under details section, enter data element category name.

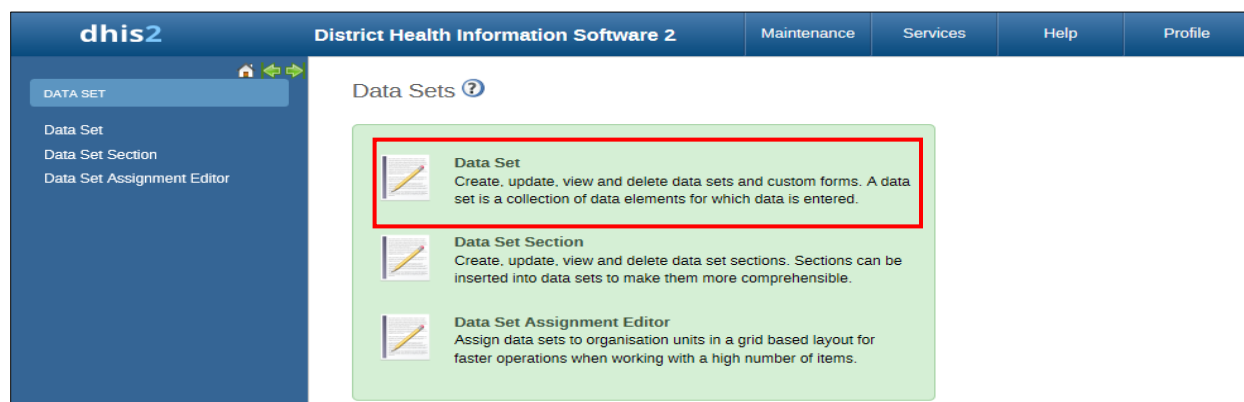
- b) Under category options, enter name of first option, then click **Add Category Option** button. The option will be added on the option box below the Add Category Option button.
 - c) To enter another option on this data element category, enter the option name and click **Add Category Option** button
 - d) Repeat instruction **c** above until all options are entered.
 - e) Then click on **Add** button to save the data element category.
5. Repeat steps 3 and 4 to create all data element categories needed for the indicators identified.

Step 3: Create a report dataset

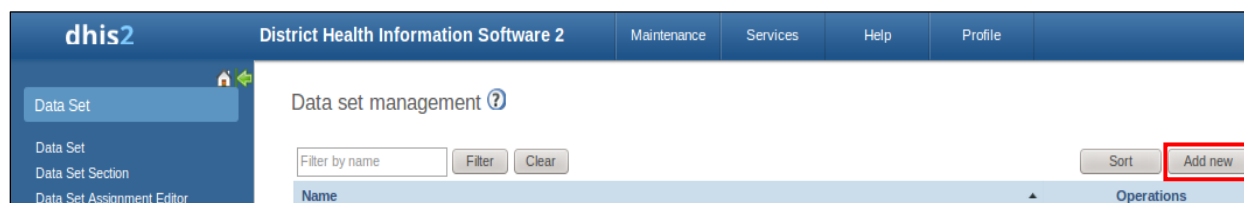
1. On DHIS 2 home page, move the cursor over maintenance tab and scroll down the dropdown list to select **Data sets**.



2. On the Data Sets page, click on **Data Set** to open Data Set Management page.



3. On the Data Set Management page, click on **Add new** button to create a data set.



4. On the Add Data Set page, enter data set details and select data elements or indicators for the data set being created.

The screenshot shows the 'Add data set' form in DHIS2. The form is divided into two main sections: 'Data set details' and 'Form details', both highlighted with a red border. Below these are sections for 'Available data elements' and 'Available indicators', each with a list of items and arrows to move them to 'Selected data elements' and 'Selected indicators' respectively. The 'Save' button is at the bottom.

Data set details:

- Name *
- Short name *
- Code
- Description
- Expiry Days
- Frequency *
- Complete notification recipients
- Send notification to completing user
- Skip aggregation

Form details:

- Allow future periods
- All fields for data elements required
- Complete allowed only if validation passes
- Skip Offline

Available data elements:

- Infants born to HIV Positive mothers (exposed)
- Number of HIV patients in care who started TB treatment
- Number of HIV patients on therapeutic or supplementary food
- Number of HIV patients receiving clinical services
- Number of HIV patients screened for TB in HIV care
- Number of HIV-positive persons receiving cotrimoxazole prophylaxis
- Number of individuals who received Testing and counseling services for HIV
- Number of male clients circumcised
- Number of patients on ARVs
- Number of patients receiving one care service
- Number of patients with advance HIV infection newly enrolled on ART
- Number of patients with advance infection receiving ART
- Number of patients with HIV positive result

Available indicators:

- (Empty list)

To add data elements to the data set created:

- Select the data element under **Available data elements.** section
- Click on > button. This will move the data element to the **Selected data elements** section and it will be available in the data set.

Follow steps **a** and **b** above to add all required data elements to the data set created. Add indicators to the same data set by selecting indicators under **Available indicators** section, then clicking on > button to move it to **Selected indicators** section.

Once all details are filled and the required data elements and /indicators are selected, click **Save** button to create the data set.

IMPORTANT: Code for each dataset is required.

NOTE: A data set can be created for each section of the indicator document. For example, data sets for HIV prevention, HIV treatment, HIV care, etc....

Creating/Customizing the report definitions XML file

Report definition XML template

The report definitions XML file/template handles and formats the data messages that are sent from OpenMRS to DHIS 2. The DHIS 2 report definition XML template has two parts in the following format:

1. XML version part

```
<?xml version="1.0"?>
```

2. Report templates

```
<reportTemplates xmlns:d2="http://dhis2.org/schema/dxf/2.0">  
</reportTemplates>
```

Report definitions XML template sample:

```
<?xml version="1.0"?>  
<reportTemplates xmlns:d2="http://dhis2.org/schema/dxf/2.0">  
  <dataElements>  
    <dataElement uid="<ID>" code="<Code>" name="<name>" type="<Type>" />  
  </dataElements>  
  <disaggregations>  
    <disaggregation uid="<ID>" code="<code>or <ID>" name="<name>" />  
  </disaggregations>  
  <reportTemplate>  
    <name><name></name>  
    <uid><ID></uid>  
    <code><code></code>  
    <periodType><frequency></periodType>  
    <dataValueTemplates>  
      <dataValueTemplate dataElement="<code>" disaggregation="<code>">  
        <annotation>  
          <sql statement to pull data >  
        </annotation>  
      </dataValueTemplate>  
    </dataValueTemplates>  
  </reportTemplate>  
</reportTemplates>
```

The report templates part is divided into three sections:

- Data elements
- Disaggregations
- Report template

Data elements

List all the needed data elements, like “history of diagnosis of hypertension.” There may be several data elements inside the Data Elements section.

Data elements code


```
<dataElements>
  <dataElement uid="<ID>" code="<Code>" name="<name>" type="<Type>" />
</dataElements>
```

Disaggregations

List all the needed category option combos or category combos, like “male_uncategorized_member”; there may be multiple disaggregation tags inside the disaggregations.

Disaggregations sample code

```
<disaggregations>
  <disaggregation uid="<ID>" code="<code>or <ID>" name="<name>" />
</disaggregations>
```

Report template

This section may have multiple entries depending on the number of different types of reports (data sets) that need to be generated.

