

Manual completo de Usuario DHIS2



2.15

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Equipo de Documentación DHIS2

1182

Version 2.15 2014-12-03 16:01:32

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Acerca de esta Guía

La documentación de DHIS2 es un esfuerzo colectivo y ha sido elaborada por el equipo de desarrollo y los usuarios. Al mismo tiempo esta guía quiere ser completa, y sin embargo todavía falta incluir algunas funcionalidades. En esta sección se explican algunas de las convenciones utilizadas en el documento.

DHIS2 es una aplicación web. En muchos casos, hemos incluido capturas de pantalla para mayor claridad en los ejemplos. También se muestran las rutas de algunas funcionalidades como "Mantenimiento->Administración de datos". El símbolo "->" indica que deberíamos primero entrar en "Mantenimiento" y luego hacer click en "Administración de datos" en el menú desplegable que aparece en la ventana del navegador.

Hemos utilizado varios estilos de texto para resaltar partes importantes del texto o tipos particulares de texto, como el código fuente. Cada convención utilizada en el documento se explica a continuación.



Nota

Una nota contiene información adicional que debería ser tomada en cuenta o una referencia a más información que puede ser relevante.



Sugerencia

Una sugerencia puede ser un consejo, como por ejemplo cómo realizar una tarea concreta de forma más eficiente.



Importante

La información importante no debería ignorarse, y normalmente indica algo que es un requisito de la aplicación.



Atención

La información incluida en estas secciones debería ser considerada cuidadosamente, y si no es así, puede tener consecuencias inesperadas en el análisis, el funcionamiento o el rendimiento del sistema.



Aviso

La información incluida en estas secciones, de no ser tomada en cuenta, puede resultar en pérdida permanente de datos o puede afectar la usabilidad global del sistema.

Las líneas de programas suelen contener algún código de programación.
Se mostrarán dentro de un cuadro sombreado y con un tipo de fuente diferente, como este.

Los comandos se mostrarán en texto en negrita, y representan un comando que necesita ser ejecutado en el sistema operativo o en la base de datos.

Los enlaces a sitios web externos o las referencias cruzadas se mostrarán en texto azul y subrayado como [este](#).

Las referencias bibliográficas se mostrarán entre corchetes como esta: [Store2007]. Podremos encontrar una referencia completa en la bibliografía incluida al final de este documento.

Capítulo 1. ¿Qué es DHIS2?

Después de leer este capítulo habremos comprendido:

- Qué es DHIS2 y qué finalidad tiene en el marco de los Sistemas de Información de Salud (SIS)
- Cuáles son las principales consideraciones tecnológicas que deberemos tener en cuenta para desplegar un sistema basado en DHIS2, y qué opciones existen para ampliar el aplicativo DHIS2 con nuevos módulos
- Qué diferencias hay entre datos agregados y datos de paciente
- Qué beneficios y dificultades conlleva la utilización de software libre y de código abierto (FOSS) en un SIS

1.1. Antecedentes de DHIS2

DHIS2 es una herramienta para la recolección, validación, análisis y presentación de datos estadísticos agregados, hecho a medida de (pero no limitado a) actividades de gestión integral de información de salud. Es más una herramienta genérica que una aplicación de base de datos preconfigurada, con un modelo de metadatos abierto y una interfaz de usuario flexible que permite al usuario diseñar los contenidos de un sistema específico de información sin necesidad de códigos de programación. DHIS2 y sus extensiones son un paquete software web y modular elaborado con entornos de código libre y abierto Java.

DHIS2 es software de código abierto publicado bajo la licencia BSD y puede utilizarse sin coste alguno. Funciona en cualquier plataforma que tenga instalado JRE 6 (o una versión superior). Simplemente se descarga (de dhis2.org), se desempaqueta, se lanza el fichero ejecutable y estamos listos para comenzar.

DHIS2 ha sido desarrollado por el Health Information Systems Programme (HISP) en un proceso abierto y distribuido globalmente con desarrolladores que actualmente están en India, Vietnam, Tanzania, Irlanda y Noruega. El desarrollo está coordinado desde la Universidad de Oslo con un soporte principal de Norad.

En Octubre de 2012, el software DHIS2 se utiliza en los sistemas de salud de más de 30 países en África, Asia y Latinoamérica, y entre los países que han adoptado DHIS2 como software de SIS nacional están Kenia, Tanzania, Uganda, Ruanda, Ghana, Liberia y Bangladesh. Un número creciente de países y organizaciones están comenzando nuevos despliegues con DHIS2.

La documentación ofrecida aquí trata de ofrecer una panorámica global de la aplicación. Dada la naturaleza abstracta de la aplicación, este manual no sirve como una guía paso a paso detallada de cómo utilizar la aplicación en cada circunstancia, sino más bien ofrece ilustraciones y ejemplos de cómo DHIS2 puede implementarse en varias situaciones mediante ejemplos generalizados.

Antes de implementar DHIS2 en un nuevo despliegue, recomendamos fuertemente la lectura de la Guía de Implementación de DHIS2 (un manual distinto de este), también disponible en dhis2.org.

1.2. Las características clave y el propósito de DHIS 2

Las características clave y el propósito de DHIS2 pueden resumirse como sigue:

- Ofrecer una solución SIS exhaustiva focalizada en principios de almacenamiento de datos y en una estructura modular que puede personalizarse fácilmente para las distintas necesidades de los sistemas de salud - y sostiene la idea de un SIS integrado a todos los niveles de la jerarquía de salud.
- Capacidad para personalizar y adaptar localmente mediante el interfaz de usuario. No es preciso programar código para empezar a utilizar DHIS2 en un nuevo despliegue (país, región, distrito, etc.).
- Ofrecer herramientas de entrada de datos que pueden ser del tipo de listas o tablas estándar, o que pueden ser personalizadas para replicar los formularios en papel.
- Ofrecer diferentes tipos de herramientas para la validación de los datos y para la mejora de la calidad de los datos.
- Ofrecer reportes fáciles de usar en un sólo click, con gráficas y tablas para los indicadores seleccionados o reportes resumen utilizando el diseño de las herramientas de recolección de datos. También es posible la integración con

herramientas de diseño de reportes externas y populares como iReport o BIRT, permitiendo a los usuarios añadir más reportes personalizados de forma flexible y accesibles a todos los usuarios.

- Análisis de datos flexible y dinámico (en tiempo real) en la herramienta de Visualizador de Datos y en el módulo SIG.
- Un panel de control (dashboard) para cada usuario con acceso rápido a las herramientas relevantes de monitoreo y evaluación incluidas las gráficas de indicadores y enlaces a los reportes favoritos, mapas y otros recursos clave en el sistema.
- Interfaces de usuario sencillas de utilizar para la gestión de metadatos, por ejemplo para añadir o editar sets de datos o establecimientos de salud. No es necesaria la programación de código para poner en marcha el sistema en un nuevo despliegue.
- Funcionalidad para diseñar y modificar las fórmulas calculadas de los indicadores.
- Módulo de gestión de usuarios para las contraseñas, seguridad y control fino de acceso (roles de usuario).
- Es posible enviar mensajes a los usuarios del sistema de cara a obtener retroalimentación y avisos. Los mensajes también pueden entregarse en formato de email y como SMS.
- Los usuarios pueden compartir y discutir sus datos en gráficas y reportes utilizando "Interpretaciones", favoreciendo una comunidad de usuarios con base activa en la información.
- Funcionalidades de exportación-importación de datos y metadatos, apoyando la sincronización de las instalaciones offline así como la interoperabilidad con otras aplicaciones.
- Integración con otros sistemas software - utilizando el API-Web de DHIS2 y el Motor de Integración.
- Existe la posibilidad de desarrollar e integrar nuevos módulos para dar respuesta a necesidades específicas de los usuarios, ya sea como parte del interfaz de usuario del portal de DHIS2 o como una aplicación externa acoplada que interactúe a través del API-Web de DHIS2.

En resumen, DHIS2 facilita una solución integral de SIS para las necesidades de reporte y análisis de los usuarios de información de salud a cualquier nivel.

1.3. Utilización de DHIS2 en el SIS: registro, procesado, interpretación y análisis de los datos

El contexto amplio de un SIS puede entenderse integralmente mediante el ciclo de la información presentado en la Figura 1.1. El ciclo vida de la información plasma gráficamente los distintos componentes, etapas y procesos por los cuales los datos se recogen, comprueban según calidad, procesan, analizan y utilizan.

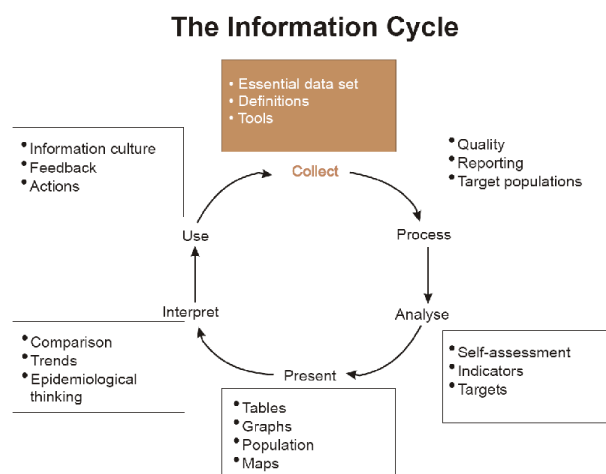


Figura 1.1. El ciclo de vida de la información en salud

DHIS2 participa en las diferentes facetas del ciclo de vida de la información, donde se incluyen:

- Recogida de datos.
- Realización de chequeos de calidad.
- Acceso a los datos a múltiples niveles.

- Reporte.
- Elaboración de gráficas, mapas y otras formas de análisis.
- Posibilidad de comparaciones a lo largo del tiempo (por ejemplo, frente a meses anteriores) y del espacio (por ejemplo, entre distintos establecimientos y distritos).
- Detección de tendencias (mostrando datos en series temporales para verificar niveles máximos y mínimos tolerados).

En un primer paso, DHIS2 sirve como herramienta para la recogida, registro y compilación de datos, y todos los datos (ya sea en forma de números o texto) pueden introducirse en la aplicación. La entrada de datos puede hacerse en listas de elementos de datos o mediante formularios definidos por los usuarios, que pueden elaborarse a imagen y semejanza de los formularios en papel para facilitar a los usuarios el proceso de registro de datos.

En un segundo paso, DHIS2 puede utilizarse para aumentar la calidad de los datos. Por un lado, en los puntos de entrada de datos puede realizarse un chequeo para verificar si los datos cuadran en rangos aceptables entre valores máximos y mínimos para cada elemento de datos particular. Este chequeo puede ayudar, por ejemplo, a identificar errores producidos al momento de meter los datos. Por otro lado, los usuarios pueden definir reglas de validación, y DHIS2 puede lanzar comprobaciones de estas reglas de validación sobre los datos para detectar infracciones.

Luego, cuando ya se han introducido y verificado los datos, DHIS2 puede ayudar a realizar diferentes tipos de reportes. El primer tipo de reporte es el rutinario que necesita ser predefinido, de modo que todos los reportes que sean generados en rutina puedan obtenerse con un click. Además, DHIS2 puede ayudar en la generación de reportes analíticos mediante por ejemplo comparaciones de indicadores en distintos establecimientos de salud o a lo largo del tiempo. Algunas de las salidas de análisis que puede producir DHIS2 son gráficas, mapas, reportes y perfiles de salud. Todos ellos deberían ser producidos, analizados y servir de base para intervenciones de salud por parte de los gestores de salud.

1.4. Antecedentes tecnológicos

1.4.1. DHIS2 como plataforma

DHIS2 puede entenderse como una plataforma con muchos niveles. Primero, la base de datos de la aplicación está diseñada de abajo a arriba con un enfoque de flexibilidad. Las estructuras de datos como son los elementos de datos, las unidades organizativas, los formularios y los roles de los usuarios pueden definirse de forma totalmente libre desde el interfaz de usuario de la aplicación. Esto posibilita que el sistema pueda adaptarse a múltiples contextos locales y casos de uso. Hemos visto que DHIS2 soporta los requisitos más importantes para la captura y el análisis rutinarios de datos necesarios en implementaciones nacionales. Esto hace que DHIS2 pueda servir también como sistema de gestión para dominios específicos como logística, laboratorios y contabilidad.

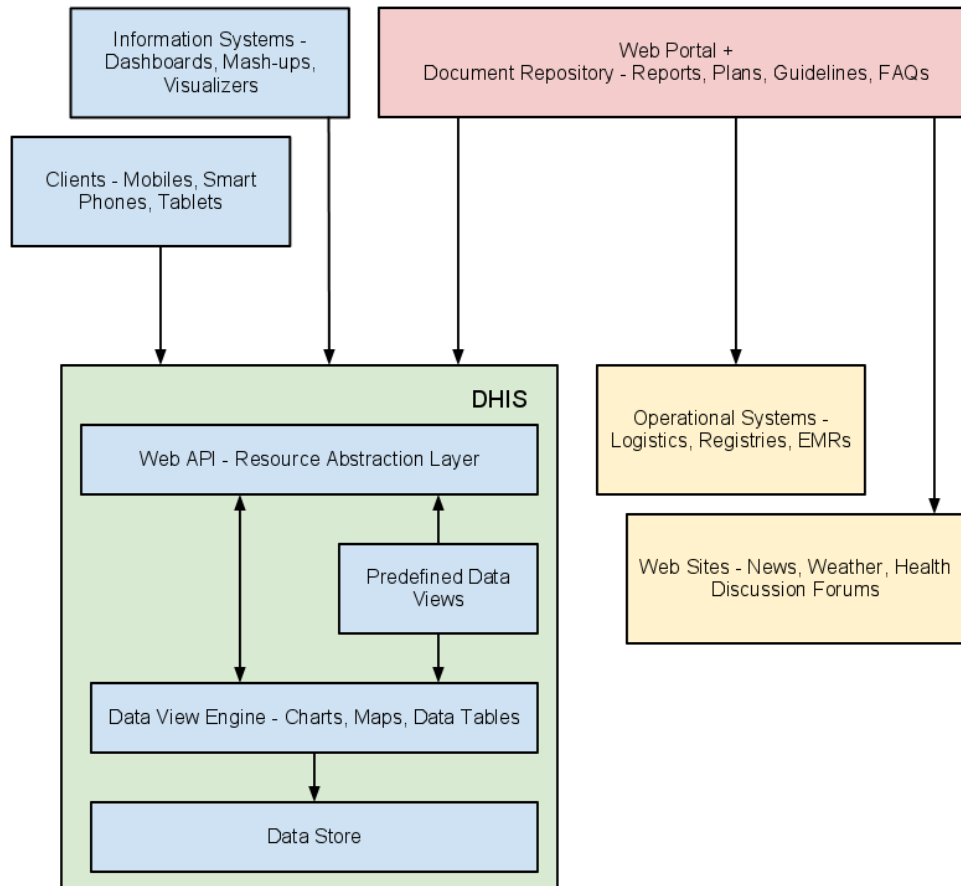
En segundo lugar, gracias a su diseño modular DHIS2 puede extenderse con módulos software adicionales. Estos módulos software pueden convivir con los módulos centrales de DHIS2, e integrarse en el portal DHIS y en el sistema de menús. Es una característica potente que permite extender el sistema con funcionalidad extra cuando se requiera, típicamente para requisitos específicos del país, como se apuntó anteriormente.

La otra cara del módulo de extensión software es que impone varias limitaciones al proceso de desarrollo. Los desarrolladores que crean funcionalidad extra están limitados a la tecnología DHIS en términos de lenguaje de programación y de entornos software, además de las limitaciones ya mencionadas para el diseño de los módulos para la solución de portal web DHIS. Estos módulos deben incluirse en el software DHIS cuando se compila el software y se despliega en un servidor, no se pueden añadir dinámicamente en tiempo de ejecución.

Para superar estas limitaciones y lograr un acercamiento entre el nivel de servicio DHIS y otras piezas adicionales de software, el equipo de desarrollo de DHIS decidió crear el API Web. Este API-Web cumple con las normas de estilo arquitectónico REST. Esto implica que:

- El API Web proporciona un interfaz navegable y también de lenguaje-máquina para completar el modelo de datos DHIS. Por ejemplo, podemos acceder a la lista completa de elementos de datos, luego navegar utilizando el hipervínculo a un elemento de datos que nos interese en particular, luego navegar utilizando el hipervínculo a la lista de formularios de los cuales este elemento de datos forma parte. Por ejemplo, los clientes solo harán transiciones de estado utilizando hipervínculos que se incrustan dinámicamente en las respuestas de la base de datos.

- Los datos son accedidos mediante un interfaz uniforme (URLs) utilizando un protocolo reconocido. No hay formatos o protocolos de transporte extravagantes - solo el protocolo HTTP ampliamente probado y entendido, que es el bloque fundamental de la Web actual. Esto implica que los desarrolladores de terceros pueden desarrollar software utilizando el modelo de datos y los datos de DHIS sin conocer la tecnología específica o sin cumplir a las restricciones de diseño de DHIS.
- Todos los datos incluidos metadatos, reportes, mapas y gráficas, que consideramos "recursos" en terminología REST, pueden obtenerse en los formatos de representación de datos más populares de la Web como HTML, XML, JSON, PDF y PNG. Estos formatos son ampliamente soportados en aplicaciones y lenguajes de programación y permiten a los desarrolladores de terceros un amplio abanico de opciones de implementación.



1.4.2. Comprendiendo la independencia de plataforma

Todas las computadoras tienen un Sistema Operativo (SO) para manejarlas y manejar los programas instalados. El sistema operativo sirve como nivel intermedio entre la aplicación software, como DHIS2, y el hardware, como la CPU o la memoria RAM. DHIS2 funciona en la Máquina Virtual de Java, y por eso puede funcionar en cualquier sistema operativo que soporte Java. La independencia de plataforma significa que la aplicación software puede ejecutarse en cualquier SO: Windows, Linux, Macintosh, etc. DHIS2 es independiente de plataforma, y es extremadamente útil en el contexto de salud pública, donde pueden estar en uso múltiples sistemas operativos distintos.

Más allá, DHIS2 es también independiente de plataforma en relación al Sistema de Gestión de Base de Datos. DHIS2 utiliza el entorno de abstracción de bases de datos Hibernate y es compatible con cualquier sistema soportado por Hibernate, como PostgreSQL, MySQL, H2, MS SQL Server, Oracle y muchos otros. PostgreSQL es el sistema de base de datos recomendado para DHIS2.

1.4.3. Estrategias de despliegue - conectado (online) o desconectado (offline)

DHIS2 es una aplicación en red y puede ser accedida a través de Internet, en una intranet local y como un sistema instalado localmente. Las alternativas de despliegue de DHIS se definen en este capítulo como (1) despliegue offline

(desconectado) (2) despliegue online (conectado) y (3) despliegue híbrido. El significado de cada una y las diferencias entre ellas se detallan en las secciones siguientes.

1.4.3.1. Despliegue Offline (Desconectado)

Un despliegue offline implica que instalamos muchas instancias autónomas offline para los usuarios finales, generalmente a nivel de distrito. El sistema lo mantienen principalmente los usuarios, trabajadores de salud en distrito, que introducen los datos y generan reportes utilizando su servidor local. Típicamente hay también un equipo de superusuarios a nivel nacional que mantiene el sistema y realizar visitas regularmente a los despliegues en distritos. Los usuarios envían los datos hacia arriba en la jerarquía produciendo ficheros de intercambio de datos que se envían electrónicamente por email o físicamente por correo convencional o viajes del personal. Notemos que aunque haya una conexión reducida a Internet para enviar emails, puede no ser suficiente para que el sistema sea online. Esta forma de despliegue tiene el beneficio claro de que funciona cuando no disponemos de una conectividad de Internet apropiada. Por otro lado hay algunos retos significativos en esta forma de despliegue, que se describen a continuación.

- **Hardware:** Tener en funcionamiento sistemas autónomos requiere un hardware más avanzado en términos de instalar servidores y suministro eléctrico fiable, generalmente a nivel de distrito, en todo el país. Esto requiere una financiación apropiada para la adquisición de equipos y la planificación de mantenimiento a largo plazo.
- **Plataforma software:** Las instalaciones locales implican una necesidad importante de mantenimiento. De la experiencia de HISP, el mayor reto son los virus y otros malwares que tienden a infectar las instalaciones locales a largo plazo. La razón principal para esto es que los usuarios utilizan dispositivos de memoria externa USB para transportar los ficheros de intercambio de datos y documentos entre computadoras privadas, otras computadoras de red y el sistema en el que funciona la aplicación DHIS. Mantener software antivirus y parches de sistema operativo actualizados en un entorno offline es dificultoso y una mala práctica en términos de seguridad muy común entre los usuarios. Tal vez la mejor manera de evitar esto es lanzar un servidor dedicado para la aplicación donde no se utilicen memorias externas y se utilice un sistema operativo basado en Linux, que no sea susceptible de infecciones de virus como lo es MS Windows.
- **Aplicación software:** Ser capaces de distribuir nuevas funcionalidades y resolución de *bugs* a los usuarios del software de información de salud es esencial para el mantenimiento y la mejora progresiva del sistema. Delegar en los usuarios finales la tarea de actualizar el software implica que ellos reciban una formación extensiva y un altísimo nivel de competencias de aquel lado, ya que las actualizaciones software pueden incluir alguna tarea técnicamente arriesgada. Delegar en el equipo nacional de superusuarios la tarea de mantener el software directamente, implicará muchos viajes.
- **Mantenimiento de la base de datos:** Un requisito previo para lograr un sistema eficiente es que todos los usuarios introduzcan datos con un set estandarizado de metadatos (elementos de datos, formularios, etc.). Aquí sucede algo parecido al punto anteriormente comentado sobre actualizaciones de software: la distribución de cambios en el set de metadatos en gran número de instalaciones offline requiere usuarios finales muy competentes si las actualizaciones se envían digitalmente o bien un equipo de superusuarios muy bien organizado. Si hay un fallo al mantener la sincronización del set de metadatos, conllevará la pérdida de capacidad para enviar datos desde los distritos y/o una base de datos nacional inconsistente, ya que los datos introducidos por ejemplo a nivel de distrito, no serán compatibles con los datos a nivel nacional.

1.4.3.2. Despliegue Online (Conectado)

Un despliegue online implica que una sola instancia de la aplicación DHIS se instala en un servidor conectado a Internet. Todos los usuarios (clientes) se conectan con el servidor central online a través de Internet utilizando un navegador web. Este estilo de implementación suele beneficiarse de las grandes inversiones y extensiones de las redes de comunicaciones de acceso: móviles (celular) y de banda ancha en países en desarrollo. Esto posibilita el acceso a servidores online incluso en las áreas más rurales utilizando modems de Internet móvil (también llamadas *dongles*).

Esta forma de despliegue online tiene implicaciones muy positivas en el proceso de implementación y en el mantenimiento de la aplicación en comparación con el estilo tradicional desconectado:

- **Hardware:** Los requisitos hardware del lado del usuario se limitan a una computadora o portátil (laptop) razonablemente modernos, y conexión a Internet a través de línea fija o módem celular. No hay necesidad de tener servidores especializados del lado del usuario, sino que cualquier computadora que pueda navegar es suficiente.
- **Plataforma software:** Los usuarios solo necesitan un navegador web para conectarse al servidor online. Hoy en día todos los sistemas operativos populares vienen con un navegador web ya instalado y no hay ningún requisito especial

sobre qué tipo o versión de navegador. Lo que esto significa es que si hay problemas graves como infecciones de virus o corrupción del software en esa computadora, siempre podremos recurrir a reformatear e instalar de nuevo el sistema operativo o comprar una computadora nueva. En tal caso, el usuario podrá seguir introduciendo datos donde lo dejó y no se habrá perdido ningún dato.

- **Aplicación software:** El estilo de despliegue online, es decir, basado en un servidor central, significa que podemos actualizar y mantener la aplicación de manera centralizada. Cuando salen nuevas versiones de DHIS con nuevas funcionalidades y resoluciones de bugs, esto puede aplicarse únicamente al servidor online. Y todos los cambios se reflejarán en el lado del cliente la próxima vez que los usuarios se conecten al servidor a través de Internet. Obviamente, esto tiene un impacto enormemente positivo en el proceso de mejorar el sistema ya que las nuevas funcionalidades se distribuyen inmediatamente a los usuarios, todos los usuarios estarán siempre accediendo a la misma versión de la aplicación, y los bugs y complicaciones pueden resolverse e implantarse al momento.
- **Mantenimiento de la base de datos:** De forma similar al punto anterior, los cambios en los metadatos se hacen en el servidor online de forma centralizada y se propagan automáticamente a todos los clientes la próxima vez que se conecten al servidor. Esto efectivamente elimina los vastos problemas relacionados con mantener un set de metadatos actualizado y estandarizado, como sucede en el despliegue offline. Por ejemplo es muy conveniente este estilo durante la fase inicial de desarrollo de la base de datos y durante los procesos anuales de revisión de la base de datos, ya que los usuarios estarán accediendo a una base de datos consistente y estandarizada incluso cuando en ella se están produciendo cambios frecuentes.

Este enfoque puede ser problemático en los casos en los que la conexión a Internet es volátil o insuficiente durante largos periodos de tiempo. Sin embargo, DHIS 2 dispone de algunas características que permiten que el requisito de conexión a Internet solo sea necesario en momentos concretos para que el sistema funcione bien, como la herramienta MyDatamart que se explica en un capítulo específico de este Manual.

1.4.3.3. Despliegue Híbrido

De la discusión de los puntos anteriores, uno puede darse cuenta de que el estilo de despliegue online es más favorable que el despliegue desconectado, pero requiere conexión a Internet allá donde se use. Es importante tomar en cuenta que los estilos mencionados también pueden coexistir en un despliegue común. Es perfectamente factible tener despliegues online y offline en un mismo país. La norma general sería que los distritos y establecimientos deberían acceder al sistema online a través de Internet siempre que exista conexión suficiente, y habrá sistemas offline en aquellos distritos donde no se dé el caso.

Es difícil definir con precisión cómo es una conexión a Internet suficiente pero podemos poner como regla práctica que la velocidad de descarga debería ser mínimo 10 Kbyte/seg y la disponibilidad debería ser como mínimo el 70% del tiempo.

En este sentido los modems de Internet por celular que se puedan conectar a una computadora o portátil para acceder a la red celular son una solución factible y suficiente. La cobertura de Internet móvil está aumentando rápidamente en todo el mundo, con frecuencia ofreciendo una conectividad buena a precios asequibles y es una alternativa a las redes locales y poco mantenidas de líneas fijas de Internet. Puede resultar un esfuerzo que vale la pena el contactar con las compañías de red móvil nacional y negociar suscripciones de postpago y beneficios potenciales de economía de escala. Es conveniente estudiar la cobertura de red para cada operador de red de telecomunicaciones en el país concreto, a la hora de decidir qué tipo de despliegue arrancar, ya que podrá ser diferente en distintas regiones del país.

1.4.3.4. Alojamiento del servidor

El enfoque de despliegue online plantea la cuestión de dónde y cómo alojar el servidor que ejecutará la aplicación DHIS2. Típicamente hay varias opciones posibles:

1. Alojamiento interno en el Ministerio de Salud
2. Alojamiento en un centro gubernamental de datos
3. alojamiento a través de una compañía externa de hosting

La razón principal para elegir la primera de las opciones es a menudo la motivación política de tener "propiedad física" de la base de datos. Muchos perciben esto como algo importante de cara a "poseer" y controlar los datos. Existe también el deseo de desarrollar capacidad local para la administración del servidor relacionada con la sostenibilidad del proyecto. Esto suele darse en iniciativas lideradas por donantes que perciben así la misión más concreta y servicial.

En cuanto a la segunda opción, en algunos lugares se construye un centro gubernamental de datos con la visión de promover y mejorar el uso y acceso a los datos públicos. Otra razón puede ser que la proliferación de entornos internos de servicios demanda muchos recursos y es más eficiente establecer una infraestructura y capacidad centralizadas.

Sobre el alojamiento externo, hay recientemente un movimiento hacia la externalización de la operación y administración de recursos informáticos a proveedores externos, donde se accede a esos recursos a través de la red, en lo que se llama popularmente "cloud computing" o "computación en la nube". Esos recursos generalmente se acceden a través de Internet utilizando un navegador web.

El objetivo primordial de un despliegue de servidor online es proporcionar un acceso estable a largo plazo y de alto rendimiento a los servicios ofrecidos. Cuando decidamos qué opción elegir para un entorno de servidor, deberemos considerar varios aspectos:

1. La capacidad humana de administración y operación del servidor. Debe haber personal con habilidades genéricas para la administración de servidor y en las tecnologías específicas de la aplicación que provee servicios. Ejemplos de estas tecnologías son los servidores web y las plataformas de gestión de bases de datos.
2. Soluciones fiables para copias de seguridad automatizadas, incluido un servidor local off y backup remoto.
3. Conectividad estable y buen ancho de banda para el tráfico hacia y desde el servidor.
4. Fuente de alimentación eléctrica estable, incluida una solución de backup.
5. Entorno seguro para el servidor físico en términos de acceso, robo y fuego.
6. Presencia de un plan de recuperación ante desastres. Este plan debe contener una estrategia realista para asegurar que el servicio solo sufrirá caídas breves en los casos de fallo hardware, caída de la red y otros.
7. Hardware viable, potente y robusto.