- name
- uid
- code
- periodType
- dataValueTemplates
 - dataValueTemplate
 - annotation

Report template sample code

```
<reportTemplate>
  <name>PCB Form A2</name>
  <uid>bazOE3Zgw80</uid>
  <code>A2</code>
  <periodType>Monthly</periodType>
  <dataValueTemplates>
    <dataValueTemplate dataElement="HXHPN" disaggregation="Gb0BGTbfg19">
      <annotation>
        select count(distinct p.person_id)
        from person p
        inner join obs o on o.person_id = p.person_id
        where p.voided = 0 and o.voided = 0
        and o.concept_id = 31
        and o.obs_datetime >= :startOfPeriod
        and o.obs_datetime &lt;= :endOfPeriod
        and o.location_id = :locationId
      </annotation>
    </dataValueTemplate>
  </dataValueTemplates>
</reportTemplate>
```

NOTE: Red text on sample code shows entities or attributes that need to be changed depending on the specified data for the DHIS 2 report.

Create report definition template/file

There are two ways that the report definition template can be created from DHIS 2.

- Using curl command (Only tested for Linux operating system)
- Manually

Note: Detailed instructions on creating a report definition template using curl command are in Appendix 1. Instructions for creating the report definition template manually are in Appendix 2.

Using DHIS 2 Reporting Module

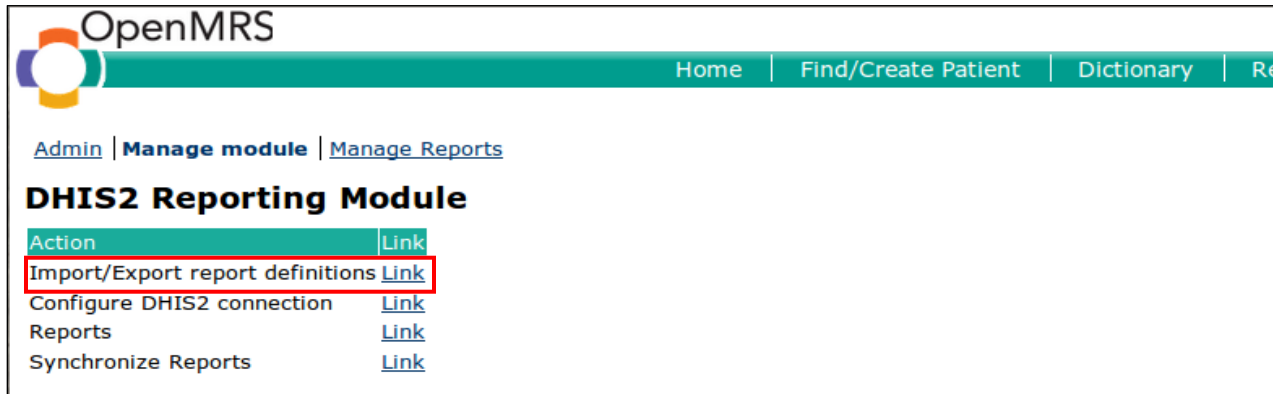
DHIS 2 reporting module features

This module has three features providing interoperability functionality.

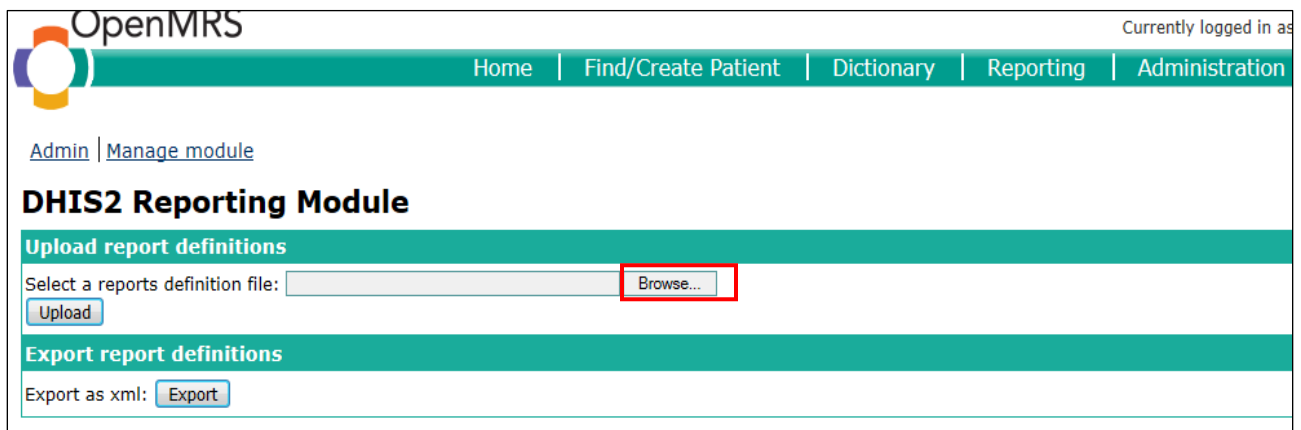
- Import/Export report definitions - to upload the XML file to create the report definition.
- Configure DHIS2 connection - to configure connection between OpenMRS and DHIS 2 server.
- Reports link - to access reports available that can be sent to DHIS 2.

Importing the Report Definitions

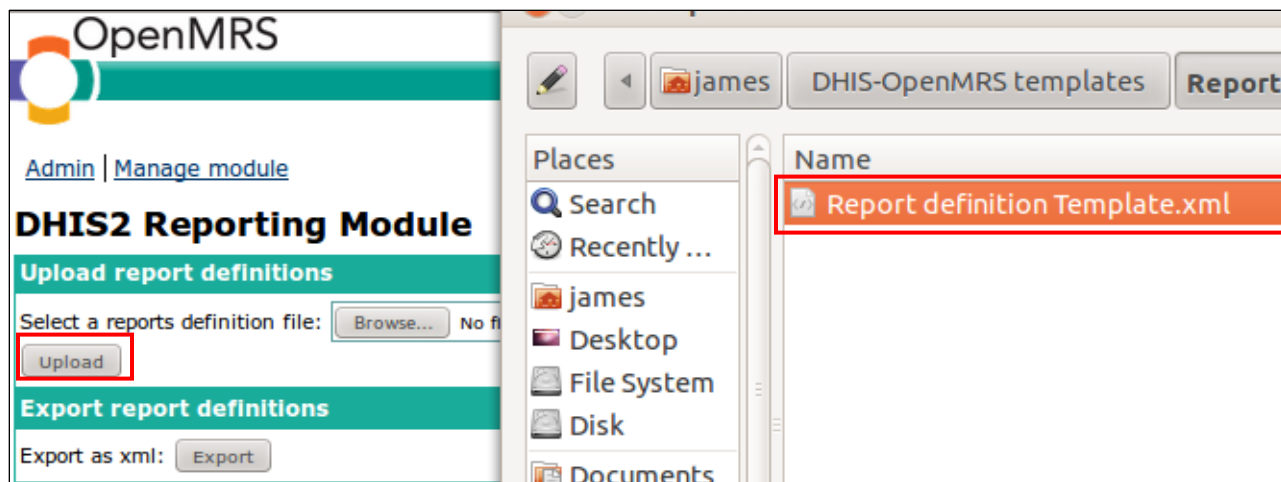
1. Go to OpenMRS administration page and click on **Manage Module** under DHIS2 Reporting Module.
2. Click on the **Import/Export report definitions** [link](#) to open Upload Report Definitions page.



3. Upload the report definition XML file using the steps below
 - a) Click **Browse** button and navigate to the folder where the report definition template was saved.

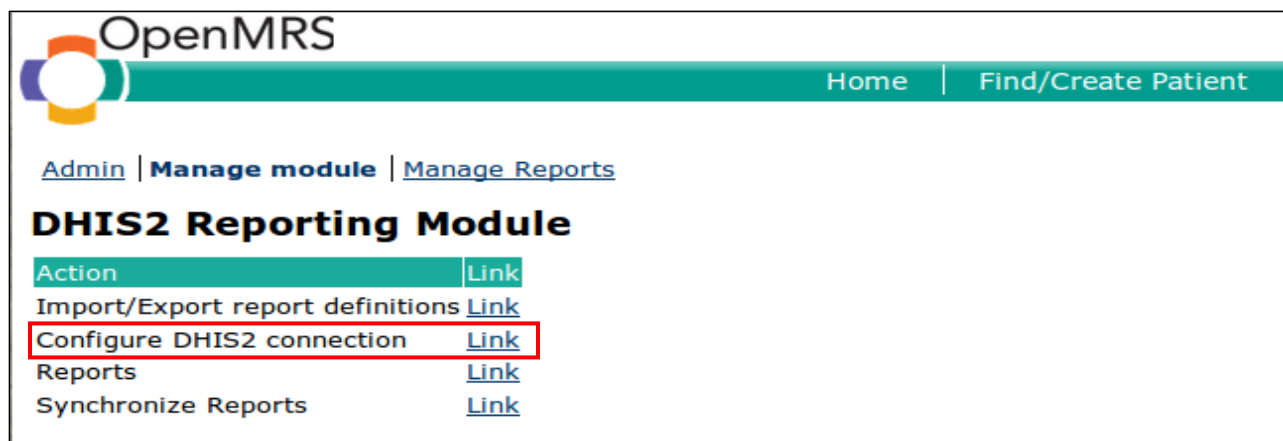


- b) Select the report definition XML file to upload, i.e. report definition templates.xml
- c) Click **Upload** button.



Configuring the DHIS 2 Connection

1. Go to **Manage Module** link under DHIS2 Reporting Module



2. Click the **Configure DHIS2 connection** [link](#).
3. Set the connection to the DHIS 2 server:
 - a. Enter the DHIS 2 URL.
 - b. Enter DHIS 2 username and password.
 - c. Click **Save** button.

[Admin](#) | [Manage module](#)

DHIS2 Reporting Module

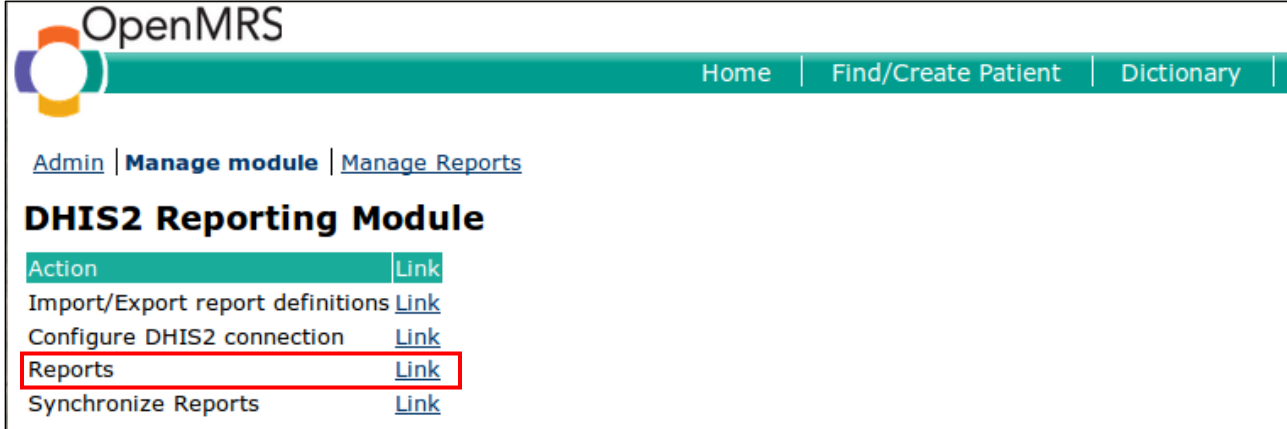
DHIS2 ServerDHIS2 Server

Parameter	Value
Base DHIS2 URL (eg: http://apps.dhis2/demo)	<input type="text" value="http://localhost:8081/dhis"/>
User name	<input type="text" value="admin"/>
Password	<input type="password" value="*****"/>

Report generation

Preview report generated

1. Go to Manage **Module** link under DHIS2 Reporting Module.
2. Click the **Reports** link.



OpenMRS

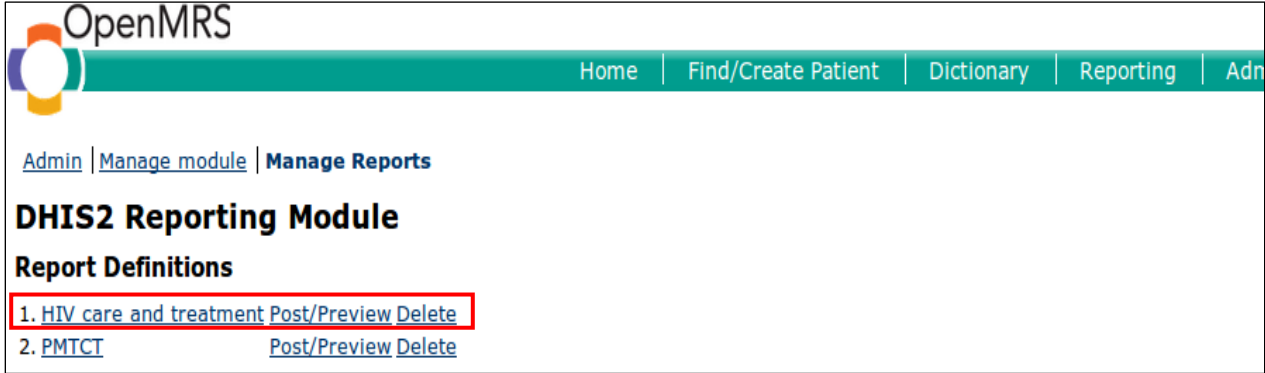
Home | Find/Create Patient | Dictionary

[Admin](#) | [Manage module](#) | [Manage Reports](#)

DHIS2 Reporting Module

Action	Link
Import/Export report definitions	Link
Configure DHIS2 connection	Link
Reports	Link
Synchronize Reports	Link

3. Click to select one of the report definitions link. **HIV care and treatment** definition is used in this example.



OpenMRS

Home | Find/Create Patient | Dictionary | Reporting | Adm

[Admin](#) | [Manage module](#) | [Manage Reports](#)

DHIS2 Reporting Module

Report Definitions

1. HIV care and treatment	Post/Preview Delete
2. PMTCT	Post/Preview Delete

Note: If you follow the steps in “Importing the Report Definitions” with a valid XML file, you should be able to see the link for that particular report form.

4. Fill the parameters of the report to be generated:
 - a) Select a location to generate a report.
 - b) Enter the report date.
 - c) The default action is **Preview**.
 - d) Click **Generate** button to view the report.

OpenMRS Current

Home | Find/Create Patient | Dictionary | Reporting | Administration

[Admin](#) | [Manage module](#) | [Manage Reports](#)

DHIS2 Reporting Module

Report Definition for HIV care and treatment

Location: Chulaimbo Sub-District Hospital

Frequency: Daily Weekly Monthly

Date (e.g 2012-03-01 for month, 2012-W03 for weekly): 2010-Mar

Preview (highlighted with a red box)

Generate

- e) The details and status of the report will be displayed as shown below.

OpenMRS

[Admin](#) | [Manage module](#)

DHIS2 Reporting Module

Report result

DataSet: HIV_1
 OrgUnit: Chulaimbo
 Period: 201003

Data Element: HIV_INCARE, Value: 0
 Data Element: EXP_INF, Value: 0
 Data Element: PTS_ON_COTR, Value: 214
 Data Element: HIV-ADV_INF_ART, Value: 2027
 Data Element: HIV_POS, Value: 11
 Data Element: T_C_SERV, Value: 11
 Data Element: PTS_IN, Value: 0
 Data Element: PTS_ARV, Value: 0

Note: Because preview option was selected, the data will not be posted to DHIS 2 server but will be displayed in OpenMRS for verification.

Mock data was used when developing this guide. Even if some of the names used are real, the data or reports displayed are based on mock data.