Todos estos aspectos deben cubrirse para crear un entorno de alojamiento apropiado. El requisito hardware se ha puesto en último lugar deliberadamente debido a que hay una tendencia clara a prestarle demasiada atención, habiendo otros factores más cruciales.

Volviendo a las tres principales opciones de alojamiento, la experiencia de misiones de implementación en países en desarrollo sugiere que los aspectos citados rara vez están presentes en las opciones uno y dos a nivel viable. Alcanzar un nivel aceptable en todos esos aspectos es desafiante en términos de recursos humanos y dinero, especialmente al comparar con la tercera opción. Tiene el beneficio de que acomoda los aspectos políticos mencionados y crea capacidades locales para la administración de servidor, aunque por otro lado esto se puede lograr por otras vías.

La opción tres - alojamiento externo - tiene la ventaja de que soporta todos los aspectos mencionados a un coste asequible. Muchos proveedores de hosting - de servidores virtuales o de servicios en la nube - ofrecen servicios fiables para lanzar la mayoría de aplicaciones posibles. Un ejemplo de estos proveedores son los servidores web de Linode y Amazon. La administración de esos servidores se realiza a través de una conexión de red, lo que sucede también muchas veces en el caso de la administración de un servidor local. La ubicación física del servidor en este caso es irrelevante ya que esos proveedores ofrecen servicios en muchas partes del mundo. Esta solución se está convirtiendo en un estándar para el alojamiento de los servicios de aplicaciones. El aspecto de crear capacidad local para la administración de servidor es compatible con esta opción ya que un equipo local TIC puede asumir la tarea de mantenimiento del servidor alojado externamente.

Una alternativa para combinar las ventajas del alojamiento externo con la necesidad de hosting local y propiedad física es usar un proveedor de hosting externo para el sistema de transacción primario, y copiar (mirror) este servidor a un servidor local no-crítico que se use para solo-lectura como el análisis de datos y que se acceda por una intranet.

1.5. Diferencias entre datos agregados y datos de paciente en un SIS

Los *datos de paciente* son datos relativos a un paciente individual, como son su diagnóstico, nombre, edad, historial médico previo, etc. Estos datos generalmente se basan en la interacción individual entre el paciente y el trabajador de salud. Por ejemplo, cuando un paciente visita un centro de salud pueden registrarse gran variedad de detalles, como la temperatura del paciente, su peso, y diversos tests sanguíneos. Si este paciente obtiene un diagnóstico de "Anemia deficiente Vitamina B12, no especificado" correspondiente al código CIE-10 D51.9, esta interacción concreta puede registrarse como una instancia de "Anemia" en un sistema de información agregada. Los datos de paciente son importantes cuando queremos hacer un seguimiento longitudinal del progreso de un paciente en el tiempo. Por ejemplo,

si queremos seguir cómo un paciente se adhiere y responde a un proceso de tratamiento de TB (que generalmente tiene una duración de 6-9 meses), necesitaremos información de datos de paciente.

Los *datos agregados* son la consolidación de datos relativos a múltiples pacientes, y por tanto no se puede rastrear el origen de los datos de un paciente concreto. Se trata generalmente de conteos, como la incidencia de Malaria, TB y otras enfermedades. Típicamente, los datos rutinarios con los que trabaja un establecimiento de salud son este tipo de estadísticas agregadas, y se utilizan para la generación de reportes e indicadores rutinarios, y lo que es más importante, para la planificación estratégica en el sistema de salud. Los datos agregados no pueden proporcionar el tipo de información detallada que dan los datos de nivel de paciente, pero es crucial para la planificación y orientación del funcionamiento de los sistemas de salud.

Digamos que entre unos y otros se encuentran los datos relativos a casos, o datos anónimos "de paciente". Es posible recoger numerosos detalles sobre el evento específico de salud sin necesidad de identificar al paciente involucrado. Las visitas de pacientes externos o internos, un nuevo caso de cólera, mortalidad materna, etc. son casos de uso comunes cuando queremos recopilar muchos más detalles que el mero conteo del número total de casos o visitas. Estos datos normalmente se registran en formularios en forma de listado, o en formularios de auditoría más detallados. Y estos datos de casos son diferentes de los datos agregados en el sentido de que contienen muchos detalles sobre un evento concreto, mientras que los datos agregados simplemente contarían cuántos eventos se producen de un cierto tipo, por ejemplo, cuántas visitas externas con diagnóstico principal "Malaria", o cuántas muertes maternas donde la fallecida no siguió el protocolo ANC, o cuántos brotes de cólera en niños menores de 5 años. En DHIS2 estos datos son recogidos mediante programas de tipo "evento único sin registro".

Los datos de paciente son muy confidenciales y por tanto deben ser protegidos para que ninguna persona no autorizada pueda obtenerlos. Cuando están en papel, deben ser archivados en un lugar seguro. En computadoras, los datos de paciente necesitan sistemas seguros con contraseñas, acceso restringido y logs de seguimiento.

La preocupación por la seguridad de datos agregados no es tan crucial como lo es para los datos de paciente, ya que generalmente es imposible identificar una persona en particular con una estadística agregada. Sin embargo, los datos también pueden ser mal usados o malinterpretados por otros, y no deberían distribuirse sin unas políticas de difusión de datos adecuadas.

1.6. Software libre y de código abierto (FOSS): beneficios y retos

El software lleva las instrucciones que indican a una computadora cómo funcionar. La forma legible y con autoría humana de esas instrucciones es denominada código fuente. Antes de que la computadora pueda realmente ejecutar las instrucciones, el código fuente debe traducirse en un formato legible por máquinas (binario), llamado código objeto. Todo el software disponible incluye el código objeto, pero FOSS publica también el código fuente.

Los dueños de software propietario licencian su código objeto con copyright a un usuario, lo cual permite a éste ejecutar el programa. Los programas FOSS, sin embargo, licencian tanto el código objeto como el código fuente, permitiendo al usuario no sólo utilizarlo sino también modificar y tal vez distribuir los programas. Teniendo acceso al código fuente, los usuarios tienen la libertad de ejecutar el programa para cualquier fin, redistribuirlo, probar, adaptar, aprender de ello, personalizar el software para responder a sus necesidades, y volcar mejoras públicamente para el bien de la comunidad. Por lo tanto, algún FOSS es conocido también como software libre, donde "libre" se refiere primero y ante todo, a las libertades antes descritas que a un sentido monetario de la palabra (en relación a la gratuidad).

En el sector de la salud pública, FOSS puede tener muchos beneficios, como por ejemplo:

- Menores costes ya que no implica el pago de costes de licencia prohibitivos.
- Dado que las necesidades de información para el sector salud están en constante cambio y evolución, hay una necesidad de que el usuario tenga libertad para hacer los cambios según sus propios requisitos. Esto frecuentemente es muy limitado en sistemas propietarios.
- Acceso a código fuente para favorecer la integración e interoperabilidad. La interoperabilidad entre diferentes aplicaciones software en el sector salud está tomando importancia creciente, lo que significa permitir que dos o más sistemas compartan datos y metadatos. Este trabajo es mucho más fácil, y a veces dependiente del código fuente que se disponibiliza a los desarrolladores que hacen la integración. Esta disponibilidad frecuentemente no es posible en el caso del software propietario. Y cuando lo es, supone costes enormes y obligaciones contractuales.

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- Las aplicaciones FOSS como DHIS2 típicamente están mantenidas por una red global de desarrolladores, y por tanto tiene acceso a conocimiento puntero en investigación y desarrollo (I+D).

Capítulo 2. Comenzando con DHIS 2

2.1. Primeros pasos con DHIS 2

Tras repasar este capítulo habremos podido entender:

- Arrancar DHIS2 desde el escritorio
- Cómo loquearnos desde el escritorio
- Cómo crear nuevos usuarios y roles de usuario
- Qué pasos son necesarios para diseñar una base de datos DHIS2 para nuestra organización

2.1.1. Requisitos previos

Primero deberemos asegurarnos de tener la versión más reciente de Java Runtime instalada en la máquina donde correrá la aplicación. Dependiendo del sistema operativo, hay diferentes formas de instalar Java. El lector podrá consultar [esta web](#) para información más detallada sobre cómo instalar Java.

2.1.2. Un comienzo con el paquete DHIS 2 Live

El paquete DHIS2 Live es la forma más fácil de comenzar con DHIS2. DHIS2 Live es apropiada para una instalación independiente. Simplemente descargamos la aplicación de [aquí](#). Una vez el fichero se ha descargado, hacemos doble click en el fichero descargado y comenzamos a usar DHIS2.

2.1.2.1. Empezando con una base de datos vacía

El paquete Live viene con una base de datos demostrativa como la que vemos en la demo online (basada en el SGIS nacional de Sierra Leona), y si queremos empezar con un sistema/base de datos vacía y construir nuestro propio sistema, entonces tendremos que hacer lo siguiente:

- 1) Parar DHIS2 Live si está todavía corriendo. Hacer click con el botón derecho en el icono de bandeja y seleccionar Salir. El icono de bandeja es el símbolo verde en la esquina inferior derecha de la pantalla (en Windows) que debería decir "Servidor DHIS2 corriendo" cuando colocamos el puntero del mouse sobre él.
- 2) Abrir la carpeta donde se ha instalado el paquete DHIS2 Live y localizar la carpeta llamada "conf".
- 3) En conf/ abrir el fichero llamado 'hibernate.properties' en un editor de texto (bloc de notas o similar) y hacer la siguiente modificación: encontrar la expresión 'jdbc:h2:./database/dhis2' y reemplazar la parte 'dhis2' por el nombre que queremos dar a nuestra base de datos (ej. dhis2_test).
- 4) Guardar y cerrar el fichero hibernate.properties file.
- 5) Arrancar DHIS 2 Live haciendo doble click en el fichero dhis2-live.exe en la carpeta de instalación de DHIS 2 Live o utilizando el acceso directo de escritorio o el enlace en el menú.
- 6) Esperar a que se abra la ventana del navegador web y la pantalla de login, y nos logueamos con nombre de usuario admin y contraseña district.
- 7) Ahora veremos un sistema DHIS2 totalmente vacío y deberemos comenzar a añadir usuarios, jerarquía organizativa, elementos de datos, sets de datos, etc. Para instrucciones detalladas sobre cómo hacer esto, podemos revisar otras secciones de este manual.

2.1.3. Trabajando directamente con la base de datos H2

DHIS 2 Live utiliza una base de datos [H2](#) embebida. Esto tiene varias ventajas, ya que no hay necesidad entonces de instalar un motor de base de datos separado como PostgreSQL o MySQL, y es posible hacer una copia de seguridad

simplemente copiando el fichero. Toda la base de datos existe en la memoria, lo que da un alto rendimiento. La desventaja viene de la necesidad de RAM. Este formato no es válido para instalaciones de servidor con múltiples usuarios.

En general, es recomendable trabajar con la base de datos mediante el interfaz de usuario de DHIS2, pero en algunas situaciones podemos necesitar manejar los datos directamente. Si descargamos H2 por separado, veremos que viene con un interfaz web. De modo que puede manejarse utilizando OpenOffice.org, siguiendo el procedimiento a continuación. Asumimos que dhis2-live está ubicado en el directorio home del usuario Linux (representado por ~). Si no es el caso, sustituiremos aquí la ruta absoluta a nuestra instalación de dhis2-live.

- Arrancamos el procesador de textos OpenOffice y seleccionamos Herramientas - Opciones, luego Java - Class Path... y hacemos click en Añadir archivo...
- Seleccionamos el siguiente fichero (la versión puede cambiar): ~/dhis2-live/webapps/dhis/WEB-INF/lib/h2-1.1.119.jar
- Cerramos la aplicación OpenOffice completamente y luego abrimos la base de datos OpenOffice.org. Seleccionamos conectar con una base de datos existente - JDBC
- El URL de la fuente de datos es:~/dhis2-live/database/dhis2;AUTO_SERVER=TRUE, y la clase del controlador JDBC es org.h2.Driver
- El nombre de usuario es sa, no es necesaria contraseña. Finalmente, seleccionamos un nombre y carpeta para el fichero .odb.

[Más info](#)

2.1.4. Descargar e instalar la versión de servidor

La versión de servidor puede descargarse de dhis2.org/download. Para una información detallada sobre cómo instalarlo veremos el capítulo de instalación en la Guía de Implementación.

2.2. Loguearse en DHIS 2

Independientemente de si hemos instalado la versión de servidor o la versión Live de escritorio, podremos utilizar un navegador web para loguearnos en el sistema. DHIS2 debería ser compatible con la mayoría de navegadores web modernos, aunque debemos asegurarnos de que Java Script esté habilitado.

Para loguearnos en la aplicación introducimos <http://localhost:8080/dhis> si estamos utilizando el paquete DHIS2 Live, o reemplazamos el localhost con el nombre o dirección IP del servidor donde está instalada la versión de servidor.

Una vez hemos arrancado DHIS2, ya sea online o offline, la pantalla nos pedirá ingresar nuestro nombre de usuario registrado y contraseña. Después de introducir la información requerida haremos click en el botón de Entrar para loguearnos en la aplicación. El nombre de usuario y contraseña por defecto son 'admin' y 'district'. Debemos cambiarlos inmediatamente después de loguearnos en DHIS2 por primera vez.

2.3. Creación de nuevos usuarios y roles

Esta sección describe cómo añadir nuevos usuarios a la aplicación DHIS2.

2.3.1. Abrir el menú de usuario

Para crear o encontrar un usuario empezaremos haciendo click en el módulo 'Usuario' que aparece en el menú desplegable del módulo de Mantenimiento, ubicado en la barra de herramientas principal en la parte superior de la pantalla.



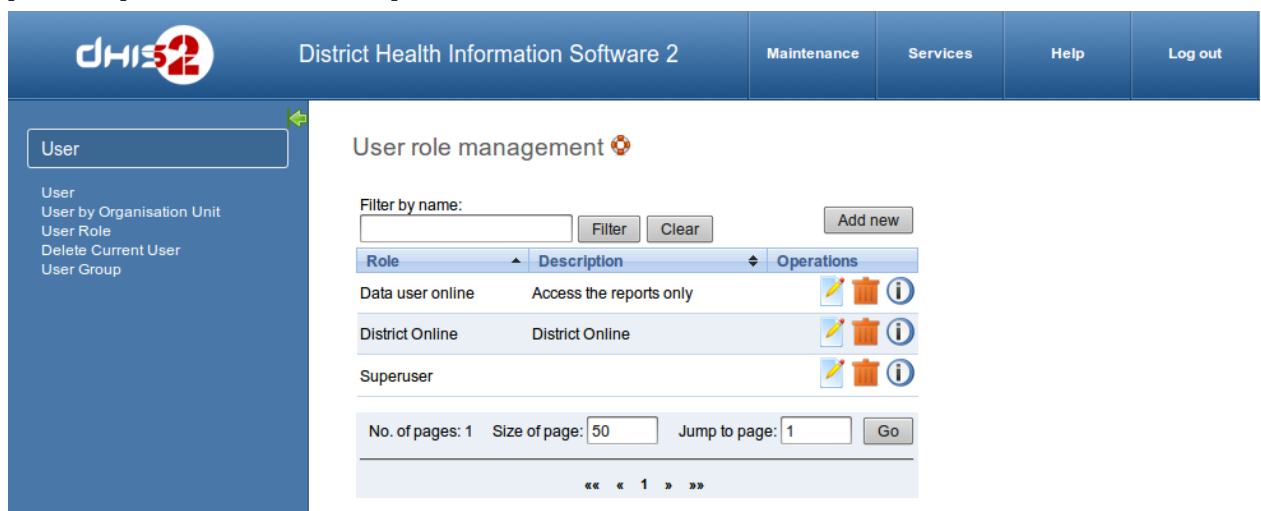
Los nombres de usuario ya registrados aparecerán como una lista tal y como se muestra en la pantalla abajo.



Podemos buscar nombres de usuario específicos en la lista de usuarios introduciendo el nombre en 'filtrar por nombre de usuario' como se muestra arriba.

2.3.2. Definir un nuevo rol

Como parte de la creación de un nombre de usuario deberemos definir el rol del usuario. Para ello hacemos click en 'rol de usuario' que aparece en el lado izquierdo de la pantalla. Esto nos mostrará la pantalla de Gestión de Roles donde podremos pinchar en Añadir nuevo para crear un nuevo rol.



La pantalla siguiente se abrirá y en el primer cuadro de texto introduciremos el Nombre del nuevo Rol como 'Superusuario', 'Administrador', etc. El segundo cuadro de texto llamado 'Descripción' da más información sobre el tipo de Rol de Usuario que se ha creado, por ejemplo Usuario Administrador Estatal, Entrada de datos en distrito.

A continuación especificamos los sets de datos concretos que están disponibles para ese rol. También deberemos especificar el tipo de 'autoridad' que damos al usuario concreto. Para cada una de las tres opciones sets de datos, reportes y autoridades podemos seleccionar múltiples opciones del menú desplegable aportado en cada campo. Un usuario puede elegir múltiples opciones también moviéndolas una por una.

Para que los usuarios puedan introducir datos, tenemos que añadirlos al set de datos y al nivel de unidad organizativa correspondiente. También podemos seleccionar múltiples sets de datos individualmente presionando la tecla Ctrl en el teclado y haciendo click en sets de datos individuales.

Finalmente cuando hayamos introducido los campos requeridos haremos click en el botón Guardar ubicado en la parte inferior de la pantalla. El rol de usuario deseado y la autorización relacionada quedarán guardados en la base de datos, y pueden entonces asignarse a un usuario concreto.

2.3.3. Añadir un nuevo usuario

Para un rol de usuario puede haber más de un usuario. Podemos añadir nuevos usuarios en las opciones de Usuario bajo el módulo de Mantenimiento.

Para añadir un nuevo usuario, seguiremos los pasos siguientes:

- Hacemos click en el botón Añadir nuevo
- Introducimos detalles del Nuevo Usuario como Nombre de usuario, Contraseña, Confirmación de contraseña, Apellido, Nombre y Email en las pestañas de opción de Usuario.
- Hacemos click en el botón Añadir para confirmar los nuevos detalles del usuario y corregimos si hay algún error.
- El usuario recién creado ya debe verse en la pantalla principal de gestión de usuarios
- Podemos editar detalles (como contraseña, apellido, etc.) y eliminar detalles de nuevos o antiguos usuarios seleccionando el Usuario correspondiente, haciendo click en el botón Editar y luego Eliminar.
- Hacemos click en Guardar después de editar todos los detalles de un usuario en particular.

Create new user

Details

Username *

Password *

Retype password *

Surname *

First name *

E-mail

Phone number

Roles

Available roles

- Superuser
- District Online
- Data user online

Selected roles

Organisation Unit Tree Selection

Select at level: National ▼ Un-select at level

Select in group: Blood Bank ▼ Un-select in group

Un-select all Select all

Un-select children Select children

Kenya

Add **Cancel**

2.4. Salir de DHIS 2

Para salir de la aplicación simplemente haremos click en el enlace "Salir" en la esquina superior derecha de la pantalla.

2.5. Una introducción rápida al diseño de una base de datos en DHIS2

La aplicación DHIS2 viene con un conjunto de herramientas para la recolección, validación, reporte y análisis de datos, pero los contenidos de la base de datos, por ejemplo, qué recolectar, quién debería registrarlo y en qué formato, dependerá del contexto de uso. Estos metadatos deben ser introducidos en la aplicación antes de que pueda utilizarse, y esto puede hacerse directamente mediante el interfaz de usuario sin necesidad de programación de código o grandes habilidades técnicas sobre software. A este proceso inicial lo llamamos diseño de la base de datos o personalización de la aplicación.

Esta sección ofrece una rápida y breve introducción al diseño de la base de datos en DHIS2 y fundamentalmente explica los pasos necesarios para preparar un nuevo sistema DHIS2 para su uso. Cómo realizar cada paso se explica en otros capítulos, y las buenas prácticas en las decisiones de diseño se explican en la Guía de Implementación. A continuación se listan los pasos a seguir:

1. Montar una jerarquía organizativa

2. Definir los elementos de datos
3. Definir los sets de datos y los formularios de entrada de datos
4. Definir las reglas de validación
5. Definir indicadores
6. Definir tablas de reportes y diseñar reportes
7. Montar el módulo SIG
8. Diseñar gráficas y personalizar el panel de control (dashboard)

2.5.1. La jerarquía organizativa

La jerarquía organizativa define la organización en DHIS 2: los establecimientos de salud, las áreas administrativas y otras áreas geográficas utilizadas en la recolección y el análisis de datos. Esta dimensión de los datos se define como una jerarquía con una unidad raíz (ej. Ministerio de Salud) y diversos niveles y nodos debajo. Cada nodo en esta jerarquía es lo que en DHIS 2 llamamos unidad organizativa. El diseño de esta jerarquía determinará las unidades geográficas de análisis disponibles a los usuarios al momento en que los datos son registrados y agregados en esta estructura. Solo puede haber una jerarquía organizativa en el sistema, de modo que deberemos considerar cuidadosamente cómo estructurarla.

Es posible modelar jerarquías adicionales (tales como límites administrativos paralelos al Sector Salud) utilizando grupos organizativos y sets de grupo, pero la jerarquía organizativa es el vehículo principal para la agregación de datos en una dimensión geográfica. Normalmente las jerarquías organizativas nacionales en Salud Pública tienen entre 4 y 6 niveles, pero DHIS soporta cualquier cantidad de niveles. La jerarquía se construye con relaciones padre-hijo, por ejemplo: una unidad País o Ministerio de Salud (la raíz) puede tener 8 unidades hijo (provincias), y cada provincia (en nivel 2) puede tener a su vez 10 ó 15 distritos como nodos hijo. Generalmente los establecimientos de salud estarán colocados en el nivel más bajo, pero también podemos colocarlos en niveles más altos como sucederá con los hospitales provinciales o nacionales, de modo que es posible tener árboles organizativos asimétricos (ej. un nodo hoja puede estar colocado en el nivel 2 mientras la mayoría de nodos hoja se encuentran en el nivel 5).

Normalmente hay una jerarquía geográfica definida por el sistema de salud, por ejemplo, dónde se ubican las oficinas administrativas (el Ministerio de Salud, las direcciones provinciales, distritales..), pero frecuentemente hay también otros límites administrativos en el país que pueden o no añadirse, dependiendo de si estas subdivisiones mejoran el análisis de los datos. Cuando diseñamos la jerarquía el número de hijos para cada unidad organizativa debe indicar la utilidad de dicha estructura, es decir, tener una o más relaciones 1 a 1 entre dos niveles no es muy útil ya que los valores serán los mismos para el nivel padre y el nivel hijo. En el lado opuesto tendríamos un número demasiado grande de hijos en medio de la jerarquía (por ejemplo, 50 distritos en una provincia) que podemos resolver con un nivel intermedio extra que aumente la utilidad del análisis de los datos. El nivel más bajo, los establecimientos de salud, a menudo tienen un número grande de hijos (entre 10 y 60), pero para otros niveles superiores en la jerarquía es recomendable limitarlo a 5-20 hijos. Demasiados o demasiado pocos hijos puede indicarnos que deberíamos eliminar o añadir un nivel. Es importante resaltar que es fácil hacer cambios en los niveles altos de la jerarquía a posteriori, el único problema es cambiar las unidades organizativas que recogen los datos (los nodos hoja), al subdividir o fusionar establecimientos de salud. El agregado de datos hacia arriba en la jerarquía se realiza según la jerarquía establecida en un momento dado, y siempre reflejará los cambios más recientes en la estructura organizativa. Hay más detalle en el capítulo sobre Unidades Organizativas para aprender cómo crear unidades organizativas y cómo construir la jerarquía.

2.5.2. Elementos de datos

El Elemento de Datos es probablemente el bloque más fundamental de una base de datos en DHIS2. Representa la dimensión *qué*, ya que explica qué se está recopilando o analizando. En algunos contextos esto está referido a un indicador, para en DHIS2 llamamos elemento de datos a esta unidad de colección y análisis. El elemento de datos a menudo representa un conteo de algo, y su nombre describe qué es aquello que se está contando, por ejemplo "Dosis entregadas de BCG" o "Casos de Malaria". Cuando los datos son recopilados, validados, analizados, reportados o presentados, lo que describe el QUÉ de los datos son los elementos de datos o expresiones construidas a partir de

elementos de datos. Como tales, los elementos de datos se vuelven importantes para todos los aspectos del sistema y deciden no sólo cómo se recopilan los datos, sino algo más importante: cómo los valores de datos se representan en la base de datos, lo cual de nuevo afecta a cómo los datos son analizados y presentados.

Es posible añadir más detalles a la dimensión "QUÉ" mediante las categorías de elementos de datos. Algunas categorías comunes son Edad y Género, pero es posible añadir cualquier categoría identificada por el usuario y enlazarla con elementos de datos específicos. La combinación del nombre de un elemento de datos y su categoría asignada define la unidad más pequeña de recolección y análisis disponible en el sistema, y por tanto describe los datos en bruto en la base de datos. Podemos hacer agregados al alejarnos en esta dimensión, pero no es posible acercarnos, descomponerlo más, ya que diseñar elementos de datos y categorías define el detalle de análisis posible en el sistema (en la dimensión QUÉ). Si hacemos cambios posteriores en los elementos de datos y categorías puede complicarse, ya que esto cambiará el significado de los valores de datos ya registrados en la base de datos. De modo que este paso es uno de los más decisivos y cuidadosos en el proceso de diseño de la base de datos.

La mejor práctica en el diseño de elementos de datos es pensar en los elementos de datos como una unidad de análisis de datos y no sólo como un campo en el formulario de entrada de datos. Cada elemento de datos tiene vida propia en la base de datos, completamente separado del formulario, y los reportes y otras salidas se basan en elementos de datos y expresiones o fórmulas compuestas por elementos de datos y no en los formularios de colección de datos. De modo que las necesidades del análisis de datos son las que deberían dirigir este proceso, y no el aspecto y función amigables del formulario de colección de datos. Una regla de oro es que el nombre del elemento de datos debe entenderse por sí mismo y describir el valor del dato también fuera del contexto de su formulario de registro. Por ejemplo, un nombre de elemento de dato como "Total referidos" tiene sentido cuando miramos bien en el formulario de "RCH" o de "OPD", pero por sí mismo no describe de forma unívoca el fenómeno (¿quiénes son referidos?), y debería más bien llamarse "Total referidos en maternidad" o "Total referidos en OPD". Dos elementos de datos diferentes con significados distintos, aunque el campo en el formulario de papel puede simplemente decir "Total referidos" ya que el usuario del formulario siempre sabe de dónde vienen los referidos (está contextualizado). En una base de datos o un repositorio de elementos de datos este contexto no es válido, y por eso los nombres de los elementos de datos se vuelven muy importantes al describir los datos.

Las propiedades comunes de elementos de datos pueden modelarse con lo que llamamos grupos de elementos de datos. Los grupos son completamente flexibles en el sentido de que son definidos por el usuario, tanto sus nombres como sus miembros. Los grupos son útiles tanto para explorar como para presentar los datos relacionados, pero también pueden utilizarse para agregar elementos de datos. Los grupos están vinculados a elementos de datos pero no ligados directamente a los valores de los datos, lo que implica que podemos modificarlos y añadir nuevos grupos en cualquier momento sin interferir en los datos en bruto.

2.5.3. Sets de datos y formularios de entrada de datos

Toda la entrada de datos en DHIS 2 se organiza mediante la utilización de sets de datos. Un set de datos es una colección de elementos de datos agrupados juntos para la recopilación de datos, y en el caso de instalaciones distribuidas también define pedazos de datos para exportarlos o importarlos entre instancias de DHIS 2 (por ejemplo de una instalación local en una oficina distrital a un servidor nacional). Los sets de datos no están vinculados directamente a los valores de datos, solo mediante sus elementos de datos y frecuencias, y como tales los sets de datos pueden ser modificados, eliminados o añadidos en cualquier momento sin que esto afecte a los datos en bruto previamente capturados en el sistema, pero tales cambios afectarán por su puesto a cómo se registrarán nuevos datos.

Un set de datos tiene un tipo de periodo que indica la frecuencia de registro de datos, que puede ser diaria, semanal, mensual, trimestral, semestral o anual. Tanto qué elementos incluir en el set de datos como el tipo de periodo son definidos por el usuario, junto con un nombre, un nombre corto y un código.

Para utilizar un set de datos para recopilar los datos de una unidad organizativa específica debemos asignar la unidad organizativa al set de datos, y este mecanismo controla qué unidades organizativas pueden utilizar qué sets de datos, y al mismo tiempo define los valores objetivo para la completitud de los datos (por ejemplo, cuántos establecimientos de salud en un distrito esperamos que envíen datos de RCH cada mes).

Un elemento de datos puede pertenecer a múltiples sets de datos, pero requiere una reflexión cuidadosa ya que puede luego provocar solapes y el registro de datos inconsistentes si por ejemplo, los sets de datos reciben diferentes frecuencias y son utilizados por las mismas unidades organizativas.

2.5.3.1. Formularios de entrada de datos

Una vez hemos asignado un set de datos a una unidad organizativa, ese set de datos quedará disponible en Entrada de Datos (en el menú de Servicios) para las unidades organizativas que le hayamos asignado y para los periodos válidos de acuerdo con el tipo de periodo del set de datos. Un formulario de entrada de datos por defecto aparecerá entonces, y es simplemente una lista de los elementos de datos que pertenecen al set de datos junto a una columna para introducir los valores. Si nuestro set de datos contiene elementos de datos con categorías como grupos de edad o género, entonces aparecerán columnas adicionales en el formulario por defecto en base a estas categorías. Además del listado por defecto hay otras dos alternativas de formularios: de sección y personalizado.