Post report to DHIS

1. Go to the DHIS2 Reporting Module. [DHIS2 Reporting Module>Manage module]

2. Click the **Reports** link.

The screenshot shows the OpenMRS interface with the 'DHIS2 Reporting Module' selected. The navigation bar includes 'Home', 'Find/Create Patient', and 'Dictionary'. Below the navigation bar, there are links for 'Admin', 'Manage module', and 'Manage Reports'. The main heading is 'DHIS2 Reporting Module'. Below this, there is a table with two columns: 'Action' and 'Link'. The 'Reports' row is highlighted with a red box, and its 'Link' is also highlighted with a red box.

Action	Link
Import/Export report definitions	Link
Configure DHIS2 connection	Link
Reports	Link
Synchronize Reports	Link

3. Click to select one of the report definition links. For example, **HIV care and treatment** link.

The screenshot shows the OpenMRS interface with the 'DHIS2 Reporting Module' selected. The navigation bar includes 'Home', 'Find/Create Patient', 'Dictionary', and 'Reporting'. Below the navigation bar, there are links for 'Admin', 'Manage module', and 'Manage Reports'. The main heading is 'DHIS2 Reporting Module'. Below this, there is a section titled 'Report Definitions'. A table lists two report definitions: '1. HIV care and treatment' and '2. PMTCT'. The 'Post/Preview' link for 'HIV care and treatment' is highlighted with a red box.

Report Definition	Post/Preview	Delete
1. HIV care and treatment	Post/Preview	Delete
2. PMTCT	Post/Preview	Delete


Note: If you follow the steps in “Importing the Report Definitions” with a valid XML file, you should be able to view the table for that report form.

4. Fill the parameters to generate and post the report to DHIS 2
 - a) Select a location to generate and post report from.
 - b) Enter the report date.
 - c) Change the default action from **Preview** to **Post to DHIS**.

Note: If Post to DHIS option is not available, it means that the connection link to DHIS 2 is not set.

The screenshot shows the OpenMRS interface with the 'DHIS2 Reporting Module' selected. The navigation bar includes 'Home', 'Find/Create Patient', 'Dictionary', 'Reporting', and 'Administration'. Below the navigation bar, there are links for 'Admin', 'Manage module', and 'Manage Reports'. The main heading is 'DHIS2 Reporting Module'. Below this, there is a section titled 'Report Definition for HIV care and treatment'. The form includes a 'Location' dropdown menu set to 'Chulaimbo Sub-District Hospital', a 'Frequency' section with radio buttons for 'Daily', 'Weekly', and 'Monthly' (with 'Monthly' selected), a 'Date' input field set to '2010-Mar', a 'Post to DHIS' dropdown menu highlighted with a red box, and a 'Generate' button.

- d) Click **Generate** button to view the report.
- e) The details and status of the report will be displayed as shown below if you successfully imported the XML file.



OpenMRS

[Admin](#) | [Manage module](#)

DHIS2 Reporting Module

Report result


DataSet: HIV_1
 OrgUnit: Chulaimbo
 Period: 201003

Data Element: HIV_IN CARE, Value: 0
 Data Element: EXP_INF, Value: 0
 Data Element: PTS_ON_COTR, Value: 214
 Data Element: HIV-ADV_INF_ART, Value: 2027
 Data Element: HIV_POS, Value: 11
 Data Element: T_C_SERV, Value: 11
 Data Element: PTS_IN, Value: 0
 Data Element: PTS_ARV, Value: 0

Status; SUCCESS
 Description: Import process completed successfully
 DataValue count: [imports=8, updates=0, ignores=0]

Posting same report more than once

If the same report is generated and posted again, data value count will show “imports = 0” and “updates=8” to ensure that no double entry/posting happened.



OpenMRS

[Admin](#) | [Manage module](#)

DHIS2 Reporting Module

Report result

DataSet: HIV_1
 OrgUnit: Chulaimbo
 Period: 201003

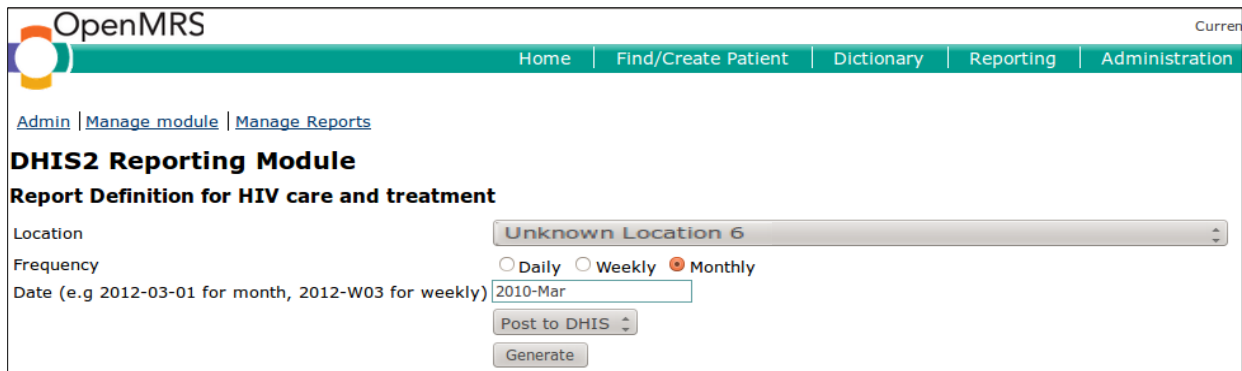
Data Element: HIV_IN CARE, Value: 0
 Data Element: EXP_INF, Value: 0
 Data Element: PTS_ON_COTR, Value: 214
 Data Element: HIV-ADV_INF_ART, Value: 2027
 Data Element: HIV_POS, Value: 11
 Data Element: T_C_SERV, Value: 11
 Data Element: PTS_IN, Value: 0
 Data Element: PTS_ARV, Value: 0

Status; SUCCESS
 Description: Import process completed successfully
 DataValue count: [imports=0, updates=8, ignores=0]

Note: If data was updated after posting the report for the month, the report can be posted again. In this case there will be a non-zero number on data value count for imports and updates.

OpenMRS default location / location does not exist in DHIS 2

If the location selected does not exist in DHIS 2 or the location used is any OpenMRS default location,