2.5.3.1.1. Formularios de Sección

Los formularios de sección nos permiten una mayor flexibilidad que los formularios en tabla (por defecto) y son rápidos y sencillos de diseñar. Frecuentemente nuestros formularios de entrada de datos requieren múltiples tablas con subtítulos, y a veces necesitamos deshabilitar (poner en gris) unos pocos campos de la tabla (por ejemplo, para algunas categorías que no aplican a todos los elementos de datos), y estas funciones son soportadas en los formularios de sección. Después de definir un set de datos podemos definir sus secciones con subconjuntos de elementos de datos, un encabezado y posibles campos en gris. También podemos fijar el orden de las secciones en un set de datos. En Entrada de Datos podemos comenzar a utilizar el formulario de sección (deberá aparecer automáticamente cuando las secciones quedan disponibles para el set de datos seleccionado). Podemos cambiar pasar de formularios por defecto a sección en la esquina superior derecha de la pantalla de entrada de datos. Muchos formularios de entrada de datos tabulares deberían poder convertirse en formularios de sección, y cuantos más de estos utilizemos más fácil nos resultará. Si estos dos tipos de formularios no cumplen nuestros requisitos, entonces tenemos también una opción totalmente flexible, aunque nos llevará más tiempo su diseño: los formularios personalizados de entrada de datos.

2.5.3.1.2. Formularios personalizados

Cuando el formulario que queremos diseñar es demasiado complicado para los formatos por defecto o de sección, esta es nuestra última opción. Nos llevará más tiempo, pero ofrece total flexibilidad en términos de diseño. En DHIS2 hay un editor HTML (Editor FCK) para el diseñador de formularios y podemos diseñar el formulario en el interfaz de usuario o bien pegar nuestro código HTML directamente (utilizando la ventana Fuente del editor). En el formulario personalizado podemos insertar texto estático o campos de datos (vinculados a elementos de datos y categorías) en cualquier posición del formulario y tendremos total libertad para diseñar la apariencia del formulario. Una vez hayamos añadido el formulario personalizado a un set de datos, deberá estar disponible en Entrada de Datos y podremos comenzar a usarlo inmediatamente. Podemos cambiar o regresar a los formularios por defecto o de sección, en la esquina superior derecha de la pantalla de entrada de datos.

2.5.4. Reglas de validación

Una vez que hayamos configurado la parte de entrada de datos del sistema y comenzado a recoger datos, entonces es momento de definir chequeos de calidad de los datos que ayuden a mejorar la calidad de los datos que se están recopilando. Podemos añadir tantas reglas de validación como queramos, que estarán compuestas por expresiones a izquierda y derecha de un operador matemático, que a su vez están formadas por elementos de datos. Las reglas típicas consisten en comparar los subtotales con los totales de algo. Por ejemplo, si tenemos dos elementos de datos "Test VIH realizados" y "Test VIH resultado positivo", entonces sabemos que en el mismo formulario (es decir, para el mismo periodo y unidad organizativa) el número total de tests deberá ser siempre igual o mayor que el número de tests positivos. Estas reglas deberían ser reglas absolutas, que significa que son matemáticamente correctas y no simplemente asunciones o "casi siempre correctas". Las reglas se pueden ejecutar en la entrada de datos, después de rellenar cada formulario, o como un proceso por tandas testeando múltiples formularios de una vez, por ejemplo para todos los establecimientos durante el mes de reporte previo. Los resultados de los tests de validación mostrarán un listado con todas las infracciones y con los valores detallados de cada lado de la expresión donde se produjo la infracción para facilitar que regresemos a la entrada de datos y corrijamos los valores.

2.5.5. Indicadores

Los indicadores representan seguramente la herramienta más poderosa de análisis incluida en DHIS 2. Mientras los elementos de datos representan los datos en bruto (conteos) que son recopilados, los indicadores representan fórmulas

que proporcionan tasas cobertura, tasas de incidencia, ratios y otras unidades de análisis calculadas. Un indicador se compone de un factor (por ejemplo 1, 10, 100, 10 000), un numerador y un denominador, los dos últimos siendo expresiones obtenidas a partir de uno o varios elementos de datos. A modo de ejemplo, el indicador "Cobertura BCG <1 año" queda definido por una fórmula con factor 100, numerador el número de "dosis BCG entregadas a niños menores de 1 año", y denominador la "población diana menor de 1 año". El indicador "Tasa de exclusión de DPT1 a DPT3" es una fórmula de $100 \% \times ("Dosis\ entregadas\ DPT1" - "Dosis\ entregadas\ DPT3") / ("Dosis\ entregadas\ DPT1")$

La mayoría de los módulos de reporte en DHIS 2 soportan tanto elementos de datos como indicadores y podemos incluso combinarlos en reportes personalizados. Pero la diferencia más importante y la ventaja de los indicadores frente a los datos en bruto (los valores de los datos en los elementos de datos) es la capacidad para comparar datos a través de áreas geográficas distintas (por ejemplo, áreas muy pobladas frente a áreas rurales) ya que la población diana puede utilizarse como denominador.

Es posible añadir, modificar y eliminar indicadores en cualquier momento sin interferir en los valores de los datos que ya se encuentran en la base de datos.

2.5.6. Reportes y tablas de reportes

Una manera muy flexible de presentar los datos que se han recopilado son los reportes estándar en DHIS 2. Los datos pueden ser agregados por unidad organizativa o cualquier nivel de orgunit, por elemento de datos, por indicadores, así como a lo largo del tiempo (por ejemplo, mensual, trimestral, anualmente). Las tablas de reportes son fuentes de datos personalizadas para los reportes estándar y se pueden definir de manera flexible en el interfaz de usuario y posteriormente acceder a ellas con diseñadores externos de reportes como iReport o BIRT. Estos diseños de reporte se pueden configurar para ser accesibles fácilmente "one-click" con unos parámetros predefinidos de modo que los usuarios puedan lanzar los mismos reportes, por ejemplo, cada mes cuando se introducen nuevos datos, y también pueden ser relevantes a usuarios a todos los niveles ya que la unidad organizativa puede seleccionarse al momento de lanzar el reporte.

2.5.7. SIG

En el módulo integrado de SIG podemos mostrar fácilmente nuestros datos en mapas, tanto en polígonos (áreas) como en puntos (establecimientos de salud), y tanto los elementos de datos como los indicadores. Si añadimos al sistema las coordenadas de nuestras unidades organizativas, podemos rápidamente comenzar a trabajar con este módulo. Recomendamos ver la sección SIG para más detalles sobre cómo configurar este módulo.

2.5.8. Gráficas y panel de control (dashboard)

Una de las maneras más sencillas de mostrar nuestros datos de indicadores es utilizar gráficas. Una pantalla de diálogo amigable nos guiará a través de la creación de varios tipos de gráficas con data de indicadores, unidades organizativas y periodos a nuestra elección. Estas gráficas pueden añadirse fácilmente a una de las cuatro secciones del dashboard destinadas a gráficas, y así las tendremos disponibles directamente al entrar en nuestra sesión. Para esto deberemos fijar el módulo dashboard como el módulo de inicio en la configuración de usuario.

Capítulo 3. Unidades organizativas

En esta sección aprenderemos cómo:

- Crear una nueva unidad organizativa y montar la jerarquía de unidades organizativas
- Crear grupos de unidades organizativas, sets de grupos, y vincularlos con unidades organizativas
- Realizar cambios en la jerarquía de unidades organizativas

3.1. La jerarquía organizativa

La jerarquía organizativa define la estructura de la instancia DHIS2, indicando cómo se relacionan entre sí establecimientos de salud, áreas administrativas y otras áreas geográficas. Es esencialmente la dimensión 'dónde' en DHIS2, similar a como los periodos representan el 'cuándo' o la dimensión tiempo. DHIS2 se estructura de tal manera que la jerarquía de unidades organizativas es también una jerarquía geográfica, y el módulo SIG depende de ello. Las jerarquías no geográficas son ignoradas, y se prefiere su representación mediante la utilización de grupos de unidades organizativas. Esta dimensión de los datos se define como una jerarquía con un nodo raíz (por ejemplo, el Ministerio de Salud del país) y varios niveles y nodos debajo. Cada nodo en esta jerarquía es lo que llamamos unidad organizativa en DHIS2.

El diseño de esta jerarquía determinará las unidades geográficas de análisis disponibles a los usuarios, a medida que los datos se registran y agregan siguiendo esta estructura. Solo hay una jerarquía organizativa al mismo tiempo de modo que el diseño de esta estructura requiere una atención cuidadosa.

Otras jerarquías (como límites administrativos paralelos al sector salud) pueden modelarse utilizando grupos organizativos o sets de grupos, pero la jerarquía organizativa es el principal vehículo de la agregación de datos en la dimensión geográfica. Generalmente las jerarquías organizativas nacionales en los sistemas públicos de salud tienen entre 4 y 6 niveles, aunque DHIS2 acepta cualquier número de niveles.

La jerarquía se construye con relaciones padre-hijo. Por ejemplo un país puede tener 8 provincias, y cada provincia de nuevo tener varios distritos como 'hijos'. Normalmente los establecimientos de salud (donde se registran los datos) se encuentran en el nivel más bajo, pero también pueden estar ubicados en niveles superiores, por ejemplo hospitales nacionales o provinciales, de modo que puede haber árboles organizativos truncados (donde un nodo hoja puede estar ubicado en el nivel 2 mientras todos los demás están en el nivel 5).

Notemos que es bastante fácil realizar cambios en los niveles superiores de la jerarquía posteriormente, el único problema es cambiar las unidades organizativas que registran los datos (los nodos hoja), por ejemplo dividiendo o fusionando establecimientos de salud. La agregación hacia arriba en la jerarquía puede hacerse en base a la jerarquía actual en cualquier momento y siempre reflejará los cambios más recientes de la estructura organizativa.



Importante

Dado que la información más reciente que está contenida en la jerarquía de unidades organizativa es siempre utilizada para agregado, es importante tener en cuenta que los cambios ahí (tales como la división de distritos en subdistritos) no se respetará posteriormente. Por ejemplo, si el Distrito A se subdivide en Distrito B y Distrito C. Este es un proceso que en ocasiones sucede por razones políticas. Los establecimientos que pertenecen al distrito A necesitarán ser reasignados a los distritos B y C según corresponda. Sin embargo, cualquier dato histórico, que se haya introducido antes de que la división ocurra, todavía quedará registrado como perteneciente a los distritos B y C y no al extinto distrito A. Esta representación temporal de la jerarquía organizativa en el tiempo se perderá.

3.2. Mantenimiento de la unidad organizativa

3.2.1. Unidades organizativas

This is where you can create organisation units (from now on referred to as orgunits) and build up the orgunit hierarchy. Orgunits are added one by one as either root unit or a child of a selected unit. The left side menu represents the current organisational hierarchy and if you select a unit there you will see its children listed in the main list of orgunits in the middle of the screen. When an orgunit is selected in the left side menu you can also add new child units to it. To locate an orgunit in the hierarchy you can either navigate through the tree by expanding the branches (click on the + symbol), or search for it by opening the search field (click the green symbol above the root of the hierarchy). In search you can either search for the orgunit name or its code, both will only show exact matches (case-insensitive). To add a new orgunit first select its parent and then click on the Add new button in the top right corner of the list of orgunits. To add a new root orgunit make sure no orgunit is selected in the menu and click on "Add new". The details of adding a new orgunit are explained in [Sección 3.2.1.1, "Editando unidades organizativas"](#).

3.2.1.1. Editando unidades organizativas

To edit the properties of an existing orgunit first select its parent (if any) in the left side menu, then locate the orgunit

in the listed orgunits, and finally click on the "Edit"  button next to the name of the orgunit that you want to modify. The following properties can be defined in the Edit (or Create new) window:

- **Nombre:** Define the precise name of the orgunit in this field. Each orgunit must have a unique name.
- **Nombre corto:** Typically, an abbreviation of the full name. This attribute is often used in reports to display the name of the orgunit, where there is limited space available.
- **Código:** In many countries, orgunits are assigned a code. This code can be entered in this field.
- **Fecha de apertura:** Used to control which orgunits that were existing at a point in time, e.g. when analysing historical data. This attribute is required. The default date for opening of organisation units is 1900-01-01, but can be set to any date (even dates which occur in the future).
- **Registra datos:** This property is used to identify which orgunits that can register data or not. Sometimes administrative orgunits at higher levels in the hierarchy are not supposed to register any data. This can help control the data entry process as only orgunits with this property set to Yes will be available for data entry.
- **Comentarios:** Any additional information that you would like to add can be put here.
- **Coordenadas:** This field is used to create the maps in the GIS module. Paste in the coordinates of the orgunit in this field, either a polygon (for orgunits that represent an administrative boundary) or a point (for health facilities). Without this information the GIS module will not work. It might be more efficient to import these coordinates later as a batch job for all orgunits using the import module. See the GIS chapter for more details.
- **URL:** You can use this field to insert a URL link to an external web site that has additional information about this specific orgunit.
- **Información de contacto:** A contact person, address, email, and phone number can be entered in these fields. This information can be vital for facilitating follow-up.
- **Sets de datos:** Datasets can be assigned to organisational units here. See the chapter on "Data sets" for more detailed information on assigning datasets to organisational units.
- **Grupos de unidades organizativas:** Assignments to organisational units group sets can be assigned through the individual drop-down boxes which appear for each group set.

3.2.2. Sets de grupos de unidades organizativas

Group sets can be understood as a flexible tool to add more categorisation to orgunits. Any number of group sets can be added, but as a default start all databases will have the two group sets "Type" and "Ownership". Using these group sets will simplify how reporting is done, and facilitate analysis through the use of tools such as Excel PivotTables.

While a group set like "Type" describes a measure dimension, the actual categories are represented by the groups, and the categorisation of an orgunit through the orgunit's group memberships. This can be understood as a parallel hierarchy

of orgunits with the group set as the root ("Type"), the groups at level 2 (e.g. "Clinic", "Hospital", "Dispensary"), and the actual orgunits at level 3. The group set can as such provide additional information and dimensionality to the data analysis as data is easily filtered, organised, or aggregated by groups within a group set.

For this aggregation to work without any duplication in the data some rules are necessary. A group set is always exclusive, which means that an orgunit cannot be member of more than one group in a group set. Therefore, when creating a new organisational unit, you will only be allowed to select a single organisational group membership for each group set. Furthermore it is possible to define whether a group set is compulsory or not, which will affect the completeness of the data when analysing data using group sets. Compulsory means that ALL orgunits must be member of a group in that group set.

We recommend that you approach the orgunit grouping in the following sequence (and one group set at a time):

1. Define a new group set, such as "Location".
2. Add new groups (such as "Urban", "Rural" and "Peri-urban"). Once all groups have been defined, return to the organisational unit group set and assign each of the desired groups to the group set.
3. Go back to each group, one by one, go to edit mode and assign the orgunits that should be member of the group. Should you follow this route, you can place multiple organisation units at a time in a group. However, you must be careful not to place the same organisational units in two groups which itself is a member of an organisation unit group set. This will result in a data integrity violation. If you have organisation unit groups which are not exclusive, they should not be members of a group.
4. A better way to ensure that you do not mistakenly assign an organisation unit to multiple members of a group set is you can use the edit feature of each organisational unit to assign memberships to each group set. You will only be able to assign a single organisation unit at a time however.

It is important to keep in mind when using the "Organisational unit group" set function, that unless great care is taken, organisational units can be assigned to multiple groups of a group set. This can be checked through the "Data Integrity" module, which will report which organisational units are not members of a compulsory organisational unit group set, and which organisational units have been assigned to more than one member of a group set.

3.2.2.1. Edición de los sets de grupos de unidades organizativas



Click on the "Edit" button next to the name of the orgunit group set that you want to modify. The following properties can be defined in the Edit (or Create new) window:

- Name: Provide a precise name for the group set.
- Description: Describe the phenomena the group set is measuring/capturing.
- Compulsory: Indicate whether ALL orgunits need to be member of a group in this group set or not.
- Available groups/Selected groups: Here you assign groups to your group set by using the arrow buttons to move highlighted groups between the two lists (/selected). If no groups appear in the list then you must go to orgunit groups and create new groups there first. Note that assigning groups that will violate the exclusive rule on group sets is not possible, e.g. adding a group that already has assigned an orgunit that again is already member of a group that has already been selected by this group set, will not be possible since one orgunit will end up with two group memberships in the same group set. To avoid such situations we recommend first adding groups to group sets, and then orgunits to groups.

3.2.3. Grupos de unidades organizativas

This function will allow you to add new and manage existing organisation groups and their memberships. It can be accessed by choosing Maintenance->Organisation units->Organisation Unit group from the main menu. To add a new orgunit group click on the "Add new" button in the top right corner of the list of groups.

3.2.3.1. Edición de grupos de unidades organizativas



Click on the "Edit" button next to the name of the orgunit group that you want to modify. The following properties can be defined in the Edit (or Create new) window:

- Name: Provide a precise name for the orgunit group.
- Organisation unit tree selection: This is where you assign orgunits to the group. The tree supports multiple selection so select all the orgunits that you want to add (the selected ones appear with orange color) and click on "Save". Click on "Cancel" to undo your changes and return to the list of orgunit groups. Use the "Select at level" button and dropdown if you want to select all orgunits at a specific level in the hierarchy (e.g. all districts).

3.2.4. Nivel de la unidad organizativas

Here you specify a contextual name for each level in the hierarchy, e.g. "Country", "Province", "District", "Health Facility", and these names will be used all over the application where levels are referred to. This page will take some time to load if the orgunit hierarchy is very big.

3.2.5. Operaciones jerárquicas

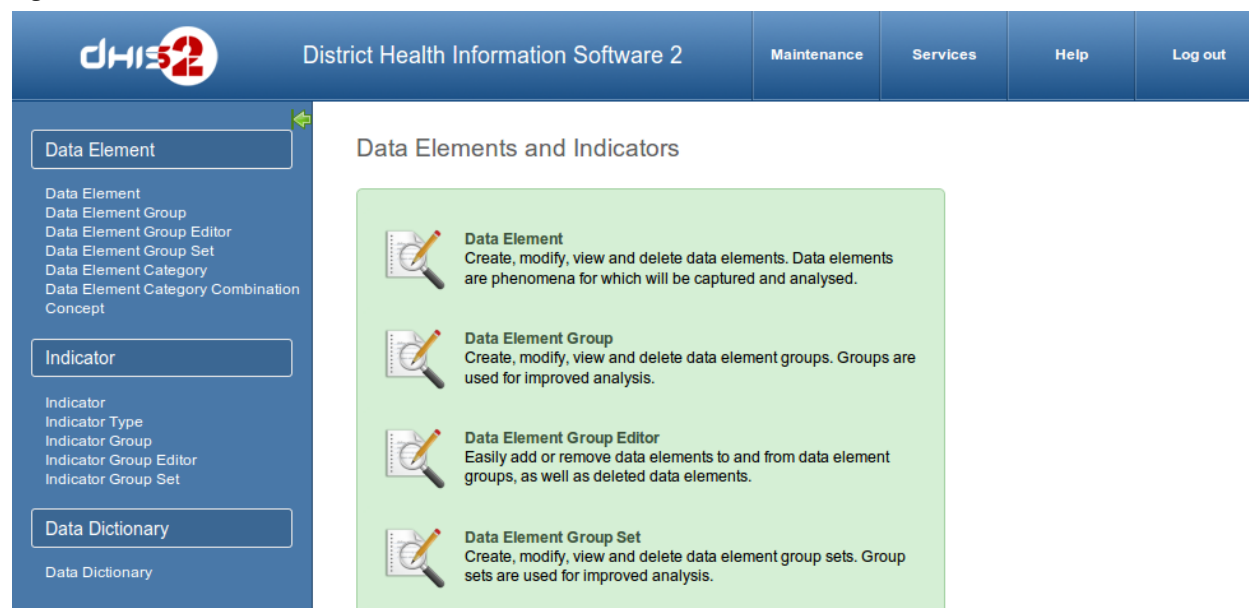
Here you can move orgunits around in the hierarchy by changing the parent of a selected orgunit. This process is done in three steps:

1. Select the orgunit you want to move (in the hierarchy in the left side menu) and click "Confirm" under the "Select an organisation unit to move" label.
2. Select the new parent orgunit (again by using the hierarchy in the left side menu). If no parent is selected then the orgunit will be moved up to root level (top of the hierarchy). Click on the "Confirm" button under the "Select the new parent organisation unit for the one to move" label.
3. Click on the "Move" button to apply your changes to the hierarchy.

Your changes will be immediately reflected in the left side menu hierarchy. At any time in the process (before hitting the Move button) you can click on the "Reset" button to unselect orgunit to move and the new parent.

Capítulo 4. Elementos de datos

Cuando abrimos las opciones de 'Elementos de datos e Indicadores' del menú de Mantenimiento, aparece la pantalla siguiente:



En el menú lateral izquierdo o haciendo click en las secciones listadas en la zona central, podemos acceder a las diversas secciones sobre elementos de datos;

Elemento de datos, Grupo de elementos de datos, Editor de grupo de elemento de datos, Set de grupos de elementos de datos, Categorías de elementos de datos, Combinación de categorías de elementos de datos.

4.1. Mantenimiento de elementos de datos

Cada una de las opciones de mantenimiento de elementos de datos se describen en la sección siguiente.

- Elementos de datos

Crear, modificar, ver y eliminar elementos de datos.

- Grupo de elementos de datos

Crear, modificar, ver y eliminar grupos de elementos de datos

- Editor de grupo de elemento de datos

Añadir o eliminar fácilmente elementos de datos de un grupo de elementos de datos.

- Set de grupos de elementos de datos

Crear, modificar, ver y eliminar sets de grupos de elementos de datos

- Categorías de elementos de datos

Crear, modificar, ver y eliminar categorías de elementos de datos

4.1.1. Elementos de datos

Data elements form the basis of DHIS2. Data elements define what is actually recorded in system, e.g. number of immunisations or number of cases of malaria. The actual creation and definition of the data elements themselves are

far beyond the scope of this manual to describe, but it is assumed that an administrator will be provided with a list of standardised data elements for inclusion into the DHIS2 system.

To access the data element maintenance module, choose Maintenance -> Data elements and Indicators -> Data element.

The 'Filter by name' will allow you to filter a range of data elements if you know either the full name of the data element, or just a part of it. Type the name into the search field and any matching data elements are displayed below. You can also choose 'Filter by group/view all' to narrow down a data element search within a particular data element group. In default mode, this field will display all the data elements in the application. The 'Get PDF' button can be clicked to generate a .pdf file of all the data elements. The 'Sort' button can be used to sort the data elements into alphabetical order.

To add a new data element, click the 'Add new' button. There are various options available from this page that allow the user to modify data elements already present in the database. Each of the options are described below in the "Editing data elements".

4.1.1.1. Editando elementos de datos

Click the "Edit"  button to modify the properties of a data element that has been previously defined.

DHIS2 District Health Information Software 2 Maintenance Services Help Log out

Edit data element

Details

Name * Accidents

Short name Accidents

Alternative name

Code

Description Fractures, injuries

Active * Yes

Domain Type * Aggregate

Value Type * Number

Number type Number

Aggregation operator * Sum

URL

Combination of categories * Age over/under 5

Data element group sets ☐

Aggregation levels ☐

Save Cancel

- **Name:** Define the precise name of the data element in this field. Each data element must have a unique name.
- **Short name:** Typically, an abbreviation of the full data element name. This attribute is often used in reports to display the name of the data element, where there is limited space available.
- **Alternative name:** Allows the definition of an alternative name of the data element.
- **Code:** In many countries, data elements are assigned a code. This code can be entered in this field.
- **Description:** Allows a full textual description of the data element to be entered. The user should be as precise as possible, and include full information on how the data element is measured and what its meaning is.
- **Active:** Defines whether a given data element is active or not. Data elements marked as inactive, will not be displayed in the data entry screens.
- **Domain type:** Defines whether a data element is an aggregate or patient type of data element.
- **Value type:** Defines the type of data this data element will be used to record. Currently there are four options: number, text, yes/no (boolean), and date.
- **Number type:** In order to increase the robustness of data entry, DHIS2 supports several different number types. During data entry, users will be restricted to enter the defined number types only. Each of the available options are described below.
 1. **Number:** This number type supports any real value with a single decimal point, an optional negative sign, and no thousands separators.
 2. **Integer:** Any whole number (positive and negative), including zero.
 3. **Positive integer:** Any whole number greater than (but not including) zero.
 4. **Negative integer:** Any whole number less than (but not including) zero.
- **Aggregation operator:** Defines the default aggregation operation that will be used on this data element. Most data elements should have the "SUM" option set. This includes all data elements which should be added together. Other data elements, such as staffing levels, should be set to use the "AVERAGE" operator, when values along the time dimension should not be added together, but rather averaged.
- **URL:** A URL having an in-depth description of the data element can be entered in the 'URL' field. This could be for instance, a link to a metadata repository or registry that contains detailed technical information about the definition and measurement of the data element.
- **Combination of categories:** Defines which category combination the data element should have.

- Data element group sets: Click the check box to activate this option then choose which data element group sets this data element should belong to. Available data element group sets are displayed in the upper window. Click the desired data element group set, then the "Add selected" button to add the data element to the group set. To remove a data element from a group set, click the data element group set in the lower list, and then click "Remove selected".
- Calculated: This option is available only when a data element is created.



Nota

As of version 2.3, calculated data elements have been deprecated. Calculated data elements should therefore be implemented as indicators instead.

Select the data elements that will be used to define the calculated data element, and then click "Add selected" to add them to the calculated data element composition list. Fill in the correct factor for the data element calculation component (defaults to 1). Component elements of the calculated data element can be removed from the definition by pressing the "Remove" button.

- Aggregation levels: The Aggregation Levels option allows the data element to be aggregated at one or more levels. When the user clicks on the Aggregation levels option, a drop down menu appears which displays available aggregation levels. The desired aggregation level is then selected by clicking the 'Add Selected' button. By default, the aggregation will start at the lowest assigned organisation unit. If e.g. Chiefdom is selected below it means that Chiefdom, District, and National aggregates will use Chiefdom (the highest aggregation level available) as the data source, and PHU data will not be included. PHU data will still be available for the PHU level, but not included in aggregations to the levels above. If District and Chiefdom are both selected then the District and National level aggregates will use District data as their source, Chiefdom will use Chiefdom, and PHU will use PHU. Read more about aggregation levels in the Reporting chapter in the section on data sources for reporting.

After making the required changes, click 'Save' to institute them. The 'Cancel' button aborts all changes made.

4.1.1.2. Traducción de elementos de datos

DHIS2 provides functionality to translate existing data elements into other languages. Simply press the translate button



to get started. The following dialogue will appear.

The reference language is displayed in the upper right portion of the dialogue. Choose a locale to translate the data element into by selecting an option from the locale drop-down menu. Specify the name, short-name and description in the target language. Press "Save" to save your changes.

The "Details" section of this dialogue will allow you add a new locale if it is not already present in the database. There are two options:

- Language code

Refers to the ISO 639-1 (two-letter code) language code. Refer to this [web page](#) for a detailed listing of language codes.

- Country code

Refers to the ISO 3166-1-alpha-2 code. A complete listing is available [here](#).

The combination of these two codes together, forms a "locale" code, which is composed of the combination of the location and language. A very comprehensive discussion of the technical standard (RFC 3066) is available [here](#). This [page](#) provides a very comprehensive list of recognised locale codes.

4.1.1.3. Eliminando un elemento de datos



Simply press the delete button  to delete a data element. Note that this operation is only possible if there is no data attached to the data element itself. The user will be prompted to ensure that the data element should be deleted.

4.1.1.4. Mostrar detalles de un elemento de datos

This operation displays an in-line panel in the browser which displays all metadata about a given data element. Press



the information button  to access this view.

4.1.2. Grupo de elementos de datos

Data element groups provide a mechanism for classifying related data elements into a common theme. For instance, two data elements "Measles immunisation" and "BCG Immunisation" might be grouped together into a data element group "Childhood immunisation". To access the data element group maintenance page, click Maintenance -> Data elements and Indicators -> Data Element Group.

Similar to the "Data element" maintenance page, data elements groups can be searched with by entering a search string in the "Filter by name" field.

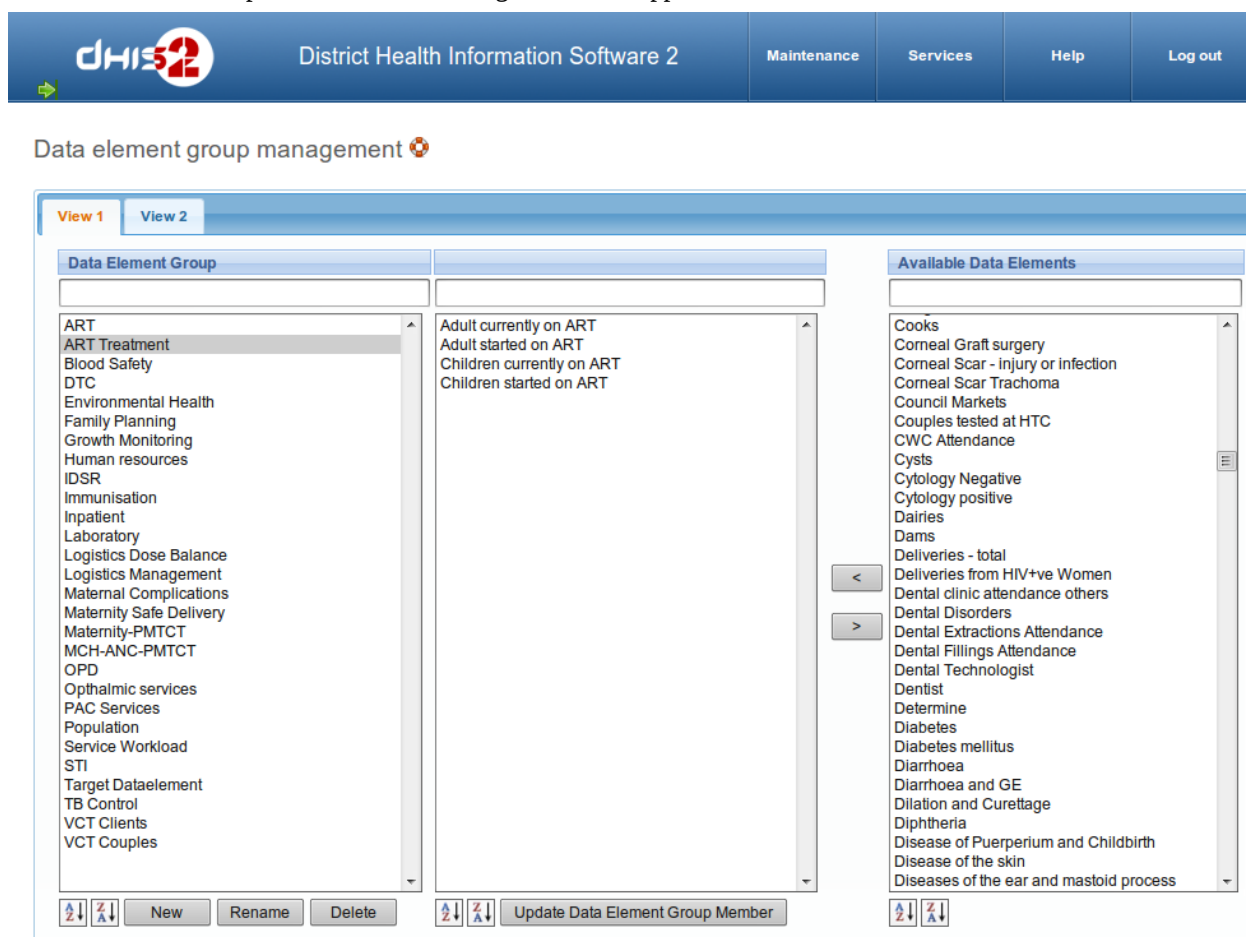
To add a new data element group, click the "Add new" button and the following screen will be displayed:

Fill in the "Name" field and then select all data elements that should belong to the group from the left panel. Click the

"Move selected"  button to add the selected data elements to the data element group. Click the "Remove selected" button to remove all data elements from the group that have been selected in the right panel. Finally, click the "Add" button to save changes, or the "Cancel" button to discard any changes.

4.1.3. Editor de grupo de elementos de datos

The data element group editor provides advanced functionality to the administrator to allow multiple data elements to be added or removed from a group. It is also possible to create new data element groups, rename existing groups, and delete groups entirely. To access the data element group editor, go to "Maintenance -> Data elements and Indicators -> Data Element Group Editor". The following screen will appear.



Data element groups are listed alphabetically in the leftmost panel. By clicking on a data element group, the current members of that group (data elements) are listed in the centre panel. Available data elements that can be added to the data element group appear listed alphabetically in the rightmost panel. To remove an existing data element from

the group, click the name of the data element in the centre panel, and then press the "Move right"  button. To

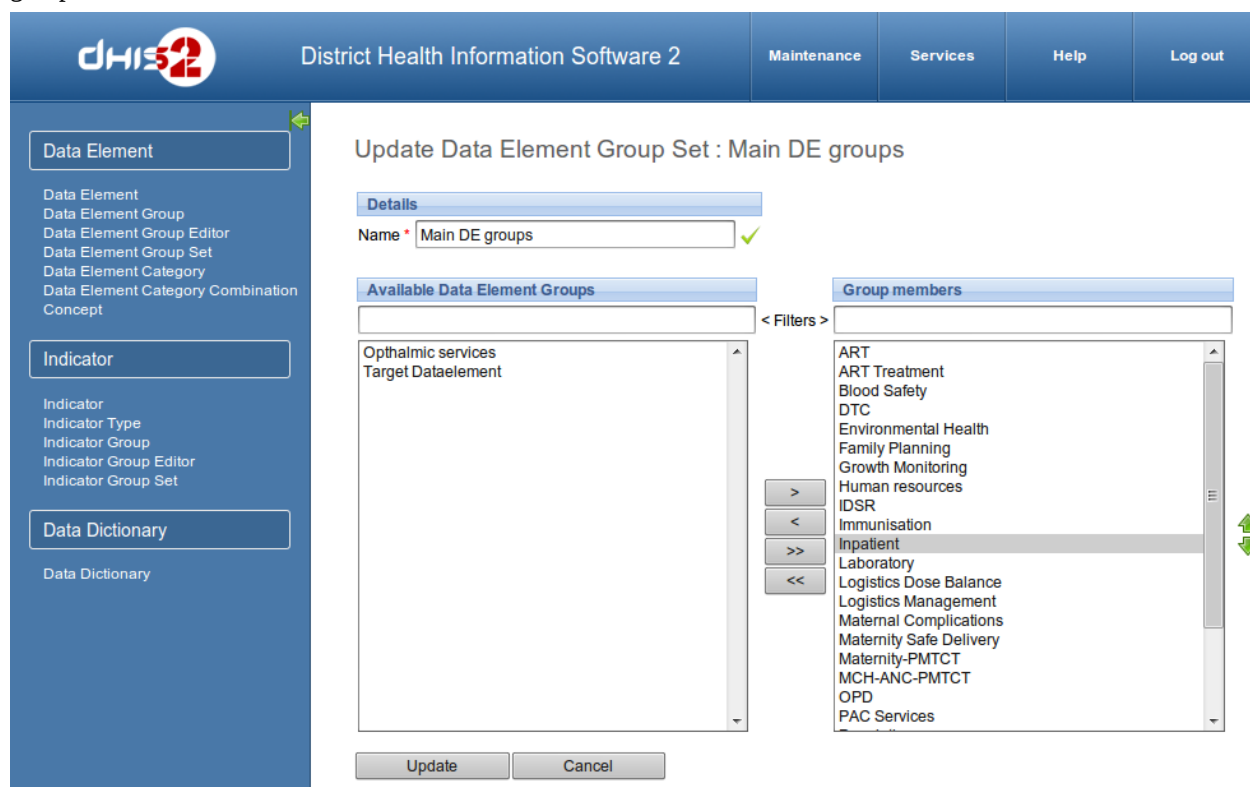
add data elements to the group, select them from the leftmost panel, and click the "Move left"  button. Press the "Update data element group member" button to save your changes.

4.1.4. Sets de grupo de elementos de datos

Data element group sets allow multiple data element groups to be categorised into a set. Data element group sets are used during analysis and reporting to combine similar data element groups into a common theme. To access the data element group set maintenance module, choose "Maintenance -> Data elements and Indicators -> Data Element Group Set". Similar to the other data element maintenance modules, new data element group sets can be added by pressing

the "Add new button". Other operations include Edit, Translate, Delete and Information, similar to the other modules in this section.

Existing data element group set members can be edited by clicking the "Edit" button  of the desired data element group set as seen below.



Available data element groups are displayed in the left panel. They can be moved into the selected data element group

set by pressing the "Move right"  button. Data element groups that are currently members of the data element group set are displayed in the right hand panel. They can be removed from the data element group set by clicking

the desired data element group and pressing the "Move left"  button. The ordering of the data element groups

can be set with the "Move Up"  and "Move Down"  arrows. This ordering will be used in the datamart and reports to order the data element groups. Press the "Update" button to save any changes and the "Cancel" button to discard all changes.

4.1.5. Categorías de elementos de datos

Data element categories can be used to disaggregate data elements into individual atomic components. Data element categories are typically a concept, such as Gender, Age or Disease Status. Data elements such as "Number of cases of confirmed malaria" are often broken into smaller component parts to determine, for instance, the number of confirmed malaria cases of particular age groups. As an example, three data element categories: Under 1, 1-5 and Over 5 could be created. They could be assigned as categories to the data element, which would then create in the data entry screens, three separate fields for this data element namely:

- Number of confirmed malaria cases (Under 1)
- Number of confirmed malaria cases (1-5)
- Number of confirmed malaria cases (Over 5)

Effective use of data element categories greatly simplifies the process of setting up the DHIS2 system, as the data element categories can be reused to disaggregate many different data elements. Otherwise, each of the data elements

listed above, would need to be created separately. Judicious use of data element categories will greatly simplify the DHIS2 implementation, and allow for subsequent advanced analysis.

Data element categories are composed of category options. Category options must be defined when a data element category is created for the first time. Subsequent changes to the data element category, i.e. adding or deleting new category options, are not allowed once the data element category has been created.

It is critical that the proper categories and category options are defined in the initial definition step, as further changes to the category and its options will are not possible.

To access the data element category maintenance module, press "Maintenance -> Data Elements and Indicators->Data Element Category". The following screen will be displayed:

The screenshot shows the DHIS2 interface for "Data element category management". The top navigation bar includes the DHIS2 logo, "District Health Information Software 2", and links for "Maintenance", "Services", "Help", and "Log out". The left sidebar contains a tree view with categories: "Data Element", "Indicator", and "Data Dictionary". The main content area is titled "Data element category management" and features a "Filter by name:" search bar with "Filter" and "Clear" buttons, and an "Add new" button. Below the search bar is a table listing existing categories with columns for "Name" and "Operations". The table includes categories like "Age over/under 1", "Age over/under 15", "Age over/under 5", "ART Treatment age group", "Attendance", "Cases and deaths", "Family Planing Change of methods", and "Financial Information". Each row has icons for editing, deleting, and viewing details.

Similar to the other data element maintains modules, data element categories can be filtered by typing the name of the data element category (or a portion of it) into the "Filter by name" field. To add a new data element category, press the "Add new" button which will then display the following screen:

The screenshot shows the "Create new data element category" form. The top navigation bar is identical to the previous screen. The left sidebar is partially visible. The main content area is titled "Create new data element category" and has two sections: "Details" and "Category options". In the "Details" section, the "Name" field contains "Test category" and the "Concept name" dropdown is set to "default", both with green checkmarks. The "Category options" section has a "Name" field with "Test option 2" and an "Add category option" button. Below this is a list box containing "Test option 1". To the right of the list box are green up and down arrow buttons for reordering, and a red trash can icon for deletion. At the bottom are "Add" and "Cancel" buttons.

Type the name of the new data element category in the "Name" field in the "Details" region. Category options can be added by typing the name of the category option in the "Category option" region and pressing the "Add category option" button. Category options can be reordered using the "Move Up"  and "Move Down"  buttons. Categories

options can be deleted by selecting the data element category option and pressing the "Delete"  button. Once all data element categories options have been added to the data element category, press the "Add" button to save all changes or the "Cancel" button to discard any changes.

All data element category options must be added and defined properly in this step. Subsequent alterations to the data element category (other than reordering of the category options themselves) is not possible.

4.1.6. Combinaciones de categorías de elementos de datos

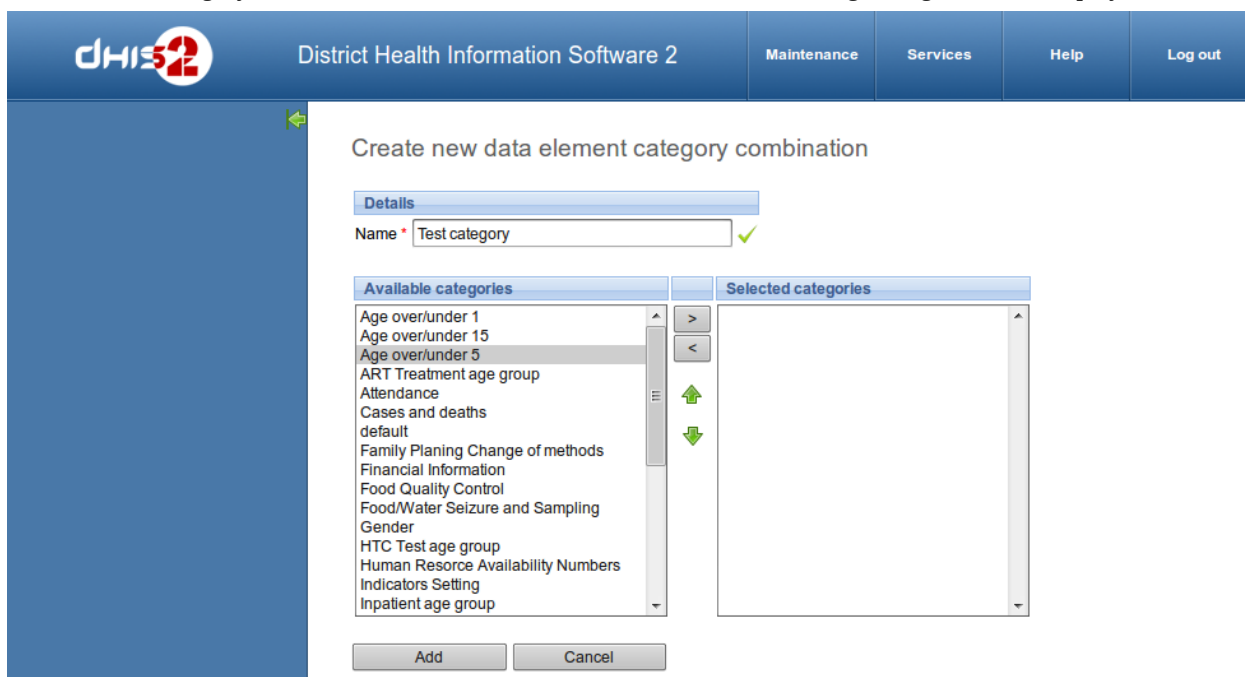
Data element category combinations allow multiple data element categories to be combined into a related set. As an example, a data element "Number of new HIV infections" might be disaggregated according to the following categories.

- Age: "Under 5", "5-15", "15-24", "24 and above"
- Gender: Male, Female

In this example, there would be two levels of disaggregation, consisting of two separate data element categories, each consisting of several data element category options. In most HMIS systems, different data elements are disaggregated according to a common set of categories. By combining these different categories into a data element category combination and assigning these combinations to data elements, the appropriate disaggregation levels can be applied efficiently and quickly to a large number of data elements.

To access the data element category combination maintenance module, select "Maintenance->Data element and indicators->Data element category combinations" from the main DHIS2 menu. As with the other maintains modules, you can filter the listed category combinations by entering the name (or portion thereof) of the category combination. Other operations such as "Edit", "Delete" and "Information" should be familiar to the reader.

To add a new category combination, click the "Add new" button. The following dialogue will be displayed.



Type the name of the category combination in the "Name" field, and then select the desired categories from the left panel. Press the "Move right" button to add the selected categories to the category combination. Press "Move left" to remove any categories that should not be part of the category combination.

Categories can only be added to a category combination at this step. Categories can be removed from category combinations later by editing the category combination, however, it is not allowed to add additional categories once the combination has been created. Ensure that the category combination and its respective categories is final before you create the category combination and assign it to a data element.

4.1.7. Diccionarios de datos

Data dictionaries are used to group data elements and indicators during filtering operations. They are useful for combining related groups of data elements and indicators according to the programs to which they belong. For instance a data dictionary called "MCH" could be created, and all maternal and child health data elements and indicators could be added to the dictionary. The data dictionary can be access by choosing Maintenance->Data elements and indicators->>Data dictionary. The following screen will be displayed in the browser.

DHIS2 District Health Information Software 2 Maintenance Services Help Log out

Edit data dictionary

Details

Name * Kenya

Description Kenya

Region Kenya

Available data elements

CT scan machine
Abortion
Active Corneal Ulcer
Active Trachoma
Adult ever erroled on ART
Adult HIV+ patients receiving ART
Adult on CTX
Adult started on ART
Adverse Events Following Immunization
All other diseases
All other external causes
All other special clinics attendance
All other Surgery
All others currently on ARVs
All others FP
All others non-technical HR

Selected data elements

Accidental drowning and submersion
Accidental poisoning by and exposure to noxious substances
Accidents
Accountants
Acute poliomyelitis
Acute rheumatic fever and chronic rheumatic heart diseases
Administrators
Adult currently on ART

Available indicators

All Other Family planning Methods CYP
ANC 1st Visit Coverage
ANC 4th visit coverage
ANC clients attending at least 4 ANC visits
BCG Coverage
BCG Wastage Rate
BTL Couple year protection
Caesarean section rate
Condom Couple year protection
Deliveries conducted by skilled health attendants
Doctor Patient Ratio
Doctor Population Ratio
DPT 1 Coverage
DPT 2 Coverage
DPT 3 Coverage
DPT/HIB/HEP B Wastage Rate

Selected indicators

HIV+ patients starting ART

Save Cancel

Provide a name for the data dictionary in the "Name" field and a description of its contents. Data elements and indicators can be added or removed from the dictionary. Click "Save" if you are creating a new data dictionary or "Add" if you are editing the contents of an existing data dictionary.

4.1.8. Traducciones

DHIS 2 provides functionality for translations of database content like data elements, data element groups, indicators, indicator groups, validation rules and more. These elements can be translated to any number of locales. A locale represents a specific geographical, political, or cultural region.

To add a translation click the Translate icon next to the element you would like to translate. Start by selecting the desired locale from the Locale select box. In the Translate screen, select your locale and enter values for the available

element properties. The reference property values are shown on the right. These values are the values which have been entered in the regular add or update user interface for the current object.

Translations can be enabled by selecting the desired locale under Database Language under User General Settings in the Settings module.

Capítulo 5. Sets de datos y formularios de entrada de datos

5.1. Sets de datos

All data entry in DHIS2 is organised through the use of datasets. You can add and edit datasets in Maintenance->Datasets. A dataset is a collection of data elements grouped together for data collection and data export between instances of DHIS2 (e.g. from a district office local installation to a national server).

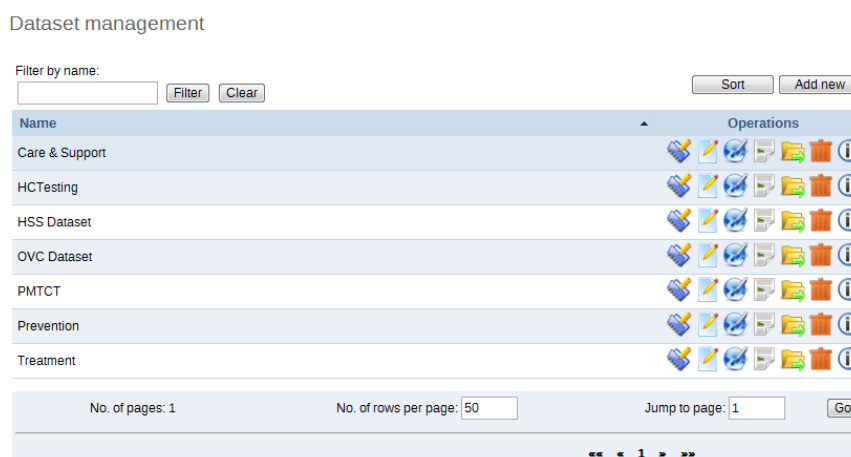
A dataset also has a frequency which controls the data collection frequency, which can be daily, weekly, monthly, quarterly, six-monthly, or yearly. Both which data elements to include in the dataset and the frequency is set in the Add/Edit Dataset window, together with a name, short name, and code. In order to use a dataset to collect data for a specific orgunit you must assign the orgunit to the dataset, and this mechanism controls which orgunits that can use which datasets.

Datasets also are assigned to specific organisation units which will be allowed to enter data for all data elements in a given dataset. You can assign orgunits to a dataset in the Dataset Management (list of available datasets are shown) by clicking on the blue folder icon, the first icon under Operations, corresponding to the dataset you would like to modify. Alternatively you can manage orgunit assignments for all datasets together in the Dataset Assignment Editor (available in the right-side menu for Datasets).

Your dataset will then be ready to be used in Services->Data Entry for the orgunits that you have assigned and for periods according to your selected frequency (period type).

5.1.1. Gestión de sets de datos

The dataset management function allows you to create new datasets and manage existing ones. The dialog can be reached by choosing Maintenance->Datasets->Dataset. A sample dialog is displayed below.



Each of the functions is described below.

- **Sort:** This controls the custom sort order. Depending on the systems settings, users will see the datasets ordered in the specific order which you provide.
- **Add new:** Adds a new dataset. When pressing this button, you can create a new dataset. You need to provide a name, shortname and frequency. The "Code" attribute is optional. Data elements can be added to the "Selected data

element" list by selecting them individually. and pressing the  button. Indicators can also be added to data sets and will be available to be placed in custom data entry forms when they need to be shown along with data elements on the same data entry form. Press "Save" to add the new dataset.

-  Assign organisation units to datasets: This function will allow you to assign individual organisational units to a dataset. Only organisational units which have been assigned to a dataset will be allowed to enter data into the dataset.
-  Edit dataset: This will allow you to edit existing datasets, for instance when you need to add or remove data elements and indicators to a given dataset.
-  Translate: Allows you to translate the name of a dataset to a different language.
-  Create or edit a custom data entry form. Refer to [???](#) for detailed information of how to use this function.
-  Edit compulsory data elements: This dialog will allow you to add or remove data elements which will be marked as compulsory during data entry.
-  Delete: Completely removes a dataset from the system.



Aviso

Any dataset which is deleted from the system, is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Ensure that you have made a backup of your database before deleting any dataset in case you need to restore it at some point in time.

-  Information: Display some informative information about the dataset, including the number of data elements, the frequency, and which data entry form has been assigned to the dataset.

5.2. Formularios de entrada de datos

Once you have assigned a dataset to an orgunit that dataset will be made available in Data Entry (under Services) for the orgunits you have assigned it to. A default data entry form will then be shown, which is simply a list of the data elements you belonging to the dataset together with a column for inputting the values. If your dataset contains data elements with a non-default categorycombination, such as age groups or gender then additional columns will be automatically generated in the default form based on the different options/dimensions.

If you use more than one dataelement category combination you will get multiple columns in the data entry form with different column headings for the options. In addition to the default list-based data entry form there are two more alternatives, the section-based form and the custom form.

5.2.1. Section forms

Section forms allow for a bit more flexibility when it comes to using tabular forms and are quick and simple to design. Often your data entry form will need multiple tables with subheadings, and sometimes you need to disable (grey out) a few fields in the table, both of these functions are supported in section forms. This function can be access by choosing Maintenance->Dataset Section.

5.2.2. Adding a new section form

Section forms are separated automatically by data element category combinations, which produce a spreadsheet like data entry form for each section.

When designing a section form the procedure is as follows:

1. Set up your dataset as described in [Sección 5.1, “Sets de datos”](#)

- Open the DataSet Section window (from right side menu under Datasets) and add your sections one by one. To add a new section to a section form, first choose the dataset from the "Select dataset" combo box. Then choose the specific category combo and press "Add new". You can now add data elements from the "Available data element" list on the left to the "Selected data elements" list on the right. Data elements can be sorted within the section with the use of the "Move up"  and "Move down"  buttons. Be sure to press "Save" once you have finished.



Nota

You can only use one data element category combination per section.

- You may need to control how the data element sections are displayed on the final form. In Dataset Section management, select the dataset from the "Dataset" drop-down box, then leave [All] in the "Select Category Combo" drop-down. Click on "Sort section" to sort the order of appearance of your sections in the data entry form.
- In Data Entry you can now start using the Section form (should appear automatically when sections are available for the selected dataset). Datasets which have section forms will automatically display the section form.
-



Certain data elements may need to be disabled for data entry. Clicking on the "Section grey field management" icon will allow you to disable specific data element category options as seen below. Pressing the "Disable" button will prevent data from being entered into this specific data element/category option during data entry. Be sure to press "Done" to save your changes.

Section grey field management

Section Details
Name * PMTCTSec1
Dataset * PMTCT
Category combinations * Pregnancy stage A

	at ANC	at L&D	Post-partum
Number of pregnant women with known HIV status (includes women who were tested for HIV and received their results)	 Disable	 Disable	 Disable
Number of pregnant women who were tested for HIV and received their test results	 Disable	 Disable	 Disable
Number of pregnant women who were tested, received their results, and were HIV-positive	 Disable	 Disable	 Disable

Done

A sample section form is displayed in the next figure. Notice how each data element category has been separated into a separate section, and a data entry table has been automatically generated by the system. Use of section forms in combination with data element categories can drastically reduce the amount of time which is required to create data entry forms for datasets.

Obstructed Labour		
Sepsis		

PAC Services

Manual Vacuum Aspiration	
Dilation and Curettage	
Family planning uptake at PAC	

Amani Family Medical Clinic - January 2011
TB cases detected - (Children <14yrs, Female)

TB Control

	Children <14yrs		Adult >14yrs	
	Female	Male	Female	Male
TB cases detected				
Smear positive TB				
Smear negative TB				
Extra-Pulmonary TB patients				
Re-treatment TB patients				
TB patients tested for HIV				
TB patients HIV+ve				
TB HIV patient on CPT				
TB Defaulters				
TB patient completed treatment				
TB deaths				

VCT

	15-24yrs		>25yrs	
	Female	Male	Female	Male
VCT clients Counselling				
VCT clients Tested				
VCT clients HIV+ve				

5.2.3. Custom Forms

When the form you want to design is too complicated for the default or section forms then your last option is to use a custom form. This takes more time, but gives you full flexibility in terms of the design. DHIS2 uses a built-in HTML editor (FCK Editor) for the form designer and you can either design the form in the UI or paste in your HTML directly (using the Source window in the editor). A complete reference for use of the editor can be found [here](#).

One of the big advantages of custom forms, is that they can be created to mimic existing paper aggregation forms. This makes data entry much easier for users, and should reduce the number of data elements which are incorrectly entered, as they are more easily identifiable when entering data from a paper form.

Once a custom form has been added to a dataset it will be available in data entry and used automatically.



Nota

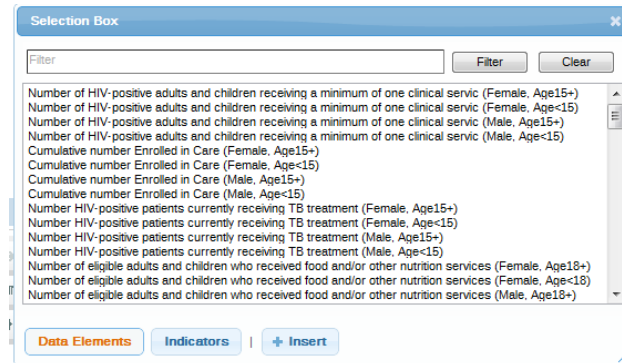
Custom forms are preferentially displayed over section forms. If a dataset has both a section form and a custom form, the custom form will be displayed during data entry. Users will not be able to select which method they wish to input data, so be sure that your custom form contains all data elements which may be required.

To add a custom form design to a dataset then first locate your dataset in the Dataset Management window and click on the Design data entry form icon under Operations (the fifth icon), see the mouse-over text to be sure.

First provide a Name for the form. There are a few important buttons in the Editor that you must pay special attention to. The blue monitor icon is the full screen mode on/off button, which can be very useful. The there is a Source button that shows the HTML code for your form.

If you already have the HTML for your form then you should start by pasting it in here. Click on Source again to go back to preview/non-HTML mode. Then there is an icon in the top right corner with a + sign on it, this will open a list of available data elements to add to your form, the Data Element Selector window.

All the input fields need to have a link to a data element or indicator. To add new data elements to the form, double-click them from the data element/indicator box as shown below. You can also select a data element/indicator and press the "+Insert" button. You can switch between either data elements or indicators by pressing the respective buttons.



You can to intermediary saving by clicking on the Save button, and this will not close the window. It is recommended to save often to ensure you do not loose your work.

When you are done or want to test your form in data entry click on <Save and close>.

5.2.4. Data set assignment editor

The data set assignment editor is a tool for adding and removing many data sets to organisation units in batch style. Start by selecting an organisation unit from the selection tree. In the area below the tree a grid will be displayed showing all data sets as columns and the child organisation units as rows.

From the grid you can now assign or unassign data sets simply by clicking on of the corresponding icons in the grid. If you want to assign or unassign an organisation unit to all data sets you can check or uncheck the checkbox next to the organisation unit. Your changes will automatically be saved.