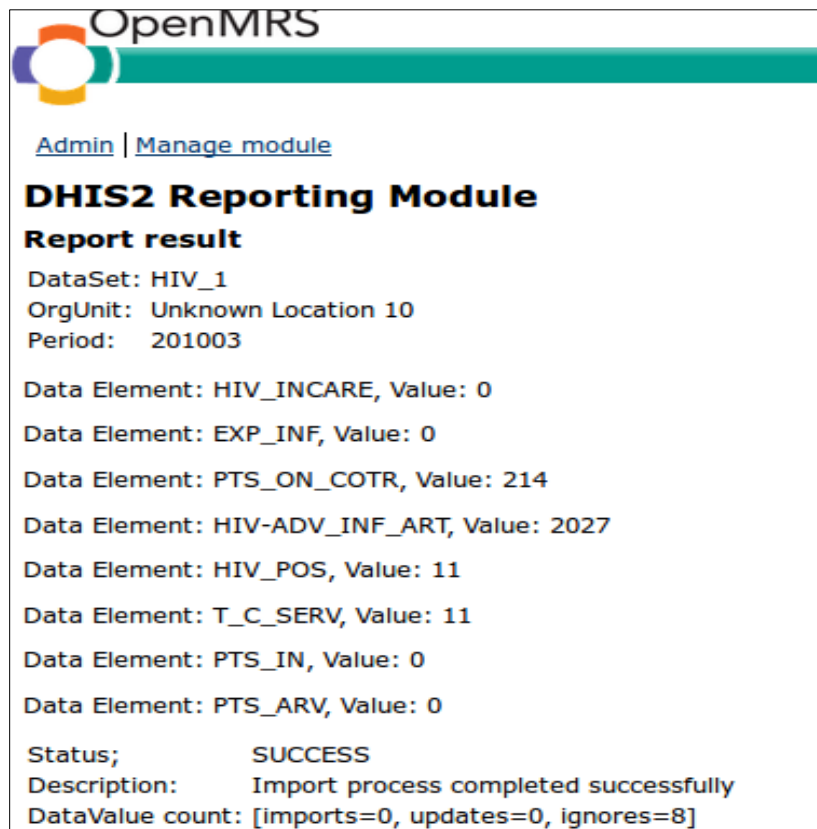


The screenshot shows the OpenMRS Reporting Module interface. At the top, there is a navigation bar with links for Home, Find/Create Patient, Dictionary, Reporting, and Administration. Below this, there are links for Admin, Manage module, and Manage Reports. The main heading is "DHIS2 Reporting Module" followed by "Report Definition for HIV care and treatment". The form includes a "Location" dropdown menu set to "Unknown Location 6", a "Frequency" section with radio buttons for Daily, Weekly, and Monthly (Monthly is selected), a "Date" input field with "2010-Mar", a "Post to DHIS" dropdown menu, and a "Generate" button.

then the OpenMRS database location table should be updated with the correct location name.

For example, if unknown location 6 is selected as shown below, it is possible to preview the report result if data exists for this location, but you will not be able to post the data to DHIS 2.

When you click **Generate** button, data value count will show import =0, updates = 0 and ignores =number of data value counts as shown below.



The screenshot shows the OpenMRS Reporting Module interface displaying the "Report result" for the HIV care and treatment report. The report details are as follows:

- DataSet: HIV_1
- OrgUnit: Unknown Location 10
- Period: 201003
- Data Element: HIV_INCCARE, Value: 0
- Data Element: EXP_INF, Value: 0
- Data Element: PTS_ON_COTR, Value: 214
- Data Element: HIV-ADV_INF_ART, Value: 2027
- Data Element: HIV_POS, Value: 11
- Data Element: T_C_SERV, Value: 11
- Data Element: PTS_IN, Value: 0
- Data Element: PTS_ARV, Value: 0
- Status: SUCCESS
- Description: Import process completed successfully
- DataValue count: [imports=0, updates=0, ignores=8]

No data values sent to DHIS 2

If you post a report to DHIS 2 and receive the report result with no data elements values as shown below, check the report sent to confirm that queries are saved.

The screenshot shows the OpenMRS interface with the following content:

- Header: OpenMRS, Home | Find/Create Patient | Dictionary
- Navigation: [Admin](#) | [Manage module](#) | [Manage Reports](#)
- Section: **DHIS2 Reporting Module**
- Section: **Report result**
- DataSet: PMTCT
- OrgUnit: Eldoret
- Period: 201301
- Status: SUCCESS
- Description: Import process completed successfully
- DataValue count: [imports=0, updates=0, ignores=0]

To check the report:

1. Click **Manage Reports** link to access the reports, and then select the report that was sent and had no data values. In this example, PMTCT report had no data values

The screenshot shows the OpenMRS interface with the following content:

- Header: OpenMRS, Home | Find/Create Patient | Dictionary | Reporting
- Navigation: [Admin](#) | [Manage module](#) | [Manage Reports](#)
- Section: **DHIS2 Reporting Module**
- Section: **Report Definitions**
- 1. [HIV care and treatment](#) [Post/Preview](#) [Delete](#)
- 2. **PMTCT** [Post/Preview](#) [Delete](#)

If the page opened does not have SQL statements as shown in the image below, it means that the queries were not saved.

The screenshot shows the OpenMRS interface with the following content:

- Header: OpenMRS, Home | Find/Create Patient | Dictionary
- Navigation: [Admin](#) | [Manage module](#) | [Manage Reports](#)
- Section: **DHIS2 Reporting Module**
- Section: **Edit Report Definition: PMTCT [PMTCT]**
- Table:

[Data Element]	[Query]	[Action]
<input type="checkbox"/> Number of pregnant women who received ARV for PMTCT		Edit
<input type="checkbox"/> Number of pregnant patients in care		Edit
<input type="checkbox"/> Number of pregnant women tested for HIV		Edit

Click on **Edit** link for each data element to add SQL statement, and then run the report again.

A report definition with queries is shown below.

OpenMRS Currently logged in as James Karande | Log out | My Profile | Help

Home | Find/Create Patient | Dictionary | Reporting | Administration

Admin | Manage module | Manage Reports

DHIS2 Reporting Module

Edit Report Definition: HIV care and treatment [HIV_CARE_TX]

[Data Element]	[Query]	[Action]
<input type="checkbox"/> Number of adults and children with advanced infection who ever started on ART	<pre>select count(distinct p.person_id) from person p inner join obs o on o.person_id = p.person_id where concept_id =1250 and ((YEAR(CURDATE())-YEAR(birthdate))>= 15) and gender = 'M' and o.obs_datetime >= :startOfPeriod and o.obs_datetime <= :endOfPeriod and o.location_id = :locationId</pre>	Edit
<input type="checkbox"/> Number of adults and children with advanced infection who ever started on ART	<pre>select count(distinct p.person_id) from person p inner join obs o on o.person_id = p.person_id where o.concept_id =1250 and ((YEAR(CURDATE())-YEAR(p.birthdate))>= 15) and p.gender = 'F' and o.obs_datetime >= :startOfPeriod and o.obs_datetime <= :endOfPeriod and o.location_id = :locationId</pre>	Edit

Wrong DHIS 2 connection configuration

If the configuration to connect to the DHIS 2 server is wrong, the following error will be displayed when you try to post data to DHIS 2.

An Internal Error has Occurred

org.openmrs.module.dhisreport.api.dhis.Dhis2Exception

Problem accessing Dhis2 server

Consult the [help document](#).
Contact your friendly neighborhood administrator if it cannot be resolved.

[Show stack trace](#)

The following data will be submitted with the report to enable the team to resolve the problem.

- The error message and stack trace
- OpenMRS version
- Application server name and version
- Username of the user currently logged in
- The implementation id of this installation (if defined)
- Names and versions of all installed modules

Generating and viewing data report sent on DHIS 2

To view the data report sent from OpenMRS to DHIS 2, log in to DHIS 2 and run a data mart process.