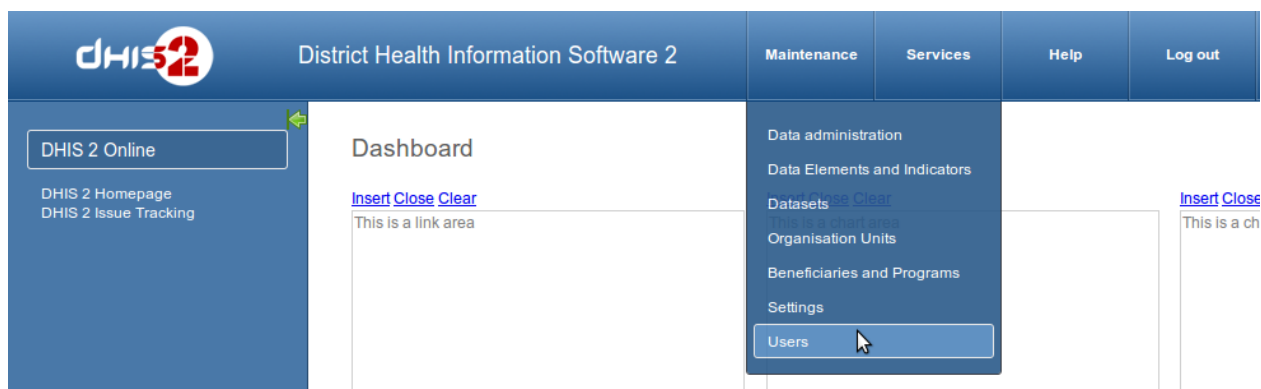
Capítulo 6. User management

DHIS2 allows for multiple users to access the system simultaneously, each with a define set of permissions. These permissions can be finely tuned so that certain users can only enter data, while others may generate reports. Multiple user roles can be created, each with their own set of permissions, and then assigned to users which grant them certain privileges within the system. This chapter describes how to manage users and user roles.

6.1. Creating new users and roles

This section will describe how to add new users and manage existing users to the DHIS2 application. You can create as many user names as you need. Each user can be assigned certain privileges, and can be assigned to certain organisation units for which they will be enabled to enter data on behalf of. To access the user module, choose "Maintenance->Users" from the main menu.

6.1.1. User maintenance



User names already registered will appear as a list as seen in the screen shot below.



You can search for specific user names in the user list by entering the name in the 'filter by user name' field as shown above.

6.1.2. User role management

As part of creating a user name you are required to define the user role. Do so by clicking on the 'user role' appearing on the left side of the displayed screen. This will lead you to the Role Management page where you will have to click on Add new to create a new role.

The following screen will open and here in the first text box you need to give Name of the Role such as Super User, Admin User, etc. The second text box called 'Description' gives more information about the type of User Role that is being created for e.g. State Admin User, District Data Entry.

Next you will specify the particular data set(s) that are to be made available to the particular role. You will also need to specify the type of 'authority' to be given to the particular user. For each of the three options namely Datasets, Reports and Authorities user can select multiple options from the scroll down menu provided against each field. A user can choose multiple options either by moving them one-by-one.

In order for particular users to be able to enter data, you must add them to both a dataset as well as an organisational unit level. You can also select multiple datasets individually by pressing the Ctrl key on the keyboard and clicking on individual datasets.

Finally when you have entered the required fields click on Save which is located on the lower part of the displayed screen. The desired user role and related authorisation will be saved to the database, and can then be assigned to a particular user.

6.1.3. User management

Under particular user role there can be more than one user. To add new users go to the User options under the Maintenance module.

To add a new user, just follow these steps:

- Click on the Add New button.
- Enter New User details like User name, Password, Confirm password, Surname, First name and Email in new user's option tabs.
- Click on Add button for confirmation of new user details and follow the user error while creation of new user.
- The recently created new user can be seen in main' User management Screen
- You can edit (like password, surname....etc) and delete the details of new/old users by selecting corresponding User's Edit and Delete Buttons.
- Click on Save tab after editing all details of a particular selected user.

Create new user

Details

Username *

Password *

Retype password *

Surname *

First name *

E-mail

Phone number

Roles

Available roles

Superuser
District Online
Data user online

Selected roles

Organisation Unit Tree Selection

Select at level: National ▼ Un-select at level Un-select all Un-select children

Select in group: Blood Bank ▼ Un-select in group Select all Select children

Organisation unit: Kenya

Add Cancel

- Users must be assigned to at least one organisational unit. Users are able to have access to all children of the organisational unit(s) which have been assigned to them. For instance, if a user has been assigned to "District X"

which has several facilities contained in the district, the user would have access to the district's data, as well as all of the facilities contained within the district.

In order for users to be able to enter data for specific organisational units, they must be assigned these units. If a user is responsible for entering data for all facilities for a given district, they should typically be assigned the district, and all of the facilities contained within the district.

6.1.4. User group management

User groups allow you to send notifications to multiple users at the same time. Simply click "Add new" from the "User group" screen, provide a name for the group, and add the desired users from the "Available users" list to the "Group members" list.

6.1.5. User by organisation unit

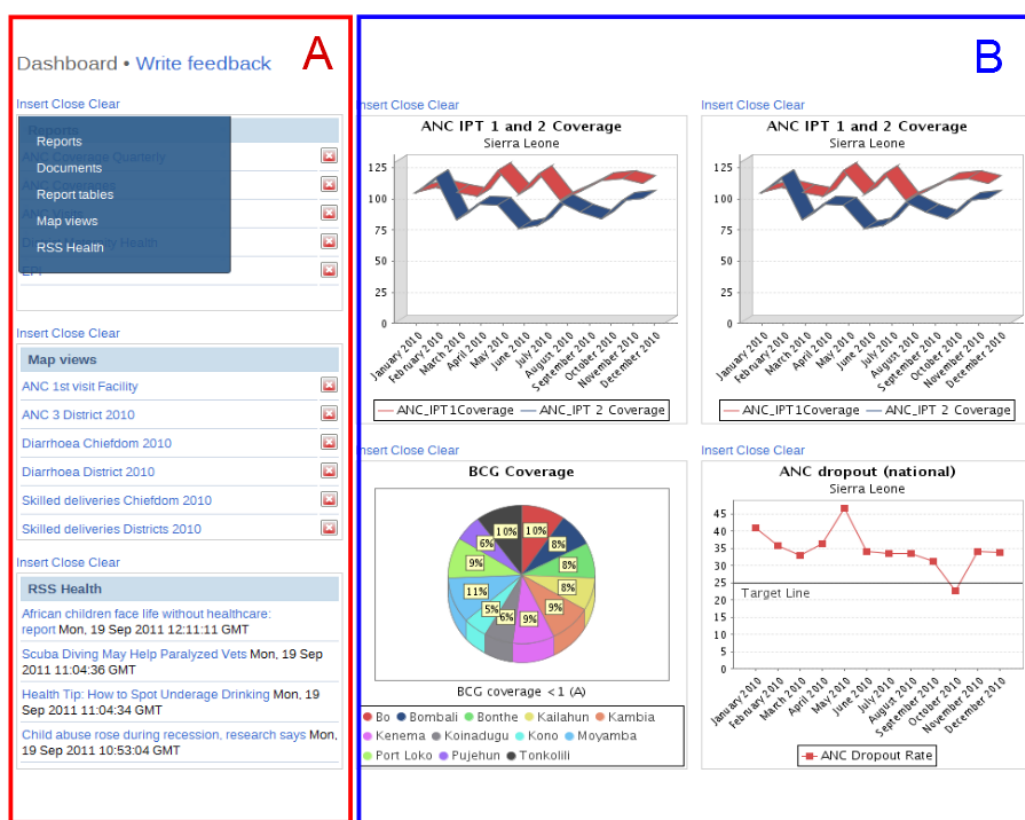
The "User by organisation unit" function allows you see which users have been assigned to a particular organisation unit. Simply select the organisation unit from the tree on the left, and a list of users which have been assigned to this particular organisation unit will be displayed

Capítulo 7. Panel de control (Dashboard)

Los paneles de control pretenden ofrecer un acceso rápido a cada usuario a los datos que han sido almacenados en DHIS2. Estos paneles tienen varias secciones, algunas de las cuales contienen enlaces a reportes o vistas de mapas definidas previamente. Otras secciones del panel permiten a los usuarios añadir gráficas que han definido a través del módulo de visualización.

7.1. Poniendo en marcha el panel de control

El panel de control se divide en dos secciones principales: el panel derecho (A en la captura siguiente) que puede usarse para albergar enlaces a reportes, documentos (informes estáticos), tablas de reportes, vistas de mapas, y noticias RSS de salud; y el panel izquierdo (B en la imagen abajo) que puede usarse para mostrar seis gráficas diferentes que se hayan creado previamente en el módulo de reporte.



En esta captura de pantalla, el panel de control ha sido ya publicado con varios reportes y vistas de mapas. Ahora basta pinchar en uno de los enlaces azules para ir directamente a la vista de reporte o de mapa. Pinchando en una de las gráficas se mostrará el diagrama ampliado, que podemos guardar como una imagen, para luego incluirlo en un reporte u otro documento.

Podemos redefinir la estructura del panel de control vaciando cada una de las ventanas pinchando en el enlace "Limpiar". Si pinchamos de nuevo el botón "Insertar", podremos seleccionar una nueva gráfica para que aparezca en la ventana.

Todos los reportes, documentos, tablas de reportes y gráficas se pueden añadir al listado de opciones disponibles

pinchando en el icono "Añadir al panel de control"  que encontraremos en los módulos respectivos. Recomendamos revisar las secciones correspondientes de este manual para más detalle. Una vez hayamos añadido el objeto al listado, podemos "Insertar" el objeto en el panel de control..



Nota

El panel de control está configurado particularmente para cada usuario.

7.2. Mensajes y retroalimentación

La aplicación DHIS2 contiene determinadas funciones que facilitan la comunicación entre usuarios y grupos de usuarios. Este tipo de comunicación es importante para agilizar la retroalimentación sobre calidad de los datos, puntualidad del registro de datos, o simplemente para dar respuesta a cuestiones o dudas planteadas por algún usuario concreto.

Los mensajes de retroalimentación se envían a un grupo particular de usuarios, y pueden ser enviados por todos aquellos usuarios que tengan acceso al módulo de panel de control. Para permitir la recepción de mensajes de retroalimentación enviados desde el panel de control, debemos activar la opción de configuración "Destinatario" de retroalimentación", que se encuentra en el cuadro de diálogo de Mantenimiento -> Opciones de Sistema. Debemos asegurarnos de definir un grupo de usuarios (por ejemplo "Destinatarios de retroalimentación") con todos los usuarios que deberán recibir dichos mensajes. Recomendamos revisar la sección de este manual sobre "Grupos de Usuarios" para más información sobre cómo realizar esto. Una vez se ha definido el grupo de usuarios, cada vez que se envíe un mensaje de retroalimentación, aparecerá como un mensaje en la cola de mensajes de DHIS2 de los destinatarios. Tengamos en cuenta que los mensajes no se enviarán a las direcciones de email de los usuarios, sino que solo aparecerán en la aplicación DHIS2.

Para enviar un nuevo mensaje de retroalimentación, sencillamente seleccionamos "Escribir retroalimentación" en el panel de control. Se mostrará un campo para el asunto y para el texto del mensaje, y al enviarse aparecerá en la cola de mensajes de todos los usuarios especificados.

Es posible enviar mensajes a grupos específicos de usuarios asociados a unidades organizativas particulares. Para escribir un nuevo mensaje a estos usuarios, pinchamos en "Mensajes" en la pantalla del panel de control y presionamos el botón "Escribir mensaje". Entonces seleccionaremos una unidad organizativa (o un grupo de unidades organizativas) en el árbol de unidades organizativas "Destinatarios". Introduciremos un asunto y texto del mensaje, y pincharemos en el botón "Enviar". Para cancelar el envío, podemos descartar el mensaje pinchando en el botón "Descartar" como se muestra en la captura de pantalla siguiente.

[Write new message](#)

Organisation Unit Selection

Select at level	Level 1 ▼	Un-select at level	Un-select all
Select in group	▼	Un-select in group	Select children

Recipients

- + Addis Ketema
- + Afder
- + Agnewak
- + Akaki Kaliti
- + Alaba Special Wereda
- + Amaro Special Wereda
- + Arada
- + Argoba Special Wereda
- + Arsi
- + Asossa
- + Awi
- + Bale
- + Basketo Special Wereda

Subject

Data review meeting

We will have a data review meeting next Thursday (September 29th) at 9 AM at the woreda health office. All information officers are expected to attend.

Text

Send Discard

Podemos leer los mensajes que nos han enviado pinchando en "Mensajes" en el panel de control. Los mensajes se mostrarán en una lista. Pincharemos en el mensaje deseado para leer todos los mensajes de esa conversación particular.

Messages

[Write message](#)

[Write feedback](#)

Sender	Subject	Date	Operations
admin admin	DHIS is great	2011-09-21	
admin admin	What's up with your data?	2011-09-21	 

Capítulo 8. Entrada de datos

8.1. Objetivos

Después de revisar este capítulo habremos comprendido:

- Cómo seleccionar correctamente el formulario de entrada de datos apropiado
- Cómo introducir datos
- Cómo hacer una validación de los datos

8.2. Entrada de datos con DHIS 2

Para abrir la ventana de entrada de datos, pinchamos en la pestaña de Servicios del menú principal. A continuación se despliega un menú con un listado de los servicios ofrecidos por DHIS 2. Pincha en la opción Entrada de Datos.

El módulo de entrada de datos es donde podemos insertar datos manualmente en la base de datos DHIS 2. Los datos son registrados para una determinada unidad organizativa, un periodo, y un set de elementos de datos (set de datos) al mismo tiempo. Un set de datos corresponde normalmente a una herramienta de recogida de datos en formato papel, es decir, a un formulario tradicional.

8.2.1. Selección del formulario de entrada de datos

El primer paso para introducir datos en DHIS 2 es abrir el formulario correcto. Recomendamos que sigas los siguientes pasos sencillos:

1. Busca la unidad organizativa donde quieres registrar los datos en el menú árbol que aparece en el lado izquierdo. Pliega y despliega la jerarquía de unidades pinchando en los símbolos -/+. Una forma sencilla de encontrar una unidad organizativa es utilizar el cuadro de búsqueda situado directamente encima del árbol (identificado con un símbolo verde), donde tendrás que escribir el nombre completo, sí :S, el nombre completo de la unidad que buscas.
2. Selecciona un set de datos del listado desplegable que está disponible para la unidad organizativa que has seleccionado.
3. Selecciona un periodo para registrar estos datos. Los periodos disponibles están configurados en los tipos de periodo de set de datos (es decir, la frecuencia de reporte: semanal, mensual, etc). Puedes saltar un año atrás o adelante utilizando las flechas situadas encima de periodo.

Ahora deberías poder ver ya el formulario de entrada de datos.

Dependiendo de cómo se haya implementado el formulario de entrada de datos, veremos tres tipos diferentes de formularios: Formulario por Defecto, Formulario de Sección o Formulario Personalizado. Si hay un formulario personalizado, se mostrará seguido de un formulario de sección y finalmente de un formulario por defecto.

8.2.2. Introduciendo datos

Introducir datos es sencillo. Comienza pinchando en el primer campo que aparece y escribe el valor que corresponda. Muévete al siguiente campo utilizando el botón de tabulación (Tab) de tu teclado. El botón Shift+Tab te devuelve al campo anterior. Cuando introducimos los valores en cada campo, estos son guardados inmediatamente en la base de datos y no se requiere pinchar en un botón de guardar como sucede en otras aplicaciones. Verás un campo verde que indica que el valor se ha guardado en el sistema (en el servidor, en realidad). Si tu conexión a Internet es lenta, es posible que demore un poco hasta que los valores se hayan guardado.

Validación de entrada: Cuando escribes un valor incorrecto, por ejemplo una letra en un campo que solo acepta valores numéricos, se abrirá un mensaje pop-up que explica el problema y el campo que intentabas rellenar se coloreará de amarillo (y permanecerá sin guardar) hasta que hayas corregido este valor. Si has definido un rango mínimo y máximo para un campo (una combinación de elemento de datos y unidad organizativa) se abrirá un mensaje pop-up que te informará cuando el valor está fuera de rango, y también ahora el valor quedará sin guardar hasta que hayas introducido un valor correcto (o hayas actualizado el rango e introducido nuevamente el valor).

Campos deshabilitados: Cuando un campo está deshabilitado (aparece en color gris) significa que el campo no debería rellenarse. Así, el cursor saltará automáticamente al siguiente campo abierto.

Historial de datos: Si pinchamos dos veces en cualquier campo de entrada del formulario se abrirá una ventana de historial de datos que muestra en un diagrama de barras los últimos 12 valores registrados para dicho campo (una combinación de unidad organizativa, elemento de datos y opción de categoría). Esta ventana muestra también el rango máximo y mínimo y permite ajustar dicho rango para la combinación específica de unidad organizativa y elemento de datos.

Data Entry

 Organisation Unit: Bamba Medical Clinic
 Data Set: Integrated RH, HIVAIDS, Malaria, TB & Nutrition
 Period: << >>
 October 2010

Run validation

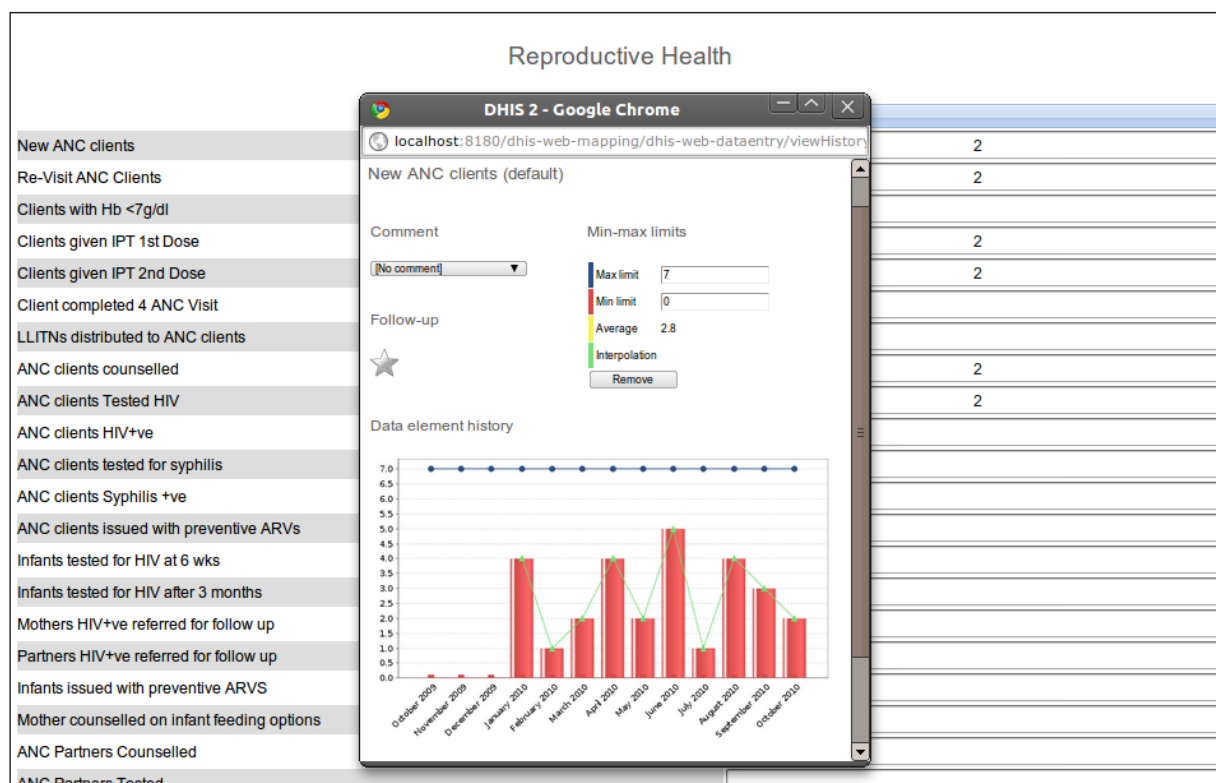
 Bamba Medical Clinic - October 2010
 New ANC clients - (default) - null - null

Use Custom Form

☒ Use Section Form☐ Use Default Form

Family Planning

Removals



Seguimiento: En la ventana de historial de datos hay también una función para etiquetar o marcar un valor. Por ejemplo, imaginemos que un valor sospechoso que necesita ser investigado a fondo puede meterse en el sistema, pero marcado para Seguimiento. En el módulo de Calidad de Datos podremos lanzar un análisis de seguimiento y revisar todos los valores marcados para seguimiento, así como editar dichos valores si posteriormente se demuestra que son incorrectos.

8.2.3. Validando los datos en el formulario

Cuando ya hemos rellenado todos los valores disponibles en el formulario, podemos lanzar un chequeo de validación sobre los datos del formulario. Pincha en el botón "Validar" en la esquina superior derecha. Todas las reglas de validación que implican elementos de datos en el formulario actual (y que forman un set de datos) se lanzarán comparándolos con los nuevos datos. Cuando termine el proceso se nos mostrará un listado de fallos o un mensaje sencillo que diga algo así: "La pantalla de entrada de datos ha sido validada con éxito". Para aprender cómo definir las reglas de validación revisa el capítulo de Calidad de Datos.

Cuando hayamos corregido los valores erróneos y hayamos terminado el formulario, es recomendable pinchar en el botón "Completado" en la parte inferior para registrar que el formulario ha sido completado. Esta información es utilizada cuando se generan reportes de grado de completitud por distrito, departamento o a nivel nacional.

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Validation Result

The data entry screen has validation errors, please correct these before proceeding

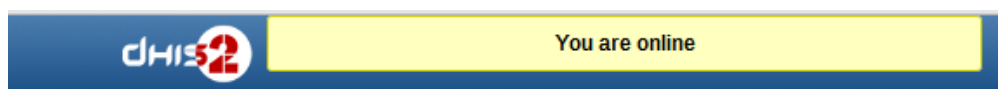
The following values violates validation rules

Validation rule	Expression	Description	Value	Operator	Value	Description
ANC 4th visits	New ANC clients >= Client completed 4 ANC Visit	ANC clients	3.0	>=	5.0	ANC 4th Visit

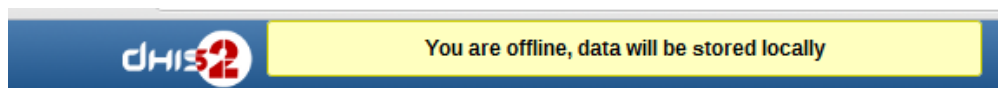
8.2.4. Entrada de datos en desconexión (offline)

El módulo de entrada de datos funciona siempre incluso si durante la introducción de datos la conexión a Internet no es estable. Para utilizar esta funcionalidad, deberemos entrar (login) en DHIS 2 en el servidor mientras la conexión a Internet está activa, pero si durante la introducción de datos el enlace de comunicaciones entre tu computadora y el servidor se torna inestable, no hay problema en continuar con la entrada de datos al formulario, ya que son guardados localmente en tu computadora, y luego serán enviados al servidor cuando la conexión a Internet haya mejorado. Es decir, los datos pueden introducirse y almacenarse localmente cuando estamos offline y luego ser cargados al servidor central cuando estamos online. Esto significa que la estrategia de despliegue de DHIS 2 online se hace más viable en aquellas zonas con un acceso a Internet poco estable. Así, la utilización total de ancho de banda se reduce enormemente ya que los formularios no se cargan del servidor en cada renderización.

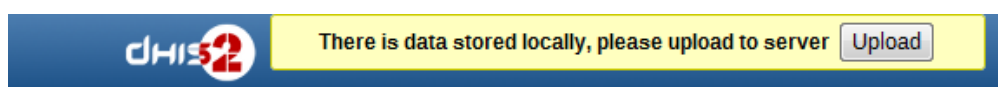
Cuando recuperamos la conexión con el servidor a través de Internet, se muestra un mensaje en la parte superior de la pantalla de entrada de datos.



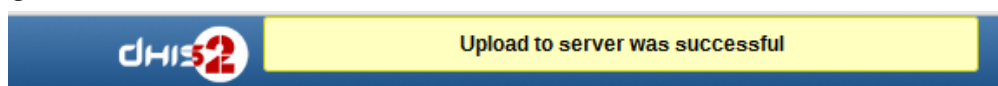
Cuando la conexión a Internet falla por alguna razón durante el proceso de entrada de datos, la aplicación DHIS 2 lo detecta y nos avisará de que los datos serán guardados localmente.



La entrada de datos puede continuar de forma normal. Una vez que hayas introducido todos los datos necesarios, y la aplicación detecta que el servidor está online, serás informado de que hay datos que deben ser sincronizados con el servidor.



Cuando los datos se han sincronizado con éxito en el servidor, recibirás un mensaje de confirmación de que los datos han sido cargados con éxito en el servidor.



Capítulo 9. Utilizando la funcionalidad de Calidad de Datos

El módulo de calidad de datos proporciona medios para mejorar la precisión y fiabilidad de los datos que se encuentran en el sistema. Esto es posible a través de reglas de validación y diversos chequeos estadísticos. Podremos encontrar las funcionalidades que se describen a continuación en el menú lateral izquierdo dentro del módulo de Servicios -> Calidad de Datos.

9.1. Un vistazo a los chequeos de calidad de datos

Garantizar la calidad de los datos es un punto clave para la construcción de un Sistema de Gestión de la Información de Salud eficaz. La calidad de datos tiene diferentes dimensiones tales como:

- *Precisión:* Los datos deben encontrarse dentro del rango normal de datos recogidos en ese establecimiento de salud. No deberían existir grandes discrepancias cuando comparamos con datos de elementos de datos relacionados.
- *Integridad o Completitud:* El total de los datos requeridos debe haberse registrado para todos los elementos de datos de todos los establecimientos de salud.
- *Coherencia:* Los datos deben ser coherentes con otros datos introducidos en meses o años anteriores al tiempo que permiten cambios en la reorganización, incremento en la carga de trabajo, etc. y coherentes también con aquellos de otros establecimientos de salud similares.
- *Puntualidad:* Todos los datos de las unidades organizativas que reportan deben ser registrados en la fecha prevista.

9.2. Chequeos de calidad de los datos

El chequeo de calidad de los datos puede realizarse de diversas formas. A continuación se citan algunas:

1. En el momento de la entrada de datos, la aplicación puede chequear los datos introducidos para verificar si estos caen entre los rangos mínimo y máximo de ese elemento de datos (basándose en todos los datos ya registrados anteriormente).
2. Es posible definir varias reglas de validación, que pueden lanzarse una vez que el usuario ha finalizado ya la entrada de datos. El usuario puede chequear también los datos introducidos para un periodo particular y unidad(es) organizativa(s) frente a las reglas de validación, así como mostrar los fallos obtenidos para dichas reglas de validación.
3. Análisis de sets de datos, como por ejemplo examinando huecos en los datos.
4. Triangulación de los datos, que consiste en comparar el mismo dato o indicador de diferentes fuentes.

9.3. Lanzando un análisis de reglas de validación

Podemos acceder al Análisis de Reglas de Validación en el menú Servicios -> Calidad de Datos.

Las reglas de validación se basan en una expresión que define la relación entre varios elementos de datos. Esta expresión tiene una parte izquierda y una parte derecha, y también un operador en medio que define si la primera debe ser menor que, igual que o mayor que la segunda. La expresión formula una condición que garantiza el cumplimiento de determinados criterios lógicos. Por ejemplo, una regla de validación puede estipular que el número total de vacunas recibidas por niños y niñas debe ser menor o igual al número total de niños y niñas.

La función de análisis de reglas de validación prueba las reglas diseñadas para los datos registrados en el sistema. Los fallos de validación son reportados en aquellos casos en los que la condición definida mediante la expresión de la regla de validación no se cumple, esto es, cuando la condición es falsa.

Seleccionando qué datos debemos validar:

En primer lugar, introducimos una fecha de inicio y una fecha de fin para filtrar los datos que serán incluidos en el análisis. Podemos utilizar el *widget* de fechas para seleccionar las fechas.

En segundo lugar, escogemos incluir o bien todas las reglas de validación o bien las reglas de validación de un grupo concreto.

En tercer lugar, escogemos incluir o bien la unidad organizativa seleccionada únicamente o bien la unidad organizativa seleccionada con todos sus hijos (unidades que cuelgan de ella).

Cuarto, seleccionamos la unidad organizativa.

Para terminar, pinchamos en el botón *Validar*.

Resultados de validación:

El proceso de análisis puede demorar un tiempo dependiendo de la cantidad de datos que está siendo analizada. Si no hay fallos de validación veremos un mensaje que indique *La validación finalizó con éxito.*

Si hubo fallos en la validación, aparecerán mostrados en un listado. Para cada fallo se muestra la unidad organizativa, el periodo, la descripción y valor del lado izquierdo de la expresión de validación, el operador, y la descripción y valor del lado derecho de la expresión.

Pulsando el icono de detalle podemos obtener más información sobre el fallo de validación. Al pulsarlo se abrirá una pantalla emergente que proporcione información sobre los elementos de datos incluidos en las reglas de validación y sus correspondientes valores. Esta información podremos utilizarla para corregir datos erróneos.

También podremos exportar los fallos de validación a un documento PDF, pinchando en el botón de *Descargar PDF*, o a un documento de Microsoft Excel, pinchando el botón de *Descargar MS Excel*.


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Maintenance
Services
Help
Log out

Run validation

Validation violations

Start date: 2010-10-01
Download as PDF
Download as Excel
End date: 2010-12-31
Download as CSV
Done

Organisation unit	Period	Left side description	Value	Operator	Value	Right side description	Details
Kilifi District Hospital	October 2010	Pregnant women enrolled for HIV care through PMTCT	11.0	>=	21.0	pregnant womens on ARVs	
Kilifi District Hospital	October 2010	Inpatient counselled	440.0	>=	530.0	Inpatient tested	
Mt Harmony Clinic	November 2010	Total ANC re-visits	1.0	>=	2.0	ANC 4th visit completed	
Jaribuni Dispensary	December 2010	Total ANC re-visits	13.0	>=	16.0	ANC 4th visit completed	
Zion Community Clinic	December 2010	ANC Tested Clients	9.0	>=	23.0	ANC clients tested positive	
Kilifi District Hospital	December 2010	Live births plus still births	187.0	>=	566.0	Deliveries	
Zion Community Clinic	December 2010	ANC clients issued with Preventive ARVs	9.0	>=	23.0	ANC tested positives (+ves)	
Nuru Medical Clinic	December 2010	Live Births	4.0	>=	5.0	Discharged alive	
Madamani Dispensary	December 2010	Live Births	0.0	>=	1.0	Discharged alive	
Jaribuni Dispensary	December 2010	Total ANC clients	43.0	>=	73.0	Total IPT given at ANC	
Pingilikani Dispensary	December 2010	Total ANC clients	55.0	>=	56.0	Total IPT given at ANC	
Zion Community Clinic	December 2010	Total ANC clients	63.0	>=	2323.0	ANC clients counselled (PMTCT)	
Kilifi District Hospital	December 2010	Pregnant women enrolled for HIV care through PMTCT	7.0	>=	18.0	pregnant womens on ARVs	
Zion Community Clinic	December 2010	PMTCT HIV tests	9.0	>=	23.0	PMTCT HIV+	
Vipingo Health Centre	December 2010	ANC clients issued with Preventive ARVs	4.0	>=	5.0	ANC tested positives (+ves)	

9.4. Análisis de outliers (valores atípicos)

Podemos acceder al análisis de outliers (de desviación típica) en el menú Servicios -> Calidad de Datos

El análisis de outliers basado en la desviación típica ofrece un mecanismo para conocer qué valores están numéricamente distantes del resto de los datos. Los outliers pueden aparecer por casualidad, pero a menudo representan un error de medida o una distribución fuertemente prolongada (derivando en números grandes). En el primer caso generalmente descartaremos estos outliers mientras en el segundo caso deberemos ser cautos al utilizar herramientas estadísticas o interpretaciones que asuman una distribución normal. El análisis está basado en una distribución normal estándar.

Seleccionando qué datos queremos analizar:

1. Seleccionamos las fechas de inicio y fin (de y a) de los datos que serán incluidos en el análisis.
2. Seleccionamos el set de datos desde el cual obtendremos los elementos de datos.
3. Seleccionamos todos o algunos elementos de datos del set de datos haciendo doble click o bien marcándolos y después pinchando en los botones de añadir/quitar.
4. Seleccionamos la unidad organizativa padre que vamos a utilizar. Al hacer esto se incluirán automáticamente todas las unidades hijas (las que se encuentran por debajo de ésta en la jerarquía).
5. Seleccionamos el número de desviaciones típicas. Así fijamos el número de desviaciones típicas que los datos pueden alejarse desde la media (o valor promedio), antes de ser marcados como outliers.

Resultado del análisis:

Los posibles valores outliers que se han descubierto en el análisis se presentan en un listado una vez que el proceso de análisis ha terminado. Para cada outlier se muestra el elemento de dato, la unidad organizativa, el periodo, el valor mínimo, el valor actual y el valor máximo. Los valores máximo y mínimo indican los valores límite derivados del número de desviaciones estándar que hemos seleccionado previamente para el análisis.

Podremos modificar cada outlier directamente en la página de resultados de análisis. El valor puede modificarse pinchando dentro del campo correspondiente en la columna de valores, introduciendo un valor y saliendo a continuación de ese campo de datos (por ejemplo pulsando la tecla Tab) o pinchando simplemente fuera del campo. El sistema lanzará una alerta si, después de modificarlo, el valor sigue fuera de los valores máximo y mínimo, aunque el valor quedará guardado en cualquier caso. Si el valor que queda introducido está fuera de rango, veremos un fondo rojo en el campo de datos. Si el valor está dentro el fondo quedará verde.

Pinchando en el icono de estrella, podemos también marcar cada outlier para posterior seguimiento.

9.5. Análisis de outliers en rangos Max-Min

El análisis de outliers basado en valores máximo y mínimo ofrece un mecanismo para detectar valores que quedan fuera de límites máximo y mínimo previamente definidos. Estos valores límite pueden ser definidos por el usuario o asignados automáticamente por el sistema en el módulo de administración de datos. Para más detalles revisa la sección sobre Análisis de Outliers Std Dev.

9.6. Análisis de Huecos

El análisis de huecos proporciona un mecanismo para detectar huecos en los datos. Hay huecos para elementos de datos y unidades organizativas concretas. Un hueco es un periodo sin datos registrados, que es precedido y seguido de periodos que sí tienen datos registrados. Este tipo de huecos indican generalmente errores en la captura u omisión, y pueden ser investigados con posterioridad. Para más detalles revisa la sección sobre Análisis de Outliers Std Dev.

9.7. Análisis de Seguimiento

La función de análisis de seguimiento lista todos los valores de datos marcados para seguimiento. Los valores de datos se pueden marcar para seguimiento en el módulo de entrada de datos y en los otros tipos de análisis disponibles en este módulo.

Capítulo 10. Configurando la funcionalidad de Calidad de Datos

The data quality module provides means to improve the quality of the data in the system. This can be done through validation rules and various statistical checks.

10.1. Objetivos de aprendizaje

After reading this module you will be able to understand:

1. What is data quality and its importance for HMIS.
2. How to do data quality check at point of data entry.
3. How to create data validation rules.
4. How to carry out data triangulation.
5. How to analyze data status.

10.2. Una panorámica al chequeo de calidad de datos

Ensuring data quality is a key concern in building an effective HMIS. Data quality has different dimensions including:

- *Correctness*: Data should be within the normal range for data collected at that facility. There should be no gross discrepancies when compared with data from related data elements.
- *Completeness*: Data for all data elements for all health facilities/blocks/Taluka/districts should have been submitted.
- *Consistency*: Data should be consistent with data entered during earlier months and years while allowing for changes with reorganization, increased work load, etc. and consistent with other similar facilities.
- *Timeliness*: All data from all health facilities/blocks/Taluka/districts should be submitted at the appointed time.

10.3. Chequeos de calidad de datos

Data quality checking can be done through various means, including:

1. At point of data entry, the software can check the data entered to see if it falls within the min-max ranges of that data element over the last six months or as defined by the user.
2. Defining various validation rules, which can be run once the user has finished data entry. The user can also check the entered data for a particular period and Organization Unit(s) against the validation rules, and display the violations for these validation rules.
3. Analysis of data sets, ie. examining gaps in data.
4. Data triangulation which is comparing the same data or indicator from different sources.

10.4. Chequeo de calidad de datos en cualquier punto de la entrada de datos

Data quality can be checked at the point of data entry through setting the minimum and maximum value range for each element manually or generating the min-max values using the DHIS 2 if there is historical data available for that data element.

10.4.1. Cómo fijar manualmente el rango de valores mínimo y máximo

If you are using the default entry screen click on the element for which you want to set the min-max value. A pop-up window will appear in which you can enter the values. On subsequent data entry if the value entered does not fall within the set min-max range the text box will change colour to red. The user will also get a pop-up as shown below. This change in colour is a prompt to check the data entered and make necessary correction. On the data entry screen the users also have the option to add a comment on how the discrepant figure might be explained (if required). This you can do by using the drop down menu of the 'comment' box. In case you are using the custom data entry screen which is displayed when you deselect the 'default data entry form' option on the top right corner of the screen. In this case the minimum and maximum values can be added by double-clicking on the data entry box instead of the data element.

10.4.2. Valores generados min-max

It is possible to generate the min-max value, element-wise, using the DHIS2. In such case you merely need to click on the 'Generate min-max' button near the upper right corner. In case of default data entry screen the min and max values, when generated, will appear on the left and right side of the data entry box. In case you deselect the default data entry form the generated values will appear on the top right end of the screen.

10.5. Regla de validación

This module provides management of validation rules. A validation rule is based on an expression which defines a relationship between a number of data elements. The expression has a left side and a right side and an operator which defines whether the former must be less than, equal to or greater than the latter. The expression forms a condition which should assert that certain logical criterias are met. For instance, a validation rule could assert that the total number of vaccines given to infants is less than or equal to the total number of infants.

To add a validation rule, click the add new button. First, provide a descriptive *name* for the validation rule. The name must be unique among the validation rules. Second, provide a description for the validation rule. Third, select an operator. The operator options are *equal*, *not equal*, *greater than*, *greater than or equal*, *less than*, *less than or equal to*. Then define the left side and right side of the validation rule expression. First, provide a description for the expression. Second, build the expression with the expression builder. The expression is mathematical and contain data elements as well as integers and mathematical operators. Data elements can be included by double-clicking one in the available data elements list to the right. Alternatively one can select a data element and click the insert button. Mathematical operators can be included by clicking the corresponding button under the expression builder area. Save the expression by clicking *save*, then save the validation rule by clicking *save*.

To edit a validation rule, click the *edit* icon next to the relevant validation rule in the list. Then follow the same procedures as above.

To delete a validation rule, click the *delete* icon next to the relevant validation rule in the list.

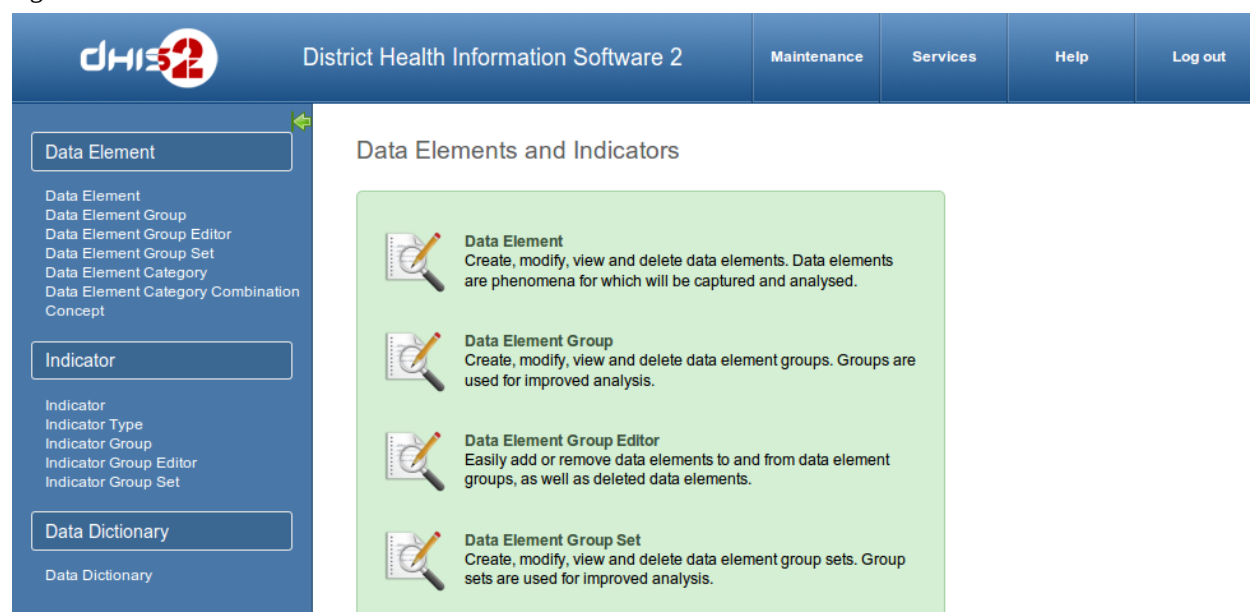
To view validation rule details, click the *view details* icon next to the relevant validation rule in the list.

10.6. Grupo de reglas de validación

A validation rule group provides a mechanism for classifying related data elements. Another advantage of using validation rule groups is that it can later be run separately, contrary to running all validation rules.

Capítulo 11. Indicadores

Cuando elegimos la opción 'Elementos de datos e Indicadores' del menú de Mantenimiento, aparece la pantalla siguiente:



En el menú lateral izquierdo o más abajo en la zona central podemos acceder a las diversas secciones de Indicadores;

Indicador, Tipo de indicador, Grupo de indicadores, Editor de grupos de indicadores, y Set de grupos de indicadores.

11.1. Mantenimiento de indicadores

Indicator maintenance functions essentially the same as each of the respective sections in the previous section on data elements. The basic operations will be described in this section, but the reader should refer to the corresponding sections above for detailed instructions.

11.1.1. Indicadores

Indicators are composed of multiple data elements, and typically consist of a numerator and denominator. Indicators are never entered in DHIS2, but are derived from combinations of data elements and factors. Indicators are used to calculate coverage rates, incidence and other values are a result of data element values that have been entered into the system.

To access the Indicator maintains page, press Maintenance -> Data Element and Indicators -> Indicator from the main DHIS2 menu. Similar to data elements, you can add, delete, modify and view extra information about the indicators in the system.

Indicators can be filtered by entering the name or a part of the indicator name in the "Filter by name" field. Similar to data elements, indicators can be added by pressing the "Add new" button. Other operations available from this menu are as follows.

-  Existing indicators can be edited.
-  Translate an existing indicator.
-  Delete an existing indicator.
-  Get detailed information about this indicator.

To add a new indicator, click the "Add new" button. The following screen is displayed.

Each of the fields marked with an asterisk are compulsory. A description of each field is provided below.

- **Name:** The full name of the indicator, such as "Incidence of confirmed malaria cases per 1000 population"
- **Short name:** An abbreviated name of the indicator such as "Inc conf. malaria per 1000 pop". The short name must be less than or equal to 25 characters, including spaces.
- **Alternative name:** An additional field for a possible alternative name of the indicator.
- **Code:** In many countries, indicators are often assigned a particular code. This code can be entered here.
- **Description:** A brief, informative description of the indicator and how it is calculated can be entered here.
- **Annualized:** Determines whether or not an annualization factor is applied during the calculation of the indicator. Typically, annualized indicator's numerator are multiplied by a factor of 12, and the denominator is for instance a yearly population figure. This allows for monthly coverage values to be calculated with yearly population figures.
- **Type:** This field will determine a factor that will automatically be applied during the calculation of the indicator. Possible choices are determined by the Indicator Types (described below). For instance, a "Percent" indicator will automatically be multiplied by a factor of 100 when exported to the data mart, so that it will display as a percentage.
- **URL:** Can be used as a link to an indicator registry, where a full metadata description of the indicator can be made available.

To define the numerator and denominator, simply press the respective button, and the following dialogue will be displayed.

Essentially, an indicator is a formula that can be composed of multiple data elements, constant factors, and mathematical operators. In order to define a new indicator proceed with the following steps.

1. Enter at least the required fields (Name and short name) from the indicator maintenance screen.
2. Next, press "Edit numerator" from the main indicator maintenance screen. This will provide a dialog where you can define the actual formula of the indicator's numerator..
3. A description of the numerator/denominator must be provided in the "Description field". This should provide a clear description of
4. Define the formula of the indicator by selecting the data elements that should compose the numerator from the "Data elements" field. Simply select the data element, and double click it. It will now appear in the formula. Your formula must be mathematically valid, including the proper use of parentheses when necessary. You can double click on each of the mathematical operator buttons below the indicator formula definition to add them to your formula.

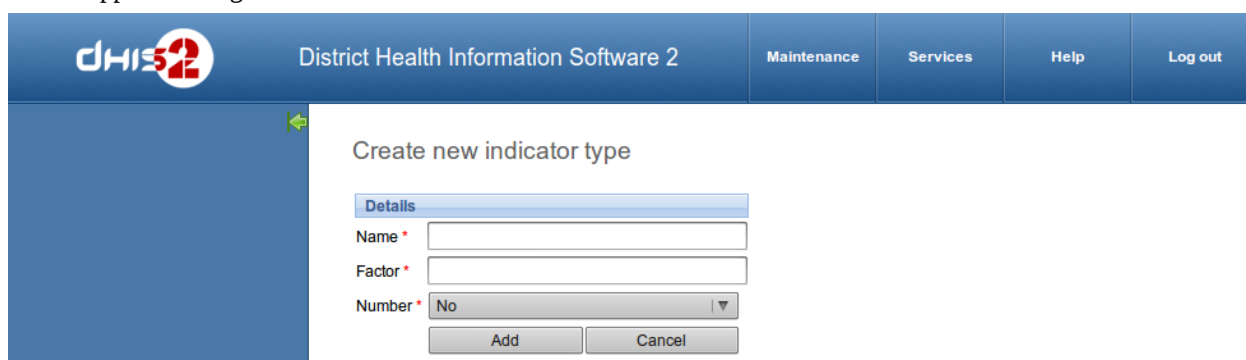
5. Click the Save button to save all changes to the numerator. Click cancel to discard any changes that you have made.
6. Follow the same procedure in order to define the denominator.

11.1.2. Tipos de indicadores

Indicator types simply define a factor that will be applied during aggregation. Indicator values that are calculate during a data mart export or report table generation process will appear properly formatted, and will therefore not require an additional multiplier (e.g. 100 in the case of percents) for the values to appear correctly formatted.

The indicator type maintenance panel has all of the same functions (Add new, Edit, Translate, Delete, and Information) as the Indicator maintenance section.

There are only two fields that need to be filled-in to create an indicator type, Name and Factor, as seen below. Name refers to the Indicator type (e.g. Per cent, Per thousand, Per ten thousand, etc). The factor is the numeric factor that will be applied during the calculation of the indicator.




Nota

As of version 2.4 of DHIS2, the "Calculated data element" object has been deprecated. Instead, a calculated data element can be created by creating an indicator type with a factor of "1" and by setting the "Number" option to "Yes". The effect of setting the "Number" option to "Yes" will be that the indicator will effectively not have a denominator. You will therefore only be able to define a numerator, which will serve as the formula of the calculated data element.

11.1.3. Grupos de indicadores

Indicator groups function essentially the same as data element groups. Multiple indicators can be assigned to a group for easy filtering and analysis. To assign indicators to groups, simply press Maintenance->Data elements and indicators->Indicator groups. See the section on Data element groups for detailed instructions of how to use this module.

11.1.4. Editor de grupos de indicadores

The indicator group editor module functions essentially the same as the data element group editor module, except on indicators. You can easily rearrange the groups that indicators belong to with this module. To access it, choose To assign indicators to groups, simply press Maintenance->Data elements and indicators->Indicator group editor from the main menu. See the section on Data element group editor for further instructions.

11.1.5. Sets de grupos de indicadores

Similar to data element group sets, indicator group sets serve to create combined groups of similar indicators. For instance, you might have a group of indicators called "Malaria" and "Leishmaniasis". Both of these groups could be combined into a group set called "Vector-borne diseases". Indicator groups sets are used during analysis of data to combine similar themes of indicators. To access this module choose Maintenance->Data elements and indicators->Indicator group sets from the main menu. The following dialogue will appear.

DHIS2 District Health Information Software 2 Maintenance Services Help Log out

Data Element

- Data Element
- Data Element Group
- Data Element Group Editor
- Data Element Group Set
- Data Element Category
- Data Element Category Combination
- Concept

Indicator

- Indicator
- Indicator Type
- Indicator Group
- Indicator Group Editor
- Indicator Group Set

Data Dictionary

- Data Dictionary

Add Indicator Group Set

Details

Name *

Available Indicator Groups

< Filters >

ANC
Malaria

Group members

> < >> <<

Add Cancel

Supply a name for the indicator group set, and then move the desired members from the "Available Indicator Groups" to the "Group members". Click "Add" to save your changes and "Cancel" to discard any changes.

Capítulo 12. Utilizando la funcionalidad de Reporte

12.1. Funcionalidad de reporte en DHIS 2

El módulo de reporte en DHIS 2 ofrece una variedad de alternativas. En esta sección veremos cómo utilizarlas para ver y analizar los datos. En otra sección se verá cómo configurar y poner en marcha las diversas herramientas de reporte.

Reportes estándar: Los reportes estándar se construyen con tablas de reportes, pero su diseño avanzado permite modificar su apariencia y estilo. Estos reportes pueden combinar múltiples tablas y gráficas en el mismo informe, y se pueden visibilizar como reportes de 'un-click' que son muy fáciles de usar. Podemos descargar estos reportes en formato PDF, por lo que son ideales para imprimir así como para compartir y copiar offline.

Reportes de Set de datos: Los reportes de set de datos son simplemente una forma amigable para ver e imprimir los formularios de entrada de datos con datos en bruto o datos agregados (por lugar o tiempo). El diseño utilizado en la entrada de datos es el mismo que se utiliza en estos reportes de set de datos. Aunque esto funcionará solo para los sets de datos que han pre-establecido un formulario de entrada de datos personalizado.

Panel de control (Dashboard): Es la manera más rápida de ver los datos. El panel de control puede mostrar hasta cuatro gráficas actualizadas así como enlaces a los reportes favoritos, tablas de reportes, y vistas de mapas. Cada usuario puede configurar su propio panel personal de control.

Visualizador de datos: Permite formas flexibles de visualizar los datos como gráficas y tablas de datos. Es posible incluir aquí tantos indicadores y elementos de datos como deseemos. También podemos elegir entre muchos tipos de gráficas, tales como gráficos de barras, barras apiladas, lineales y diagramas de tarta. Podremos guardar las gráficas a su vez para cargarlas fácilmente en sesiones posteriores, y también podemos incluirlas en nuestro panel personal de control. Las gráficas se pueden descargar como imágenes o como PDF en nuestro computador local.

Tablas de reportes: Son una forma de mostrar los datos en tablas con múltiples opciones de configuración, ya sea utilizando datos en bruto, agregados o indicadores. Estas tablas son utilizadas bien como fuente de datos para otros reportes más avanzados, para exportar la información a otros sistemas externos, o como un informe bruto. Se pueden exportar a diversos formatos: PDF, MS Excel, CSV y Jasper. Las tablas representan una manera muy dinámica, flexible y rápida de revisar los datos. Las tablas de reportes pueden configurarse con parámetros específicos para reutilizarlas en otros periodos o lugares.

Reportes de distribución de unidades organizativas: Estos reportes se generan a partir del set grupo de unidades organizativas (orgunit) y permiten ver qué tipos (y qué cantidad) de establecimientos de salud están ubicados en un área determinada (en cualquier nivel de la jerarquía). Estos reportes se generan automáticamente y muestran la información tanto en tablas como gráficas, que pueden descargarse en PDF, MS Excel y CSV.

Resumen de la tasa de reportes: Estos reportes ofrecen una bonita vista de cuántos establecimientos han registrado sus datos para un periodo y set de datos determinados. Aquí podemos obtener la cuenta y el porcentaje de la tasa de reporte para uno o para todos los sets de datos.

Tablas Excel dinámicas: Las tablas dinámicas Excel son una forma potente de analizar nuestros datos y DHIS 2 enlaza directamente con las tablas dinámicas, de manera que todos los datos quedan disponibles y actualizados en el fichero Excel. Esto puede ser una herramienta muy útil a usuarios que prefieren trabajar con los datos offline. Para actualizar las tablas dinámicas locales necesitarás la herramienta *myDatamart* que conecta con el servidor online y descarga los datos restantes. Esta actualización normalmente se realiza una vez al mes cuando están disponibles los nuevos datos, pero no requiere una conexión permanente a Internet como sucede con otras herramientas de reporte (si estás conectado generalmente a un servidor DHIS 2 online).

Tablas Web dinámicas: La herramienta incluida en DHIS 2 de tabla dinámica es una herramienta web sencilla para mostrar los datos de indicadores por unidad organizativa y por periodo en una vista típica de tabla dinámica. Permite algunas manipulaciones básicas de dinamismo de las tablas. Es una manera rápida y fácil de mirar muchos valores de

indicadores al mismo tiempo (por *orgunit* y/o periodo), pero que no tiene las mismas funcionalidades que las tablas Excel dinámicas offline.

Sistema de Información Geográfica (SIG): Permite presentar y analizar los datos utilizando mapas temáticos. Es posible ver tanto los elementos de datos como los indicadores y, dado que disponemos de las coordenadas de todas nuestras *orgunits*, podemos explorar la jerarquía y ver los mapas para todos los niveles desde polígonos de país a puntos de establecimientos de salud. Para más detalles revisa el capítulo específico sobre SIG. Toda la información de mapas está cargada en DHIS 2 y tan solo necesitas registrar las coordenadas de las unidades organizativas y los mapas estarán disponibles inmediatamente.

12.2. Utilizando reportes estándar

Podemos acceder a los reportes disponibles en el menú desplegable "Servicios", seleccionando "Reportes". En el menú de reporte que aparece en la barra lateral izquierda, pincha en Reporte Estándar. Aparecerá entonces en la ventana principal una lista de todos los reportes que hay predefinidos.

Name	Operations
ART	[Play] [Edit] [Delete] [Add]
Family Planning	[Play] [Edit] [Delete] [Add]
Immunisation cumulative coverage chart	[Play] [Edit] [Delete] [Add]
Immunisation Yearly	[Play] [Edit] [Delete] [Add]
Immunization DPT	[Play] [Edit] [Delete] [Add]
Immunization Dropout Rates	[Play] [Edit] [Delete] [Add]
Immunization OPV	[Play] [Edit] [Delete] [Add]
Life cycle	[Play] [Edit] [Delete] [Add]
OPD top 10 new cases Over 5	[Play] [Edit] [Delete] [Add]
OPD top 10 new cases Total	[Play] [Edit] [Delete] [Add]
OPD top 10 new cases Under 5	[Play] [Edit] [Delete] [Add]
PMTCT	[Play] [Edit] [Delete] [Add]
Safe delivery overview	[Play] [Edit] [Delete] [Add]

Podemos lanzar o leer un reporte pinchando en la flecha verde y blanca que aparece junto al reporte que queremos. Entonces veremos una ventana de parámetros de reporte que tenemos que rellenar con los valores correspondientes de *orgunit* y/o mes de reporte, dependiendo de qué se ha definido para la tabla de reporte subyacente. Cuando hayas completado los parámetros, pincha en "Obtener Reporte". El reporte aparecerá en tu navegador o como un fichero PDF para descarga, dependiendo de las opciones configuradas en tu navegador para los documentos PDF. Podemos guardar el documento y almacenarlo localmente en la computadora para utilizarlo más tarde.

12.3. Utilizando tablas de reportes

Las tablas de reportes son una herramienta fácil de usar para crear análisis tabulares. Para lanzar una tabla de reporte primero navegamos en la lista de tablas de reporte disponibles que encontramos en Servicios->Reportes->Tabla de Reporte y pinchamos en la flecha verde y blanca (el primer símbolo que aparece en la lista de operaciones) situado junto a la tabla de reportes que queremos ver.

Parámetros de los reportes: La mayoría de las tablas de reportes tienen parámetros configurables, es decir, podemos filtrar qué *orgunits* y/o periodos queremos en el reporte. Esto hace los reportes fácilmente reutilizables. Cuando

lanzamos una tabla de reporte aparece una ventana de parámetros que nos solicita introducir valores para los parámetros seleccionados. Los parámetros posibles son "Mes de Reporte" y "Unidad Organizativa", y es posible que uno de ellos o ambos aparezcan en la ventana. Después de seleccionar los valores hemos de pinchar en el botón "Obtener Reporte".

Exportar/Ver opciones: Cuando una tabla de reporte está preparado, se muestra en una vista HTML. La tabla de reporte puede exportarse en PDF (para imprimir y guardar cómodamente), en Excel, CSV, y también en el formato estándar de reporte (Jasper) mostrando un cuadro y una gráfica más bonicos, o como un archivo de diseño Jasper de modo que se puedan realizar modificaciones futuras en el diseño del reporte antes de cargarlo en la aplicación DHIS como un reporte estándar (ver la sección Crear reportes estándar).

Period	Organisation unit	Fully Immunised	DPT3 doses given	Measles doses given	DPT1 doses given
October 2010	Bamba Medical Clinic	0.0	0.0	0.0	0.0
October 2010	Uzima MC (Kilifi)	0.0	0.0	0.0	0.0
October 2010	Mwanzo Medical Clinic	0.0	0.0	0.0	0.0
October 2010	Menengai Health Care Serv	0.0	0.0	0.0	0.0
October 2010	Mtwapa Dispensary	153.0	127.0	153.0	117.0
October 2010	Vipingo Health Centre	76.0	102.0	76.0	107.0
October 2010	Union Medical	0.0	0.0	0.0	0.0
October 2010	Amani Family Medical Clin	0.0	0.0	0.0	0.0
October 2010	Michaela Denis MC	0.0	0.0	0.0	0.0
October 2010	Ganze Dispensary	29.0	0.0	29.0	76.0
October 2010	Vutakaka Medical Clinic	2.0	0.0	2.0	0.0
October 2010	Chumani Medical Clinic	2.0	8.0	2.0	9.0

12.4. Utilizando reportes de set de datos

Los reportes de sets de datos son un tipo de vista (lista para imprimir) de la pantalla de entrada de datos que se han rellenado bien con datos en bruto o bien con datos agregados. Estos reportes solo están disponibles para sets de datos que tienen formularios de entrada de datos personalizados y no para los formularios por defecto o por secciones.

Podemos acceder a los reportes de sets de datos en el Menú Reportes, en el desplegable de Servicios. Entonces aparecerá una ventana de Criterios de búsqueda donde deberemos rellenar los detalles del reporte:

Set de Datos: Los sets de datos que queremos mostrar.