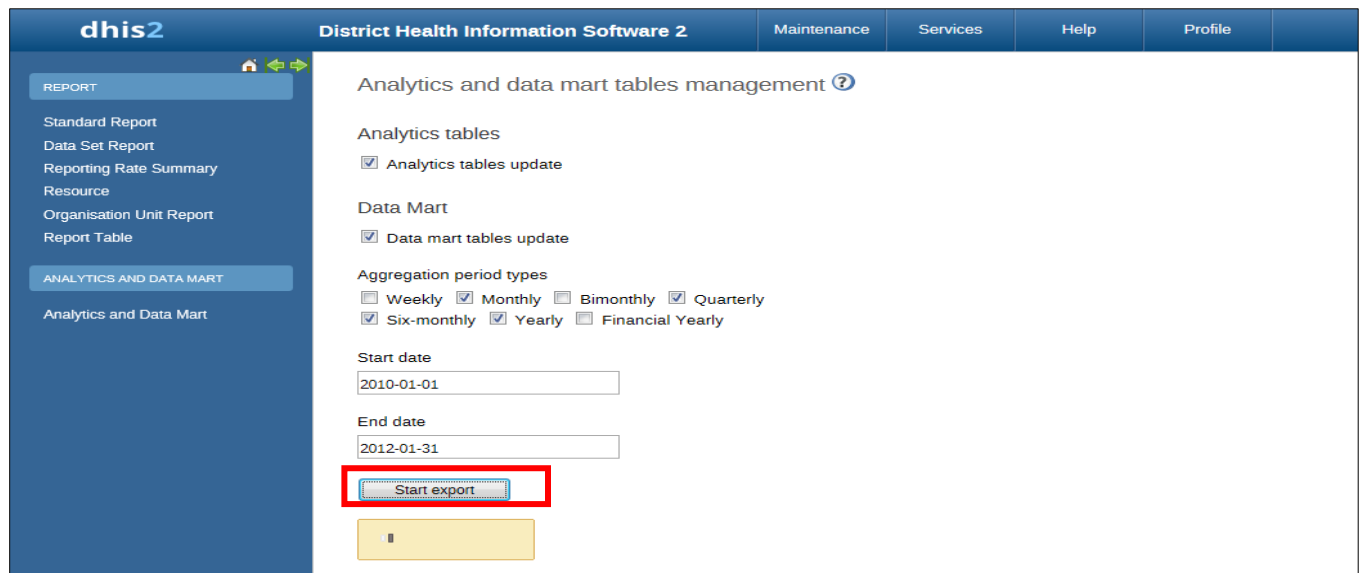
Run DHIS 2 data mart process

1. On DHIS 2 home page, go to **Services** on the top menu.

2. Select **Reports** on the dropdown list to open reports page.



3. Click on the **Analytics and Data Mart** link to open Data Mart Management page.
4. Select the period type/frequency and start date and end date.
5. Click **Start Export** button to begin the process of exporting data from tables to data mart for report generation.

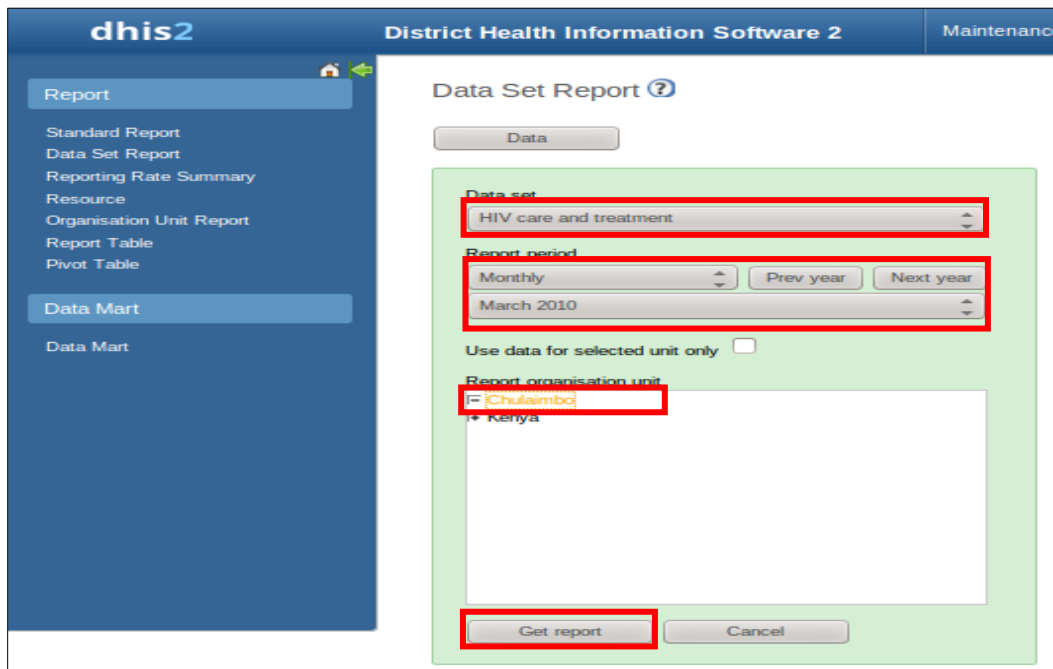


Generating the Report

Once the data mart process is complete:

1. Click on **Data Set Report** to open data set report page.
2. Fill in the details to generate the dataset report:
 - a) Select the data set (in this case, HIV care and treatment).
 - b) Select report period and frequency (In this case, monthly).
 - c) Select month and year of the report to be generated.

- d) Specify the organization unit by clicking on the organization unit whose report will be generated. Tick the checkbox if for selected unit only.
- e) Click **Get report** button.



View the Generated Report

Name	Value
Infants born to HIV Positive mothers (exposed)	0
Number of HIV patients on therapeutic or supplementary food	
Number of HIV patients receiving clinical services	0
Number of HIV-positive persons receiving cotrimoxazole prophylaxis	
Number of individuals who received Testing and counseling services for HIV	11
Number of patients on ARVs	0
Number of patients receiving one care service	0
Number of patients with advance HIV infection newly enrolled on ART	
Number of patients with advance infection receiving ART	2027
Number of patients with HIV positive result	
Number of persons provided with post exposure prophylaxis (PEP)	

The aggregated data sent from OpenMRS is available in the DHIS 2 Dataset Report.

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Please send your input or feedback to jkariuki@cdc.gov

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Appendixes

Appendix 1: Creating report definitions template using curl command

Using a computer with Linux OS (client side), the report definition XML template can be downloaded using curl command. This process has been tested using Linux operating system. The command does not have to be run on the server as long as the DHIS 2 server URL, username, and password are known. If you are using Windows (client side), the curl command will be more complex because xmllint is not well supported on Windows operating systems.

Curl command for DHIS 2 version 2.9 and below

Open the computer terminal and then enter the command below.

```
curl http://DHIS2username:DHIS2password@DHIS2url/api/metaData.xml?assumeTrue=false&categoryOptionCombos=true&dataElements=true&dataSets=true" | xsltproc dxf2template.xslt - /xmllint --format -> ReportTemplates.xml
```

This command will download the report definition xml file and would require the file dxf2template.xslt on your local computer. The report template is transformed to the required format.

Note: Computer administrator privilege is required to download the file.

Curl command for DHIS 2 version 2.10 and above

Open the computer terminal and then enter the command below.

```
curl -u user:password -H "Accept: application/dsd+xml" http:// dhis2 URL/dev/api/dataSets >templatename.xml
```

(Substitute user:password and the DHIS server URL with your own.)

Example

```
user@user-PC:~$ curl -u user:userpassword -H "Accept: application/dsd+xml" http://localhost:8080/dhis/api/dataSets >Report definition template.xml
```

This should download the report definition XML file in a format that does not require client side XSLT transformation.

During report definition download, progress report as shown below will be generated.

% Total	% Received	% Xferd	Average Speed	Time	Time	Time	Current
	Dload	Upload	Total	Spent	Left	Speed	
100	6093	0	6093	0	0	819	0 --:--:-- 0:00:07 --:--:-- 1784

Once the report template is downloaded, open it in a text editor.

Sample report definition template downloaded using curl command.

```
<?xml version="1.0" encoding="UTF-8"?>
<reportTemplates xmlns:d2="http://dhis2.org/schema/dxf/2.0">
  <dataElements>
    <dataElement uid="vsYsrqWNyLr" code="PTS_IN" name="Number of patients in care"
type="int"/>
    <dataElement uid="PNgDUAQCOqt" code="PTS_ARV" name="Number of patients on ARVs"
type="int"/>
  </dataElements>
</reportTemplates>
```

```

</dataElements>
<disaggregations>
  <disaggregation uid="hpflXpfSCEE" code="hpflXpfSCEE" name="(default)"/>
</disaggregations>
<reportTemplate>
  <name>Test Report</name>
  <uid>jmJbDaBUNV6</uid>
  <code>A1</code>
  <periodType>Monthly</periodType>
  <dataValueTemplates>
    <dataValueTemplate dataElement="PTS_ARV" disaggregation="hpflXpfSCEE"/>
    <dataValueTemplate dataElement="PTS_IN" disaggregation="hpflXpfSCEE"/>
  </dataValueTemplates>
</reportTemplate>
</reportTemplates>

```

The report definition template has UID, codes, and names already in place. All that is needed to have a final report definition XML file is adding annotation and SQL statements on data value templates.

On the data value template, add the annotation code and SQL statements.

```

<annotation>
/* SQL query for dataelement here */
</annotation>

```

The resulting report definition file will be as shown.

```

<?xml version="1.0" encoding="UTF-8"?>
<reportTemplates xmlns:d2="http://dhis2.org/schema/dxf/2.0">
  <dataElements>
    <dataElement uid="vsYsrqWNyLr" code="PTS_IN" name="Number of patients in care"
type="int"/>
    <dataElement uid="PNgDUAQCOqt" code="PTS_ARV" name="Number of patients on ARVs"
type="int"/>
  </dataElements>
  <disaggregations>
    <disaggregation uid="hpflXpfSCEE" code="hpflXpfSCEE" name="(default)"/>
  </disaggregations>
  <reportTemplate>
    <name>Test Report</name>
    <uid>jmJbDaBUNV6</uid>
    <code>A1</code>
    <periodType>Monthly</periodType>
    <dataValueTemplates>
      <dataValueTemplate dataElement="PTS_ARV" disaggregation="hpflXpfSCEE"/>
        <annotation>
          /* Add SQL query for dataelement PTS_ARV here */
        </annotation>
      <dataValueTemplate dataElement="PTS_IN" disaggregation="hpflXpfSCEE"/>
        <annotation>
          /* Add SQL query for dataelement PTS_IN here */
        </annotation>
    </dataValueTemplates>
  </reportTemplate>
</reportTemplates>

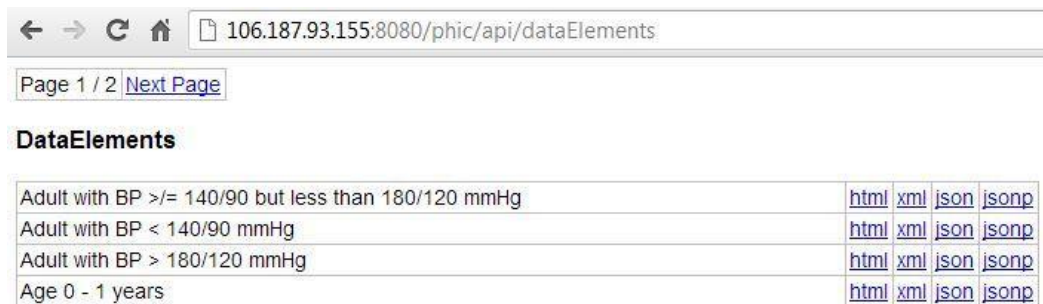
```

Save the report definition file with a name and in a folder that you can remember when uploading it to the module.

Appendix 2: Creating report definition template manually

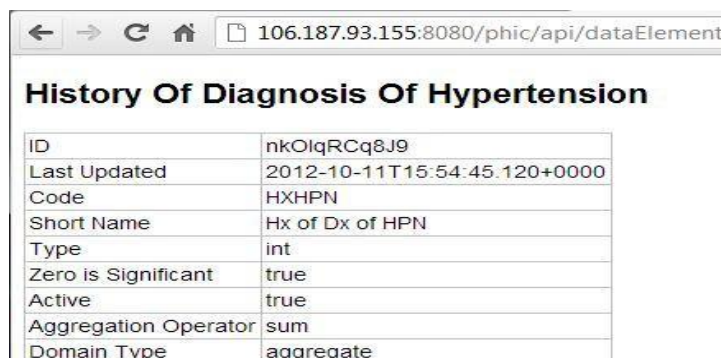
Step 1: Adding data elements to the report definition template

1. Log into DHIS 2 then:
2. Go to :< dhis2site URL>/api/dataElements
 - a. i.e. **localhost: 8080/phic/api/dataElements**
3. Search for the data element you need from the displayed list.
4. Click the **html** link for the data element you need to use.



DataElements				
Adult with BP >= 140/90 but less than 180/120 mmHg	html	xml	json	jsonp
Adult with BP < 140/90 mmHg	html	xml	json	jsonp
Adult with BP > 180/120 mmHg	html	xml	json	jsonp
Age 0 - 1 years	html	xml	json	jsonp

5. Assign the value of the ID, code, name, and type of that data element (based on the HTML shown) to the respective XML attributes.



History Of Diagnosis Of Hypertension	
ID	nkOlqRCq8J9
Last Updated	2012-10-11T15:54:45.120+0000
Code	HXHPN
Short Name	Hx of Dx of HPN
Type	int
Zero is Significant	true
Active	true
Aggregation Operator	sum
Domain Type	aggregate

In this example, history of hypertension ID is “nkOlqRCq8J9”, the code is “HXHPN”, the name is “history of diagnosis of hypertension” (you may shorten the name), and the type is “int”.

6. Using the sample code of the existing DHIS 2 report definition XML above, change the values in red color on the code below.

```
<dataElements>
  <dataElement uid="<ID>" code="<Code>" name="<name>" type="<Type>" />
</dataElements>
```

The updated XML code for data element would be:

```
<dataElements>
  <dataElement uid="nkOlqRCq8J9" code="HXHPN" name="hx_hypertension"
type="int" />
</dataElements>
```

- If you would like to add more data elements in the template, simply add another data element tag inside the data elements section.

```
<dataElements>
  <dataElement uid="nk0lqRCq8J9" code="HXHPN" name="hx_hypertension" type="int"/>
  <dataElement uid="<ID>" code="<Code>" name="<name>" type="<Type>" />
</dataElements>
```

Step 2: Adding disaggregations to the report definition template

- Go to <dhis2site>/api/categoryOptionsCombos or <dhis2site>/api/categoryCombos or <dhis2site>/api/categoryOptions
i.e. localhost:8080/phic/api/categoryOptionCombos
- Search for the disaggregation that you need.
- Click the **html** link for the category option combo you need to use.

CategoryOptionCombos

(0 - 1 years, Female)	html	xml	json	jsonp
(0 - 1 years, Female)	html	xml	json	jsonp
(0 - 1 years, Male)	html	xml	json	jsonp
(0 - 1 years, Male)	html	xml	json	jsonp
(16 - 24 years, Female)	html	xml	json	jsonp

- Assign the value of the ID, code, and name (based on the HTML shown) of the disaggregation selected to the XML attributes.

(Male, Uncategorized, Member)

ID	Gb0BGTbfg19
Last Updated	2012-07-02T12:13:31.437+0000
Code	

In this example, disaggregation of “male, uncategorized, member” ID is “Gb0BGTbfg19”. If the code for this disaggregation does not exist, copy the UID and use it as the code too. Therefore, the code is also “Gb0BGTbfg19”. The name may be “male_uncategorized_member”.

- Using the sample code of the existing DHIS 2 report definition XML above, change the values in red color. **(Follow the same process used for data element)**

The XML code for data element would be:

```
<disaggregations>
  <disaggregation uid="Gb0BGTbfg19" code="Gb0BGTbfg19" name="male_uncategorized_member" />
</disaggregations>
```

- If you would like to add more disaggregations in the template, simply add another disaggregation tag inside the disaggregation section.

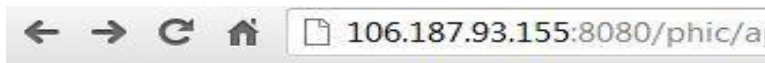
```

<disaggregations>
  <disaggregation uid="Gb0BGTbfg19" code="Gb0BGTbfg19" name="male_uncategorized_member" />
  <disaggregation uid="<ID>" code="<code>or <ID>" name="<name>" />
</disaggregations>

```

Step 3: Adding report data sets

- Go to: <dhis2site URL>/api/dataSets
 - i.e. Localhost:8080/phic/api/dataSets
- Search for the data set that you need.
- Click the **html** link opposite the preferred data element.