Periodo de Reporte: Podemos introducir periodos agregados o en bruto, es decir, podemos solicitar un reporte trimestral o anual incluso si ese set de datos se recoge mensualmente. El tipo de periodo de un set de datos (la frecuencia de recogida de datos) se define en el menú de Mantenimiento de set de datos. Para ello hay que seleccionar primero el tipo de periodo (mensual, trimestral, anual, etc) en el desplegable que hay junto a los botones Anterior y Siguiente, y entonces seleccionamos uno de los periodos disponibles en la lista desplegada abajo. Utilizamos los botones Anterior y Siguiente para movernos al año anterior o posterior.

Utilizar los datos solo para la unidad seleccionada: Podemos usar esta opción si queremos obtener un reporte para una Unidad Organizativa con hijos (otras unidades por debajo en la jerarquía), pero solo queremos mostrar ahora los datos recogidos directamente en esta unidad y no todos los datos recogidos por todas las subunidades. Si queremos generar un reporte agregado típico para una Unidad Organizativa no utilizaremos esta opción.

Reportando Unidad Organizativa: Aquí podemos seleccionar la Unidad Organizativa para la que queremos el reporte. Esto puede ser en cualquier nivel de la jerarquía porque los datos se agregarán en este nivel automáticamente (salvo si hemos seleccionado la opción anterior).

Una vez hemos terminado de rellenar los criterios de reporte pinchamos en "Generar". El reporte aparecerá en una vista HTML con formato listo para impresión. Utiliza los botones Imprimir y Guardar de tu navegador para imprimir o guardar (como HTML) el reporte.

12.5. Utilizando la herramienta de Recursos

La herramienta de Recursos nos permite cargar ficheros de nuestra computadora local en la aplicación DHIS y añadir enlaces a otros recursos de Internet mediante direcciones URL. Para compartir un enlace directo a los recursos DHIS pincharemos en el botón "Ver Recurso" y copiaremos la dirección del enlace en el campo que aparece.

Para crear un recurso nuevo pincharemos en el botón "Añadir nuevo". Introducimos un nombre para el recurso y elegimos entre cargar un archivo o una URL externa. Si elegimos la carga de archivo local, deberemos pinchar en "Elegir archivo" y seleccionar el documento de nuestra computadora. Si elegimos URL deberemos introducir el enlace al recurso de Internet. Para finalizar pinchamos en "Guardar".

12.6. Utilizando el visualizador de datos

Podemos acceder al módulo de visualización de datos en el menú principal "Servicios". Para saber más consulta el capítulo titulado "Utilizando el visualizador de datos" donde se explica en detalle este módulo.

12.7. Utilizando el panel de control

El panel de control es la primera vista de los datos que vemos siempre al abrir la aplicación y loguearnos en el sistema. Cada usuario tiene su propio panel de control, que consiste generalmente en cuatro áreas de gráficas en la parte derecha y tres áreas de acceso directo en la parte izquierda.

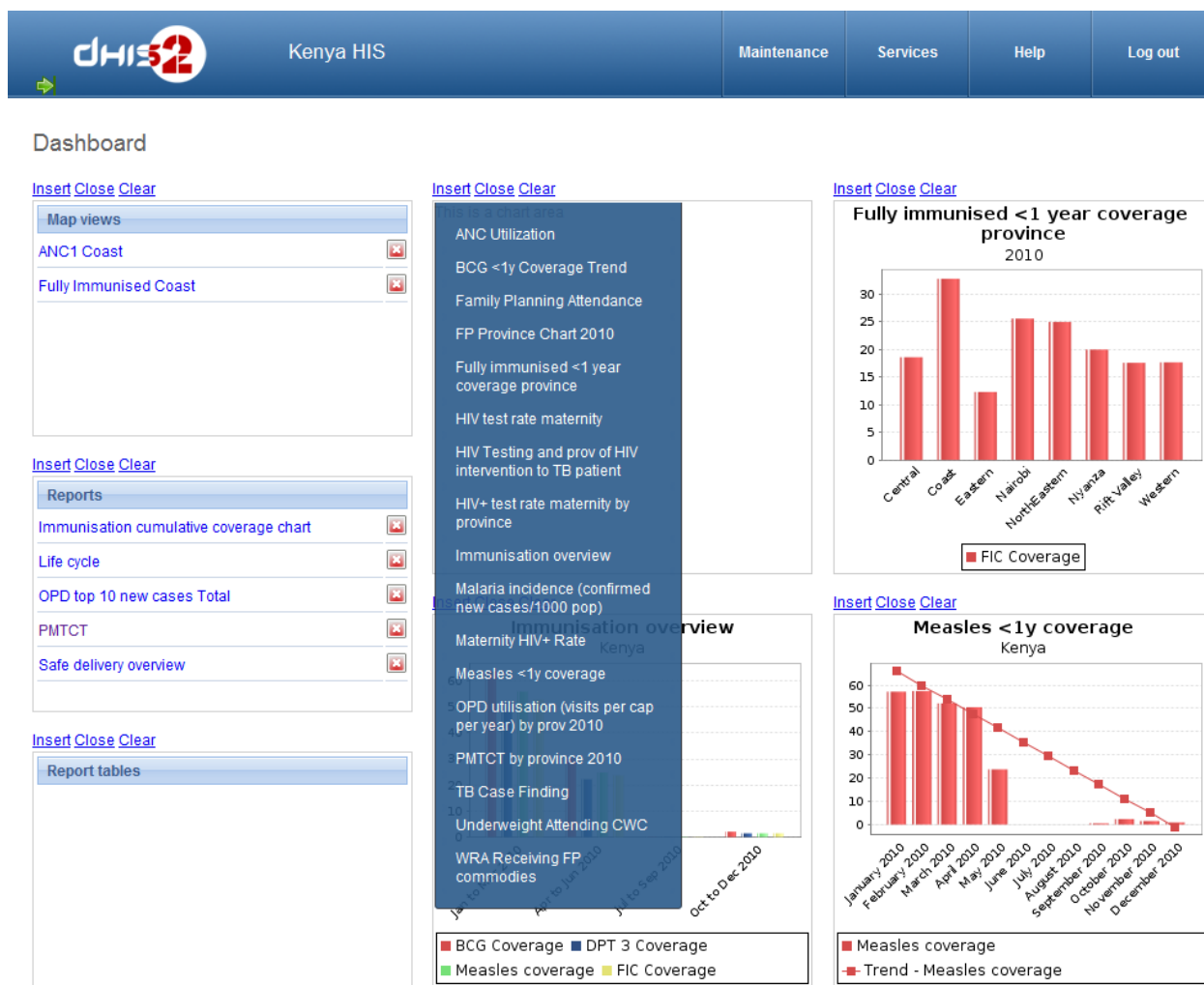


Personalizar las áreas de acceso directo: Cada una de estas áreas podrá contener una lista de objetos entre los que se encuentren: Reportes (estándar), Documentos, exportaciones de Datamart, Tablas de reportes, vistas de mapas, RSS de Salud. Si queremos añadir un tipo de objeto al área de acceso directo pincharemos en el enlace de Insertar ubicado encima del área. Para publicar el listado necesitaremos añadir los objetos uno por uno desde los menús de Servicios->Reportes. De las listas de reportes, tablas de reportes, gráficas, etc. podemos añadir un objeto pinchando en el icono de gráfico circular situado junto al objeto que queremos añadir al panel de control.

Por ejemplo, imaginemos que queremos añadir nuestros reportes estándar favoritos al panel de control. Primero haremos Insertar Reportes en una de las áreas de acceso directo del panel de control, a continuación vamos a Servicios->Reportes y pinchamos en Reportes Estándar. En la lista de reportes estándar podemos ubicar los reportes que queremos y pinchar en el icono de gráfico circular ubicado junto a cada uno de los reportes que deseamos añadir al panel de control. Cuando regresemos al panel de control veremos ya los tres reportes listados en el área de acceso directo donde hemos insertado los reportes.

Utilizaremos el enlace Limpiar situado encima del área de acceso directo para vaciarla. Por su lado, el enlace Cerrar lo que hace es cerrar el menú de inserción sin añadir ningún objeto nuevo.

Personalizar áreas de gráficas: Hay un total de cuatro áreas de gráficas. Para insertar una gráfica en una de ellas sencillamente pincharemos en Insertar y después en una de las gráficas de la lista. Utilizaremos el botón Cerrar para cerrar el listado sin añadir ningún gráfico nuevo, y el botón Limpiar para vaciar un área de gráfica. Estas gráficas se actualizarán cada vez que abramos el panel de control, mostrarán automáticamente los datos de la unidad organizativa asociada al usuario, y actualizarán los datos cuando haya nuevos periodos disponibles.



12.8. Utilizando el resumen de las tasas de reporte

Accedemos al resumen de las tasas de reporte en el menú Servicios->Reportes. Los resúmenes mostrarán cuántos sets de datos (formularios) han sido registrados por unidad organizativa y por periodo. Podemos utilizar uno de los tres diversos métodos que hay para calcular la integridad: 1) en base al botón Completar en la entrada de datos, 2) en base a un conjunto de elementos de datos definidos como obligatorios, o 3) en base al total de valores de datos registrados para un set de datos.

Para lanzar el reporte haremos lo siguiente:

1. Seleccionar una unidad organizativa del árbol desplegable.
2. Seleccionar uno de los métodos de integridad.
3. Seleccionar todos los sets de datos (que reportará sobre todos los sets de datos para la unidad seleccionada) o bien un solo set de datos (que reportará la integridad de todos los hijos de la unidad seleccionada).
4. Seleccionar un tipo de periodo y un periodo como tal de la lista disponible para cada tipo de periodo. Avanzar adelante y atrás en los años utilizando los botones de Anterior y Siguiente.
5. El reporte aparecerá automáticamente en pantalla.
6. Cambiar alguno de los parámetros anteriores y el reporte se actualizará automáticamente.

Data Completeness Report

Select organisation unit

Kenya

Central

Coast

Kilifi County

Kaloleni

Kilifi

Malindi

Kwale County

Lamu County

Mombasa County

Taita Taveta County

Tana River County

Eastern

Nairobi

NorthEastern

Nyanza

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Configuration

☒ Based on complete data set registrations
☐ Based on compulsory data elements
☐ Based on number of registered data values

Integrated RH, HIVAIDS, Malaria, TB & Nutrition

PrevNext

Monthly

November 2010

Data Completeness Report

Kilifi Integrated RH, HIVAIDS, Malaria, TB & Nutrition

Name	Actual	Target	Percent	On time	Percent
Amani Family Medical Clinic	0	1	0.0	0	0.0
Amani Medical Clinic (Kilifi)	1	1	100.0	1	100.0
Bamba Health Centre	1	1	100.0	1	100.0
Bamba Medical Clinic	0	1	0.0	0	0.0
Bomani Dispensary	1	1	100.0	1	100.0
Chasimba H/C	1	1	100.0	1	100.0
Chizi Medical Clinic	0	1	0.0	0	0.0

12.9. Utilizando los reportes de distribución de las unidades organizativas

Podemos acceder a estos reportes en el menú lateral izquierdo en el módulo de Servicios->Reportes.

Los reportes de distribución de las unidades organizativas son informes que muestran cómo están distribuidas las unidades en base a áreas geográficas y a diversas propiedades como tipo o pertenencia.

El resultado obtenido aquí puede procesarse en un reporte basado en tablas o en una gráfica.

Lanzando un reporte de distribución:

Para lanzar un reporte primero seleccionaremos la unidad organizativa en la parte superior izquierda del árbol de unidades. El reporte se basará en unidades organizativas ubicadas bajo la unidad seleccionada. Entonces seleccionaremos el set de grupos de unidades organizativas que deseamos usar, normalmente será Tipo, Pertenencia, Urbano/Rural, aunque también podemos definir este tipo de sets desde nuestro propio usuario. A continuación pincharemos en Obtener Reporte para obtener una representación en tablas, u Obtener Gráfica para ver el mismo resultado graficado.

Type - Kenya

Organisation unit	Dispensary	Health Centre	Hospital	Nursing Home	Private Medical Clinic
Central	355	415	32	16	490
Coast	190	781	9	5	121
Eastern	77	42	4	2	12
Nairobi	0	1	1	0	0
NorthEastern	94	248	1	8	58
Nyanza	4	824	1	0	4
Rift Valley	713	249	44	27	166
Western	1	11	3	0	0

12.10. Utilizando tablas dinámicas web

Una tabla dinámica web es una herramienta para mostrar y jugar con datos de indicadores y de elementos de datos de forma sencilla y fácil. Empezaremos en el cuadro de selección de datos abiertos, seleccionando los tipos de datos, que pueden ser elementos de datos o indicadores. Seleccionamos a continuación uno de los grupos para filtrar o lo dejamos en "Todos". Seleccionamos una fecha de inicio, una fecha de fin y un tipo de periodo para indicar qué periodos queremos incluir en la tabla dinámica. Seguiremos seleccionando una unidad organizativa del árbol desplegable. Los hijos del nivel inferior al de la unidad organizativa seleccionada también serán incluidos en la tabla dinámica. Para terminar pinchamos en "Obtener datos".

Después de cargar una tabla dinámica veremos que los indicadores (o elementos de datos, según corresponda) aparecen en la parte superior como columnas, mientras que los periodos y las unidades organizativas se combinan en filas. Si queremos pivotar la tabla pinchamos en el botón "Pivotar" y seleccionamos las nuevas dimensiones. Estas dimensiones se mostrarán como columnas en la tabla al momento de pinchar el botón "Pivotar".

En la tabla dinámica podemos también pinchar en cualquier celda y obtendremos un menú desde el cual tenemos la opción de visualizar el indicador, la unidad organizativa y el periodo relevantes en las diferentes variantes de graficación.

Para guardar los datos de la tabla dinámica en nuestra computadora local pincharemos en el botón de "Descargar Excel", que contendrá un documento de hoja de cálculo con una página correspondiente a cada periodo.

12.11. Utilizando la gestión con datamart

Datamart es un set de tablas de la base de datos DHIS que se utilizan en todas las herramientas de reporte y de análisis para importar los datos almacenados en el sistema. Datamart se genera en base a los datos registrados. Este interfaz de usuario para la gestión permite controlar el proceso de conversión de los datos registrados en bruto en datos agregados y copiarlos en el datamart.

La pantalla de gestión de datamart permite seleccionar tipos de periodo, fecha de inicio y fecha de fin, que controlarán qué periodos se incluyen en el proceso del datamart. Por defecto se incluyen todos los elementos de datos, indicadores y unidades organizativas.

El proceso de datamart puede demorar un tiempo considerable y utiliza de forma extensiva los recursos del servidor DHIS2, de modo que es recomendable iniciar este tipo de procesos en un momento en que sea viable en entornos de producción. Los procesos de datamart se pueden planificar como tareas habituales en el módulo de administración de datos.

Capítulo 13. Setting up report functionality

13.1. Data sources for reporting

13.1.1. Types of data and aggregation

In the bigger picture of HIS terminology all data in DHIS are usually called aggregated as they are aggregates (e.g. monthly summaries) of medical records or some kind of service registers reported from the health facilities. Aggregation inside DHIS however, which is the topic here, is concerned with how the raw data captured in DHIS (through data entry or import) are further aggregated over time (e.g. from monthly to quarterly values) or up the organisational hierarchy (e.g. from facility to district values).

13.1.1.1. Terminology

- *Raw data* refers to data that is registered into the DHIS 2 either through data entry or data import, and has not been manipulated by the DHIS aggregation process. All these data are stored in the table (or Java object if you prefer) called `DataValue`.
- *Aggregated data* refers to data that has been aggregated by the DHIS 2, meaning it is no longer raw data, but some kind of aggregate of the raw data.
- *Indicator values* can also be understood as aggregated data, but these are special in the way that they are calculated based on user defined formulas (factor * numerator/denominator). Indicator values are therefore processed data and not raw data, and are located in the `aggregatedindicatorvalue` table/object. Indicators are calculated at any level of the organisational hierarchy and these calculations are then based on the aggregated data values available at each level. A level attribute in the `aggregateddatavalue` table refers to the organisational level of the orgunit the value has been calculated for.
- *Period and Period type* are used to specify the time dimension of the raw or aggregated values, and data can be aggregated from one period type to another, e.g. from monthly to quarterly, or daily to monthly. Each data value has one period and that period has one period type. E.g. data values for the periods Jan, Feb, and Mar 2009, all of the monthly period type can be aggregated together to an aggregated data value with the period Q1 2009 and period type Quarterly.

13.1.1.2. Basic rules of aggregation

13.1.1.2.1. What is added together

Data (raw) can be registered at any organisational level, e.g. at a national hospital at level 2, a health facility at level 5, or at a bigger PHC at level 4. This varies from country to country, but DHIS is flexible in allowing data entry or data import to take place at any level. This means that orgunits that themselves have children can register data, sometimes the same data elements as their children units. The basic rule of aggregation in DHIS 2 is that *all raw data is aggregated together*, meaning data registered at a facility on level 5 is added to the data registered for a PHC at level 4.

It is up to the user/system administrator/designer to make sure that no duplication of data entry is taking place and that e.g. data entered at level 4 are not about the same services/visits that are reported by orgunit children at level 5. NOTE that in some cases you want to have duplication of data in the system, but in a controlled manner. E.g. when you have two different sources of data for population estimates, both level 5 catchment population data and another population data source for level 4 based on census data (because sum of level 5 catchments is not always the same as level 4 census data). Then you can specify using advanced aggregation settings (see further down) that the system should e.g. not add level 5 population data to the level 4 population data, and that level 3,2,1 population data aggregates are only based on level 4 data and does not include level 5 data.

13.1.1.2.2. How data gets added together

How data is aggregated depends on the dimension of aggregation (see further down).

Along the orgunit level dimension data is always summed up, simply added together. Note that raw data is never percentages, and therefore can be summed together. Indicator values that can be percentages are treated differently (re-calculated at each level, never summed up).

Along the time dimension there are several possibilities, the two most common ways to aggregate are sum and average. The user can specify for each data element which method to use by setting the aggregation operator (see further down). Monthly service data are normally summed together over time, e.g. the number of vaccines given in a year is the sum of the vaccines given for each month of that year. For population, equipment, staff and other kind of what is often called semi-permanent data the average method is often the one to use, as, e.g. 'number of nurses' working at a facility in a year would not be the sum of the two numbers reported in the six-monthly staffing report, but rather the average of the two numbers. More details further down under 'aggregation operators'.

13.1.1.3. Dimensions of aggregation

13.1.1.3.1. Organisational units and levels

Organisational units are used to represent the 'where' dimension associated with data values. In DHIS 2, organisational units are arranged in a hierarchy, which typically corresponds to the hierarchical nature of the organisation or country. Organisational unit levels correspond to the distinct levels within the hierarchy. For instance, a country may be organized into provinces, then districts, then facilities, and then sub-centers. This organisational hierarchy would have five levels. Within each level, a number of organisational units would exist. During the aggregation process, data is aggregated from the lower organisational unit levels to higher levels. Depending on the aggregation operator, data may be 'summed' or 'averaged' within a given organisational unit level, to derive the aggregate total for all the organisational units that are contained within a higher level organisational unit level. For instance, if there are ten districts contained in a province and the aggregation operator for a given data element has been defined as 'SUM', the aggregate total for the province would be calculated as the sum of the values of the individual ten districts contained in that province.

13.1.1.3.2. Period

Periods are used to represent the 'when' dimension associated with data values. Data can easily be aggregated from weeks to months, from months to quarters, and from quarters to years. DHIS 2 uses known rules of how these different intervals are contained within other intervals (for instance Quarter 1 2010 is known to contain January 2010, February 2010 and March 2010) in order to aggregate data from smaller time intervals, e.g. weeks, into longer time intervals, e.g. months.

13.1.1.3.3. Data Elements and Categories

The data element dimension specifies 'what' is being recorded by a particular data value. Data element categories are actually degenerated dimensions of the data element dimension, and are used to disaggregate the data element dimension into finer categories. Data element categories, such as 'Age' and 'Gender', are used to record a particular data element, typically for different population groups. These categories can then be used to calculate the overall total for the category and the total of all categories.

13.1.1.4. Aggregation operators, methods for aggregation

13.1.1.4.1. Sum

The 'sum' operator simply calculates the sum of all data values that are contained within a particular aggregation matrix. For instance, if data is recorded on a monthly basis at the district level and is aggregated to provincial quarterly totals, all data contained in all districts for a given province and all weeks for the given quarter will be added together to obtain the aggregate total.

13.1.1.4.2. Average

When the average aggregation operator is selected, the unweighted average of all data values within a given aggregation matrix are calculated.

It is important to understand how DHIS 2 treats null values in the context of the average operator. It is fairly common for some organisational units not to submit data for certain data elements. In the context of the average operator, the average results from the number of data elements that are actually present (therefore NOT NULL) within a given aggregation matrix. If there are 12 districts within a given province, but only 10 of these have submitted data, the

average aggregate will result from these ten values that are actually present in the database, and will not take into account the missing values.

13.1.1.5. Advanced aggregation settings (aggregation levels)

13.1.1.5.1. Aggregation levels

The normal rule of the system is to aggregate all raw data together when moving up the organisational hierarchy, and the system assumes that data entry is not being duplicated by entering the same services provided to the same clients at both facility level and also entering an 'aggregated' (sum of all facilities) number at a higher level. This is to more easily facilitate aggregation when the same services are provided but to different clients/catchment populations at facilities on level 5 and a PHC (the parent of the same facilities) at level 4. In this way a facility at level 5 and a PHC at level 4 can share the same data elements and simply add together their numbers to provide the total of services provided in the geographical area.

Sometimes such an aggregation is not desired, simply because it would mean duplicating data about the same population. This is the case when you have two different sources of data for two different orgunit levels. E.g. catchment population for facilities can come from a different source than district populations and therefore the sum of the facility catchment populations do not match the district population provided by e.g. census data. If this is the case we would actually want duplicated data in the system so that each level can have as accurate numbers as possible, but then we do NOT want to aggregate these data sources together.

In the Data Element section you can edit data elements and for each of them specify how aggregation is done for each level. In the case described above we need to tell the system NOT to include facility data on population in any of the aggregations above that level, as the level above, in this case the districts have registered their population directly as raw data. The district population data should then be used at all levels above and including the district level, while facility level should use its own data.

13.1.1.5.2. How to edit data element aggregation

This is controlled through something called aggregation levels and at the end of the edit data element screen there is a tick-box called Aggregation Levels. If you tick that one you will see a list of aggregation levels, available and selected. Default is to have no aggregation levels defined, then all raw data in the hierarchy will be added together. To specify the rule described above, and given a hierarchy of Country, Province, District, Facility: select Facility and District as your aggregation levels. Basically you select where you have data. Selecting Facility means that Facilities will use data from facilities (given since this is the lowest level). Selecting District means that the District level raw data will be used when aggregating data for District level (hence no aggregation will take place at that level), and the facility data will not be part of the aggregated District values. When aggregating data at Province level the District level raw data will be used since this is the highest available aggregation level selected. Also for Country level aggregates the District raw data will be used. Just to repeat, if we had not specified that District level was an aggregation level, then the facility data and district data would have been added together and caused duplicate (double) population data for districts and all levels above.

13.1.2. Data mart

The purpose of the data mart is to provide pre-processed data to external data analysis and reporting tools. The data mart consists of two tables, aggregateddatavalues and aggregatedindicatorvalues in the DHIS 2 database. The values in the data mart are aggregated versions of the raw data found in the datavalue table as well as calculated indicator values. Aggregation can take place over time (e.g. from monthly data to aggregated quarterly values), or along the organisation unit hierarchy levels (e.g. from PHU data to aggregated district totals). The data mart can store all kinds of such aggregated values. The data mart is as such just a processed 'copy' of the data values and it can be emptied and regenerated at any time, and the tables are read only tables. The metadata in the two data mart tables are referenced by internal identifiers, such as dataelementid, organisationunitid which refer to the tables like dataelement and organisationunit, see 'How to make use of the data mart in external tools' for more on this.

13.1.2.1. The data mart export process

The DHIS2 Data Mart handles the aggregation of data across multiple dimensions (organisation unit hierarchy, orgunit group hierarchy, time, etc) and can be controlled through this interface. Select the organisation unit levels which should

be aggregated, the start date and end date, and press "Start export". The data mart process will be executed in the background, and a full report of the export process will be updated regularly so that you can determine the state of the process. See the section on "Scheduling" in the data administration module for information on how this process can be triggered to run automatically.

13.1.2.1.1. Data element categories in the data mart

Each data value for a data element has a reference to a category option combo, which is a combination of the disaggregations for the data value, e.g. (male,<5y) or (In PHU, <1y). These disaggregations are exported as they are to the data mart, and no aggregation is done on this dimension. See the data elements section for more on data element categories and the resource tables section for more information on how to do aggregation on these categories.

13.1.2.1.2. Adding new data to an existing data mart

When you add new data to an existing data mart the new values will be appended to the existing so that the data mart grows for each new process if new selections (such as new periods) have been made. If any of the selected values are already in the data mart, then the old will be replaced by the newly generated values.

13.1.3. Resource tables

Resource tables provide additional information about the dimensions of the data in a format that is well suited for external tools to combine with the data mart tables. By joining the data mart with these resource tables one can easily aggregate along the data element category dimension or data element/indicator/organisation unit groups dimensions. E.g. by tagging all the data values with the category option male or female and provide this in a separate column 'gender' one can get subtotals of male and female based on data values that are collected for category option combinations like (male, <5) and (male,>5). See the Pivot Tables section for more examples of how these can be used. orgunitstructure is another important table in the database that helps to provide the hierarchy of orgunits together with the data. By joining the orgunitstructure table with the data mart tables you can get rows of data values with the full hierarchy, e.g. on the form: OU1, OU2, OU3, OU4, DataElement, Period, Value (Sierra Leone, Bo, Badija, Ngelehun CHC, BCG <1, Jan-10, 32) This format makes it much easier for e.g. pivot tables or other OLAP tools to aggregate data up the hierarchy.

13.1.4. Report tables

Report tables are defined, cross-tabulated reports which can be used as the basis of further reports, such as Excel Pivot Tables or simply downloaded as an Excel sheet. Report tables are intended to provide a specific view of data which is required, such as "Monthly National ANC Indicators". This report table might provide all ANC indicators for a country, aggregated by month for the entire country. This data could of course be retrieved from the main datamart, but report tables generally perform faster and present well defined views of data to users.



Importante

It is therefore important to keep in mind that when the aggregation strategy of the system is set to "Batch", the data for each report table must also be present in the data mart.

13.2. How to create report tables

To create a new report table, go to the Report tables section of the Reports module (Reports -> Report Table). Above the list of standard reports, use the "Add report table" or "Add Dataelement Dimension Table" buttons. A regular report table can be used to hold data on data elements, indicators or dataset completeness, while Dataelement dimension tables are used to include data element categories in report tables. Creating the tables are done in the same way, however, the only exception being when choosing data.

To create a report table, you start by making some general choices for the table, the most important of which is the crosstab dimension. Then, you choose which data elements, indicators, datasets or data element dimensions you want

to include. Finally you select which organisation units and time periods to use in the report table. Each of these steps are described in detail below.

13.2.1. General options

Cross tab dimensions

You can cross-tab one or more of the following dimensions: data element/indicator, orgunit, and period, which means that columns will be created based on the values of the dimensions chosen, e.g. if indicators is selected you will get column names in the table reflecting the names of the selected indicators.

For example, if you cross-tab on indicators and periods, the column headers will say "<indicator title> <period>". The organisation units will be listed as rows. See screenshot for clarification:

If you cross-tab on indicators and organisation units, the column headers of the table will say "<indicator title> <organisation unit>". Now the periods will be listed as rows. See screenshot for clarification:

Note that the options made here regarding crosstab dimensions may have consequences for what options are available when using the report table as a data source later, for example for standard reports.

Sort order

Affects the rightmost column in the table, allows you to choose to sort it low to high or high to low.

Top limit

Top limit allow you to set a maximum number of rows you want to include in the report table.

Include regression

This adds additional columns with regression values that can be included in the report design, e.g. in line charts.

13.2.2. Selecting data

Indicators/Data elements

Here you select the data elements/indicators that you want to include in the report. Use the group filter to more easily find what you are looking for and double click on the items you want to include, or use the buttons to add/remove elements. You can have both data elements and indicators in the same report.

Data sets

Here you select the data sets that you want to include in the report. Including a data set will give you data on the data completeness of the given set, not data on its data elements. Double click on the items you want to include, or use the buttons.

13.2.3. Selecting report parameters

There are two ways to select both what organisation units to include in a report, and what time periods should be included: relative, or fixed. Fixed organisation units and/or periods means that you select the units/periods to include in the report table when you create the report table. Using relative periods, you can select the time and/or units as parameters when the report table is populated, for example when running a standard report or creating a chart. A combination is also possible, for example to add some organisation units in the report permanently while letting the

users choose additional. Report parameters is discussed below. In general, using fixed organisation units and/or time periods are an unnecessary restriction.

Fixed Organisation Units

To add fixed organisation units, click "Toggle fixed organisation units". A panel will appear where you can choose orgunits to always include in the report. If you leave it blank, the users select orgunits when running the report through the use of report parameters. Use the drop down menu to filter organisation units by level, double click or use the buttons to add/remove.

Fixed Periods

To add fixed periods, click "Toggle fixed organisation units". A panel will appear where you can choose periods to always include in the report. If you leave it blank, the users select periods when running the report through the use of report parameters. Use the drop down menu to choose period type (week, month, etc), the Prev and Next button to choose year, and double click or use the buttons to add/remove.