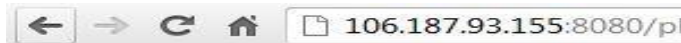


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Data Sets

Immunization dataset	html	xml	json	jsonp
PCB Form A2	html	xml	json	jsonp
PCB Form A4	html	xml	json	jsonp
PCB Provider Clientele Profile	html	xml	json	jsonp
PHIC OPB Reporting	html	xml	json	jsonp

- Assign the value of the ID, code, and name (based on the HTML shown) of the data set selected to the XML file.



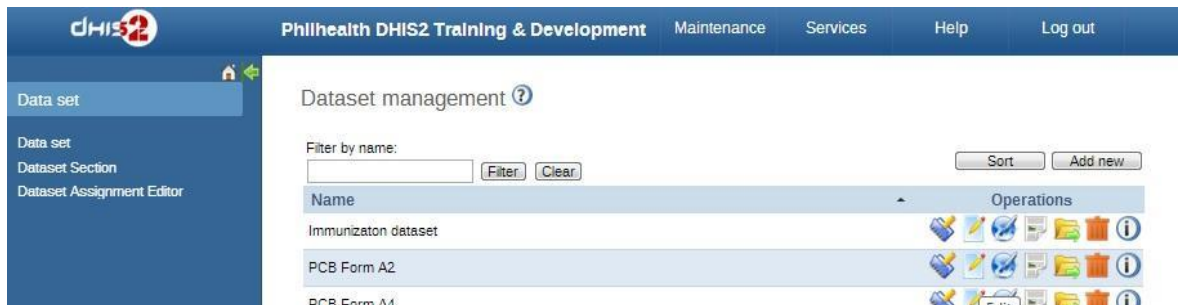
PCB Form A2

ID	bazOE3Zgw8O
Last Updated	2012-10-11T17:59:36.479+0000
Code	A2
Short Name	
Expiry Days	0
Version	12
Mobile	true

- To add Period Type:
 - Navigate to the DHIS 2 site.
 - Select **Maintenance** on the main menu, then scroll down to select **Datasets** on the dropdown list.
 - Select **Data set** on the data sets page.

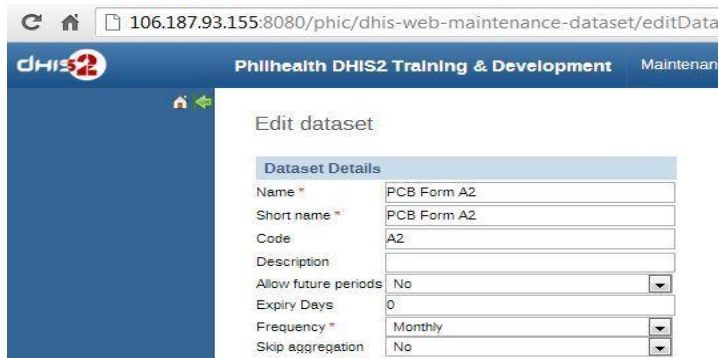


d) Click the edit icon for the preferred dataset (i.e. edit for PCB Form A2) on the dataset management page.



e) Assign the value for the Frequency to the <periodType> e.g. weekly, monthly, quarterly.

The dataset name and the code will also be in this page. However, on **Edit dataset** page, the ID is not available.



In this example, the report template for “PCB Form A2” is as follows: Name is “PCB Form A2”, UID is “bazOE3Zgw8O”, the Code is “A2”, and the period type (Frequency) is “Monthly”.

6. Using the sample code of the existing DHIS 2 report definition XML above, change the values in red color.

The XML code for data element would be as shown below:

```
<reportTemplate>
  <name>PCB Form A2</name>
```

```

    <uid>bazOE3Zgw8O</uid>
    <code>A2</code>
    <periodType>Monthly</periodType>
    <dataValueTemplates>
    </dataValueTemplates>
</reportTemplate>

```

7. If you would like to add more data sets in the template, simply add another report template tag inside the report templates section.

```

<reportTemplate>
  <name>PCB Form A2</name>
  <uid>bazOE3Zgw8O</uid>
  <code>A2</code>
  <periodType>Monthly</periodType>
  <dataValueTemplates>
  </dataValueTemplates>
</reportTemplate>
<reportTemplate>
  <name><name></name>
  <uid><ID></uid>
  <code><code></code>
  <periodType><frequency></periodType>
  <dataValueTemplates>
  </dataValueTemplates>
</reportTemplate>

```

Step 4: Adding data value templates

Data value templates section has data value template tag to hold the data element and its disaggregation value and annotation tag where SQL query for pulling the data element value from the database is defined. The data value template has data element code and disaggregation code that identify the data element whose value is sent and how the values are disaggregated.

Annotation contains SQL query that defines the value that is aggregated from data pulled from the database. The query includes a start and end period and location of the data being pulled.

```

<dataValueTemplates>
  <dataValueTemplate dataElement="HXHPN" disaggregation="Gb0BGTbfg19">
    <annotation>
      select count(distinct p.person_id)
      from person p
      inner join obs o on o.person_id = p.person_id
      where p.voided = 0 and o.voided = 0
      and o.concept_id = 31
      and o.obs_datetime >= :startOfPeriod
      and o.obs_datetime &lt;= :endOfPeriod
      and o.location_id = :locationId
    </annotation>
  </dataValueTemplate>
</dataValueTemplates>

```

If you would like to get more data values within the data set, simply add another data value template tag inside the data value templates tag as shown below.

```

<dataValueTemplates>
  <dataValueTemplate dataElement="<code>" disaggregation="<code>">
    <annotation>
      <sql statement to pull data >

```

```

    </annotation>
  </dataValueTemplate>
  <dataValueTemplate dataElement="HXHPN" disaggregation="Gb0BGTbfg19">
    <annotation>
      select count(distinct p.person_id)
      from person p
      inner join obs o on o.person_id = p.person_id
      where p.voided = 0 and o.voided = 0
      and o.concept_id = 31
      and o.obs_datetime >= :startOfPeriod
      and o.obs_datetime &lt;= :endOfPeriod
      and o.location_id = :locationId
    </annotation>
  </dataValueTemplate>
</dataValueTemplates>

```

Final report definitions XML file

When all sections are put together, the report definitions XML file will be complete, as shown below.

```

<?xml version="1.0"?>
<reportTemplates xmlns:d2="http://dhis2.org/schema/dxf/2.0">
  <dataElements>
    <dataElement uid="nk0lqRCq8J9" code="HXHPN" name="hx_hypertension" type="int"/>
  </dataElements>

  <disaggregations>
    <disaggregation uid="Gb0BGTbfg19" code="Gb0BGTbfg19" name="male_uncategorized_member"/>
  </disaggregations>

  <reportTemplate>
    <name>PCB Form A2</name>
    <uid>bazOE3Zgw80</uid>
    <code>A2</code>
    <periodType>Monthly</periodType>
    <dataValueTemplates>
      <dataValueTemplate dataElement="HXHPN" disaggregation="Gb0BGTbfg19">
        <annotation>
          select count(distinct p.person_id)
          from person p
          inner join obs o on o.person_id = p.person_id
          where p.voided = 0 and o.voided = 0
          and o.concept_id = 31
          and o.obs_datetime >= :startOfPeriod
          and o.obs_datetime &lt;= :endOfPeriod
          and o.location_id = :locationId
        </annotation>
      </dataValueTemplate>
    </dataValueTemplates>
  </reportTemplate>
</reportTemplates>

```

Save the complete report definition XML file in a folder that is accessible when uploading it into the DHIS2 reporting module.