Relative periods

Instead of using fixed/static periods like 'Jan-2010' or 'Q1-2010', more generic periods can be used to create reusable report tables, e.g. for monthly reports the period 'Reporting month' will simply pick the current reporting month selected by the user when running the report. Note that all relative periods are relative to a "reporting month". The reporting month is either selected by the users, otherwise the current month is used. Here is a description of the possible relative periods:

- *Reporting month:*

Use this for monthly reports. The month selected in the reporting month parameter will be used in the report.

- *Months/Quarters this year:*

This will provide one value per month or quarter in the year. This is well suited for standard monthly or quarterly reports where all month/quarters need to be listed. Periods that still have no data will be empty, but will always keep the same column name.

- *This year:*

This is the cumulative so far in the year, aggregating the periods from the beginning of the year up to and including the selected reporting month.

- *Months/Quarters last year:*

This will provide one value per month or quarter last year, relative to the reporting month. This is well suited for standard monthly or quarterly reports where all month/quarters need to be listed. Periods that still have no data will be empty, but will always keep the same column name.

- *Last year:*

This is the cumulative last year, relative to the reporting month, aggregating all the periods from last year.

Example - relative periods

Let's say we have chosen three indicators: A, B and C, and we have also chosen to use the relative periods 'Reporting month' and 'This year' when we created the report table. If the reporting month (selected automatically or by the user) is for example May 2010, the report table will calculate the values for the three selected indicators for May 2010 (= the 'Reporting month') and the accumulated values for the three selected indicators so far in 2010 (= so far 'This year').

Thus, we will end up with six values for each of the organisation units: "Indicator A May 2010", "Indicator B May 2010" "Indicator C May 2010", "Indicator A so far in 2010", "Indicator B so far in 2010" and "Indicator C so far in 2010".

Report parameters

Report parameters make the reports more generic and reusable over time and for different organisation units. These parameters will pop up when generating the report table or running a report based on the report table. The users will

select what they want to see in the report. There are four possible report parameters, and you can select none, all, or any combination.

- *Reporting month:*

This decides which month will be used when the system is choosing the relative periods. If the box it not checked, the user will not be asked for the reporting month when the report is generated - the current month will then be used.

- *Grand parent organisation unit:*

Select the grand parent of all the orgunit children and grand children you want listed in the report. E.g. a selected region will trigger the use of the region itself, all its district, and all their sub-districts.

- *Parent organisation unit:*

Select the parent of all the orgunit children you want listed in the report. E.g. a selected district will trigger the use of the district itself and all its children/sub-districts.

- *Organisation unit:*

This triggers the use of this orgunit in the report. No children are listed.

Example - report parameters

Continuing with the example on relative periods just above, let's say that in addition to 'Reporting month', we have chosen 'Parent organisation unit' as a report parameter when we created the report table. When we're running the report table, we will be asked to select an organisation unit. Now, let's say we choose "Region R" as the organisation unit. "Region R" has the children "District X" and "District Y".

When the report is run, the system will aggregate data for both "District X" and "District Y". The data will be aggregated from the lowest level where they have been collected. The values for the districts will be aggregated further to give an aggregated value for "Region R".

Thus, the report table will generate the six values presented in the previous example, for "District X", "District Y" and "Region R".

13.2.4. Data element dimension tables

These tables enable the use of data element categories in report tables. There are two differences from regular report tables. The first is that it is not possible to select crosstab dimensions, as the columns will always be the disaggregations from the category combinations. The other is the actual choice of data. Only one category combination can be added per report, and only data elements from the same category combo can be selected.

Subtotals and the total will also be included in the table, e.g. a gender (male, female) + EPI age(<1, >1) category combo would give the following columns: male+<1, male+>1, Female+<1, female+>1, male, female,<1, >1, total.

Selecting data

Use the drop down menu to choose category combinations. The data elements using this category combination will be listed. Double click to add to the report, or use the buttons.

13.2.5. Report table - best practices

To make the report tables reusable over time and across orgunits they can have parameters. Four types of parameters are allowed; orgunit, parent orgunit (for listing of orgunits in one area), grand parent orgunit and reporting month. As a side note it can be mentioned that we are looking into expanding this to include reporting quarter and year, or to make that period parameter more generic with regard to period type somehow. The ability to use period as a parameter makes the report table reusable over time and as such fits nicely with report needs such as monthly, quarterly or annual reports. When a report is run by the user in DHIS 2, the user must specify the values for the report tables that are linked

to the report. First the report table is re-generated (deleted and re-created with updated data), and then the report is run (in the background, in Jasper report engine).

Report tables can consist of values related to data elements, indicators or data completeness, which is related to completeness of reporting across orgunits for a given month. Completeness reports will be covered in a separate section.

There are three dimensions in a report table that identify the data; indicators or data elements, orgunits and periods. For each of these dimensions the user can select which metadata values to include in the report. The user must select one or more data elements or indicators to appear in the report. The orgunit selection can be substituted with a parameter, either one specific orgunit or an orgunit parent (making itself and all its children appear in the report). If one or more orgunits are selected and no orgunit parameter is used, then the report is static with regard to which orgunits to include, which in most cases is an unnecessary restriction to a report.

Using relative periods

The period selection is more advanced as it can in addition to specific periods like Jan-09, Q1-08, 2007 also contain what is called relative periods. As report usually is run routinely over time a specific period like Jan-09 is not very useful in a report. Instead, if you want to design a monthly report, you should use the relative period called Reporting Month. Then you must also include Reporting Month as one of your report parameters to let the system know what exactly is the Reporting Month on the time of report generation. There are many other relative periods available, and they all relate to the report parameter Reporting Month. E.g. the relative period called So far this year refers to the accumulative value for the year incl. the Reporting Month. If you want a trend report with multiple periods in stead of one aggregated period, you can select e.g. 'Months this year', which would give you values for each month so far in the year. You can do a similar report with quarters. The idea is to support as many generic report types as possible using relative periods, so if you have other report needs, please suggest new relative periods on the mailing list, and they might be added to the report table options.

Cross-tabbing dimensions

Cross tabbing is a very powerful functionality in report design, as the typical DHIS 2 data table with references to period, data element/indicator and orgunit makes more advanced report design very difficult, as you cannot put e.g. specific indicators, periods or orgunits on specific columns. E.g. by cross-tabbing on the indicator dimension in an indicator report table you will get the indicator names on the column headers in your report, in addition to a column referencing orgunit, and another column referencing period. With such a table design you could drag and drop indicator names to specific columns or chart positions in the iReport software. Similarly you can cross tab on orgunits or periods to make their names specifically available to report design. E.g. by cross-tabbing on periods and selecting the two relative periods 'Reporting month' and 'This year', you can design reports with both the last month and the accumulative annual value for given month as they will be available as column headers in your report table. It is also possible to combine two dimensions in cross-tabbing, e.g. period and indicator, which makes it possible to e.g. look at three selected indicators for two specific relative periods. This would e.g. make it possible to make a table or chart based report with BCG, DPT3 and Measles coverage, both for the last month and the accumulative coverage so far in the year.

All in all, by combining the functionality of cross tabbing, relative periods and report table parameters you should have a tool to support most report scenarios. If not, we would be very happy to receive suggestions to further improvements to report tables. As already mentioned, we have started to look at more fine-grained parameters for the period dimension as the 'Reporting month' does not cover enough, or at least is not intuitive enough, when it comes to e.g. quarterly reports.

13.3. Report table outcome

When the report table is run, the system will calculate values for specified indicators/data elements/data sets, orgunits and periods. The data will be presented in DHIS 2 in a table layout. The column headers will correspond to the cross-tab dimension you have selected. An example report table showing ANC coverage for a district in The Gambia, is shown below. Here the indicator and the periods are cross-tabbed, as can be seen from the column headers.

Above the table there are six buttons; five download buttons and one Back button. Clicking the Back button will simply take you back to the previous screen. The function of the five download buttons, are presented below the screenshot:

The five download buttons

- *Download as Excel:*

Downloads a generated Excel file you can open in Excel.

- *Download as CSV:*

Downloads a generated .csv file. CSV stands for **C**omma **S**eparated **V**alues. It's a text file with the file ending .csv. Each line in the file corresponds to a row in the table, while the columns are separated with semi colons (;). The file can be opened in a text editor as well as in a spread sheet program (such as Excel).

- *Download as PDF:*

Downloads a generated pdf file. The data will be presented in a similar layout as the generated table you are already viewing in DHIS 2.

- *Download as Report:*

Downloads a "styled" pdf file. In addition to present the data in a table layout, this file also presents a chart, showing the aggregated data from all the chosen periods and the parent organisation unit chosen for the report table. The report is generated using the Jasper report engine.

- *Download as JRXML:*

Downloads the design file for the generated Report described in the previous bullet. The design file (with the file ending .jrxml) can be opened in the Jasper iReport Designer software. If you plan to design standard reports, this is the starting point.

13.4. Standard reports

13.4.1. What is a standard report?

A standard report is a manually designed report that presents manually chosen data in a manually specified layout. Still, it's highly flexible, as it can be designed to be reused over and over again, by making use of the powerful report tables.

A standard report can present any value from any table in the DHIS 2 database, but for the report design, we want the reports to be flexible, so we want to connect the reports to tables that changes through time. The report tables are therefore ideal for the report design.

13.4.2. Designing Standard reports in iReport

Jasper iReport Designer is a tool for creating reports that can be used as Standard Reports in DHIS 2. The tool allows for the creation of standard report templates that can easily be exported from DHIS 2 with up to date data. The process of creating reports involves four major steps:

1. A report table must be created in DHIS 2 with the indicators/data elements/datasets to be used in the report.
2. You have to run the report table and download the design file (Click the "Download as JRXML" button).
3. Open the downloaded .jrxml file using the free software Jasper iReport Designer to edit the layout of the report.
4. The edited report can then be uploaded to DHIS 2 to be used as a standard report.

If you want to preview your report during the design in iReport, you actually have to upload your file to DHIS 2 to see how it looks.

These four steps will be describe in detail in the coming sections. In general, when you are making standard reports you should have a clear idea of how it should look before you even make the report table, as how the report table is designed has implications for how the report can be formatted in iReport. For example, what crosstab dimensions

are selected in the report table has consequences for what crosstabs are available for the standard report, and it has consequences for what types of charts you can make.

13.4.2.1. Download and open the design file

Note: If you have not created a report table yet, you have to do so. See section "How to create report tables" to do so.

Locate your desired report table and run it by clicking the green circle with a white arrow inside. When the report is shown, click the "Download as JRXML" button to download the design file. Then open that file in the Jasper iReport Designer software.

13.4.2.2. Editing the report

You are now ready to edit the layout of the report. The main iReport window consists of a "Report Inspector" to the left, the report document in the middle, a "Palette" area on the upper right hand side and a "Properties" area on the lower right hand side. The "Report Inspector" are used for selecting and examining the various properties of the report, and when selecting an item in the inspector, the "Properties" panel changes to display properties relating to the selection. The "Palette" is used for adding various elements, e.g. text boxes, images and charts to the document.

Note: If you cannot see the Palette or Properties sidebar, you can enable them from the menu item called "Window" on the menu bar.

The iReport document is divided into seven main bands, divided by layout separators (the blue lines). These lines are used to decide how big each of the areas should be on the report.

The areas all have different purposes:

- Title - area for the title of the report
- Page header - area for the page header
- Column header - area for column headers (for the table)
- Detail 1 - area where the actual report data will be placed
- Column footer - area to make footer of the table
- Page footer - area for the page footer
- Summary - elements in this area will be placed at the end of the report

By default you will see that only the Title, Column Header and the Detail 1 bands have data. For most reports this is OK. The Title band is suitable for a title and e.g. a chart. Data fields entered into the Detail 1 area will be iterated over to create a table. For example, if a field called "dataelementname" is placed in the Detail 1 band, all data elements in the report table will be listed here. We'll come back to data fields management just a little below.

The unused bands in the report are shrunk to add more space for your report data. You can however increase/decrease the band height as you like. There are two ways to do that. The first way is simply to drag the blue band-line as shown below.

The other way to adjust the band height is to select a band in the "Report Inspector", and then adjust the "Band height" value in the "Detail 1 - properties" area in the lower right corner.

As the fields are already present on the report, you probably don't want to do anything than just fix the layout and drag fields around. You can also resize the fields by dragging the side, top or bottom lines. If you want to change the text in the column headers, you simply double click the field and change the text.

To add the a field to the table, we simply drag it to the Detail 1 band from the "Report Inspector". The column header will be added automatically.

By double clicking the box, the text can be edited. The format of the text, such as size, font and alignment, can be adjusted with the tools above the document.

NOTE: Fields starting with "\$F" present values that are retrieved from the database every time the report is run. The values here will vary, so do not change these fields unless you want a static value here!

13.4.2.3. Text

There are two types of text in iReport: «Text labels» and «Text fields» (data fields). They work in different ways, and should be used for different purposes. The main point is that text fields are just placeholders that will be filled with the correct text from the report table when the report is run, while text labels will stay the way they are when the report is run.

13.4.2.3.1. Static text

Static text are text plain text labels that can be edited normally. There are two ways to edit text labels:

- By double clicking in the text box
- By using the Static text properties in the Properties panel

13.4.2.3.2. Text fields

Text fields are formulas that will be filled from the report table when the report is run. Unlike static text, these can not be edited in a normal way. However, they can be manipulated in various ways to ensure that the desired output will be produced. There are three ways to edit the text fields:

- By right clicking on the text box and selecting Edit expression
- By double clicking the text field (not recommended, as this will not bring up the expression editor)
- By using the Text field properties in the Properties panel

Text fields can represent either numbers or text, so that they can be used both for showing for example names of district or for numeric values. It is therefore important the the Expression class, seen in the Text field properties matches the Text field expression. For the default text fields in the .jrxml file downloaded from DHIS 2 this is not a problem, but it is important when making new text fields. The two most important Expression classes are `java.lang.Double` for numbers and `java.lang.String` for text.

13.4.2.3.2.1. Example

For example, let us say you have a quarterly report where you would like to add a new column with the yearly total. You therefore add a new Static text field to the column header band, and a Text field to the details band in. By default, new Text fields are set to `java.lang.String` (text). However, the yearly total column will be filled with numbers. We therefore have to change the Expression class for the new text field to `java.lang.Double`:

When we edit the text field expression, we see the Expression editor window with all the available columns from the report table. We can see here that each of these are marked with what type they are - text or number. What we need to make sure of is therefore that the expression class we choose for the text field matches the actual expression.

13.4.2.4. Filtering the table rows

In the default table exported from DHIS 2, there are some rows that it might be better to leave out of the table, and some that it would be preferable to have at the end. For example, when making a table based on a report table with the «parent organisation unit» parameter, the default table might have a row with the national level somewhere in between

all the regions. In iReport, this can be changed so that the «parent organisation unit» appears at the bottom of the table. This involves two steps that will be explained below. Note that this will not work where there is only one organisation units, and it is therefore most useful when using the «parent organisation unit» or «grand parent organisation unit» parameters in the report table.

13.4.2.4.1. Hiding the «parameter organisation unit» from the table

We exclude the "paramter organisation unit" from the table by using a property in the Details band called "Print when expression". To set a Print when expression, start by selecting the Detail band in the Report inspector, then edit the Print when expression in the properties panel.

The Expression editor window should now appear. What we must do is to create an expression that checks if the row being generated is the row with the organisation unit given as a parameter. The report table contains a column that we can use for this called `organisation_unit_is_parent`. To exclude the row with the parameter organisation unit, double click on `organisation_unit_is_parent` in the list to copy it to the expression area, then add `.equals("No")` at the end so that the code is:

```
$F{organisation_unit_is_parent}.equals("No")
```

This tells the report engine to only print table rows where the organisation unit is not the parent organisation unit.

13.4.2.4.2. Putting the "param organisation unit" at the bottom of the table

Instead of removing the "param organisation unit" from the table entirely, it is also possible to put it at the bottom (or top) of the table. This is done by using the sort functionality explained in the next section, and choosing to sort first by "organisation_unit_is_parent". Other sorting options can be added in addition to this, for example to make a list where the param organisation unit is at the bottom of the table, with the other organisation units listed alphabetically above it.

13.4.2.4.3. Hiding other rows

Using the expression editor it is also possible to exclude other rows from the table, in addition to the parent organisation unit as was explained above. In Ghana, for example, all regions have a «fake district» which is the name of the region in square brackets. This can also be excluded from the table using the Print when expression that was introduced above. To to this, follow the instructions above to bring up the Expression editor window. Then, we use Java expressions to test whether or not the row should be hidden.

13.4.2.4.3.1. Example - removing rows with organisation units starting with [

Example - removing rows with organisation units starting with [

```
($F{organisationunitname}.charAt( 0 ) != '[')
```

This makes the report skip any rows where the first character of the organisation unit name is [.

It is also possible to combine several of these expressions. To do this we put the expressions in a parenthesis with the two characters && in between. For example, to make a table that leaves both organisation units whose name starts with [and the parent organisation unit, we can use the following expression:

```
($F{organisationunitname}.charAt( 0 ) != '[')&&$F{organisation_unit_is_parent}.equals("No")
```

13.4.2.5. Sorting

Often you will be making reports where the first column is organisation unit names. However, it can be a problem that the list of organisation units are not sorted alphabetically. This can be fixed in iReport through a few simple steps.

In the report inspector, right click on the name of the report (by default this is dpt) and select Edit query.

A Report query window will appear. Click on the Sort options button.

A Sorting window as show below will appear. Here, we can add our sorting options. Click the Add field button. Another small window will show up, with a drop down menu where you can choose Sort by organisationunitname to have the table sorted alphabetically by name.

Click OK - Close - OK to close the three windows. The table should now be sorted.

13.4.2.6. Changing indicator/data element names

By default, the reports from DHIS 2 uses the short names for indicators and data elements in reports and charts. In some cases these are not always very meaningful for third parties, but with some work they can be given custom names through iReport. This is useful for example if you are making a report with indicators as rows and periods as column, or for charts with indicators.

To change the names of an indicator or data element, we have to edit its «expression» or formula, for example by right clicking the text box and choosing Edit expression to bring up the Expression editor.

Next, we have to insert some Java code. In the following example, we will be replacing the shortname of three indicators with their proper names. The code searches for the shortname, and then replaces it with a proper name.

```
($F{indicatorname}.equals("Bed Util All")) ? "Bed Utilisation - All Wards"
```

```
:
```

```
($F{indicatorname}.equals("Bed Util Mat")) ? "Bed Utilisation - Maternity"
```

```
:
```

```
($F{indicatorname}.equals("Bed Util Ped")) ? "Bed Utilisation - Paediatric"
```

```
:
```

```
$F{indicatorname}
```

From this, we can see a pattern that is reusable for more general cases.

- For each indicator or data element we want to change the name for, we need one line
- Each line is separated by a colon :
- We finish the expression with a «regular» line

Each line has the same format, where the red text is the shortname, the blue text is what we want to insert instead.

The same expressions can be used for example when having indicator names along the category axis of a chart.

13.4.2.7. Adding horizontal totals

By using the expression editor, it is possible to add a column to the table with totals for each row. In the following example, we will make a table with three months as columns as well as a column with the totals for the three months.

We start by dragging a text label into the table header and changing its text to "Total", and dragging a text field into the details row.

As was discussed in the section on "Text field", we have to change the properties of the new text field so that it can display numbers. To do this, change the "Expressions Class" in the properties panel to "java.lang.Double".

Right click the text field and choose "Edit Expression". This will bring up the "Expressions editor". As the expression, we want to sum up all the columns. In this case we have three value expressions we want to sum up: "September", "October 2010", "November 2010". The name of these fields will vary depending on the crosstab dimension you have chosen in the report table. In our case, the expression we make is "\$f{September}+\$f{October 2010}+\$f{November 2010}":

Each row of the table have a totals column to the right.

13.4.2.8. Groups of tables

There are cases when it can be useful to have several tables in one report. This can be done using Report groups. Using this functionality, one can for example create a report one table for each indicator, or one table of each organisation unit. In the following, we will go through the steps needed to make a report with three indicators, each represented in one table. It is important that the report table does not crosstab on indicators when we want to make groups of tables based on indicators.

In our example, the .jrxml file downloaded from DHIS 2 will by default have one column for organisation unit and on for indicators (assuming we have chosen periods as the only crosstab dimension). We start by removing the indicator column, since this is not needed in our case, and realign the other fields to fit the report.

Next, we create our Report group. Go to the report inspector, right click on the report name (dpt is the default) and choose Add Report Group.

A window will appear, with a report group wizard. Select a name for the group, in this case we choose «Indicator». In the drop down menu, we can select what columns in the report table we want the groups to be based on. So, if we wanted one table for each organisation unit, we would choose organisation unit name as the report object to group according to. However, since we are grouping by indicators in this example, we choose indicatorname. Then click next.

The next step is to select whether or not we want a separate Group header and Group footer band for each report group. In this case, we choose to include both. Click Finish, and the group bands should appear in the report.

If you upload and run the report, it will now create one table for each indicator. However, it will not look very good as there will be no header row over each table - only one header at the top of each page. Also, there is no indication as to which table is showing which indicator. In the following, we will fix this.

Instead of having the title row in the column header, we can instead move it to the Group header. This will make the heading show up above each individual table. Furthermore, we can add a heading to each table with the name of the indicator.

Move the column headers from the Column header band to the Indicator group header band.

Next, add a text field to the Indicator group heading band, and edit its expression to display the indicator name.

The report should now have three tables, one for each indicator. Each table will have a heading with the name of the indicator, and also a table header row.

13.4.2.8.1. Sorting and grouping

When using grouping, some precautions must be taken with regards to sorting. Notably, when adding sorting parameters, whatever parameter is used as basis for the grouping must come first. Thus if you are grouping the report

by indicator, and want sort the organisation units alphabetically, you have to choose to sort first by indicator, then by organisation unit name as shown below. For instructions on how to add sorting, see the sorting section above.

13.4.2.9. Charts

By default, a 3D bar chart is included in the .jrxml file that is downloaded from DHIS 2. This is set up so that only data from the «parameter organisation unit» (often the parent or grand parent) is used. Usually, this is a good solution. Since it is the default, we will start by looking at bar charts, before looking at line charts.

13.4.2.9.1. Bar charts

Bar charts are the default chart type in DHIS 2. In this section, we will look at how to make a bar charts like the one above, comparing the value of one indicator in several districts. To edit the default chart in iReport, right click on it and choose Chart data.

A window will appear. By default, the Filter expression is filled in so that only data for the parent organisation unit will be displayed. If for some reason you do not want this, simply delete the text in the text box. In this case we do NOT want the filter, as we are making a chart showing a comparison across districts. To continue, click the details tab.

Under details, you see the list of series for the chart. By default, one series is created per crosstab column. In this case, we are looking at data for one indicator for the whole of 2010, for a number of districts. The indicator is along the crosstab dimension.

To make changes to a series, select it and click modify. Another window will appear where there are four areas that can be edit. The three first are required, but it is sufficient to add an empty quote («») in one of the first two.

The first box is a text field where the name of the series can be inserted or edited. This is the field that will be used to fill the text in the legend box (shown below).

However, if you want to have the name of each bar along the x-axis of the chart instead of using the legend, this can be done by adding whatever text you want to present in the Category expression field, or by inserting an expression to have it filled automatically when the report is run. In this case, we want to have one bar for each organisation unit. We therefore edit the category expression by clicking on the button to the right.

As the expression, we chose organisationunitname, as shown below.

When we are finished, the series editor should look like below. Click OK, then Close to close the Chart Details window.

If you add a good description in the Category expression area, you can leave out the legend box. This is done in the Report properties panel of iReport, where you can also edit many other details of the chart.

We can also add a title to the chart, for example the name of the indicator. This is also done in the Chart properties panel, under Title expression.

The Expression editor window will appear, where you can enter the title. Note that the title must be in quotes, as shown below.

The chart is now ready.

13.4.2.9.2. Line charts

Line charts can be useful in many circumstances. However, to make line charts the report data (report table) must be suited for it. Thus if you want to make a line chart, it is important that the report table does not have periods in the crosstab dimension. Examples where this is useful is if you are making a report for a single organisation unit with one or more indicators, or if you are making a report with one indicator and one or more organisation units.

Below, we will go through the steps needed to make a report with a line chart showing the development of three indicators over one year, for one organisation unit. We start by making a report table with the choices shown below:

When we open the resulting .jrxml-file in iReport, the default line chart is included. Since we want to make a line chart, we delete this chart and drag a new chart element into the report from the Palette panel.

As soon as we drag the Chart element into the report, a window will appear. We choose the Line chart, as shown below.

A chart wizard will appear. Click next in the first step, then Finish in the next - we will add the data later.

Next, adjust the size and position of the chart in your report. Then, we will add one data series for each of our three indicators. Right-click on the chart and choose Chart data. If you are making a chart with one indicator and several organisation units, you probably want to make a filter expression so that only data from the parameter/parent organisation unit is used in the chart. To do this, add this line to the Filter expression area:

`$F{organisation_unit_is_parent}.equals("Yes")`

In our example, we only have one organisation unit, so this is not necessary. Next, click the details tab to see a list of the series in the chart. For now, this list is empty, but we will add one series for each of our three indicators. To add a series, click the Add button.

In the window that appears, enter the name of the first of the indicators in the Series expression window. Remember to put the name in quotes. In the category expression (along the x-axis) we want the months, so we use the button next to the field to open the Expression editor and add periodname.

In the value expression, we add the actual data values for our first indicator. Use the Expression editor again to do this. When we are finished, the window should look like the one below, only with different names according to the indicator.

You can then Click OK to close the window. Follow the same steps to add a series for the other indicators.

Close the window, and the data for the line chart should be ready. However, some additional adjustments might be needed - most of these can be found in the Line chart properties panel. For example, when making a month by month chart as we have in example, there is often not enough space for the month names along the category axis. This can be fixed by rotating the labels by for example -40 degrees, by using the property Category Axis Tick Label Rotation.

Many other options are available to give the chart the desired look.

13.4.2.10. Adding the Report to DHIS 2

We can now switch to DHIS 2 and import our report. Go to the Report Module in DHIS 2, and select "Standard Report". In the "Standard Report" screen, click "Add new", or edit an existing one.

In the following screen, there are several actions we need to take. First, enter a name for the new "Standard Report". Second, for design, click "Choose File" and find the .jrxml-file you have edited in iReport. Then we select the report table that we used as a basis for the report in iReport. Click add, and it should move to the "Selected report tables" area. Finally, click save.

The report is now available as a "Standard Report" in DHIS 2:

13.4.2.11. Some final guidelines

- Use the same version of iReport and DHIS 2's version of Jasper reports. See the About page in DHIS 2 for the Jasper version in use.
- Use report tables with cross tab dimensions as your data source for your report designs. This will make it a lot easier to design reports where you need to put specific indicators, periods, or orgunits on columns.
- Learn from others, there are many DHIS 2 report designs for Jasper on launchpad, see <http://bazaar.launchpad.net/~DHIS 2-devs-core/DHIS 2/trunk/files/head:/resources/>

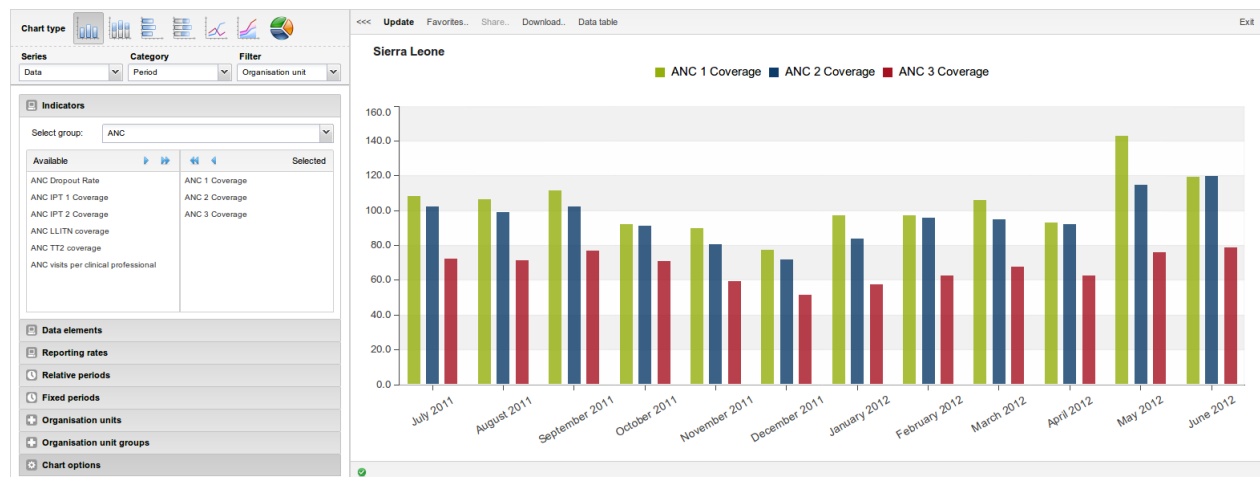
Capítulo 14. Utilizando el Visualizador de Datos

14.1. Un vistazo al Visualizador de Datos

El módulo de visualización de datos permite que los usuarios puedan crear fácilmente análisis de datos y visualizaciones dinámicas mediante gráficos o tablas de datos. Para el análisis, podemos seleccionar libremente el contenido (por ejemplo indicadores, periodos y unidades organizativas). Este módulo se accede en el menú principal en "Servicios - Visualizador de Datos. La imagen siguiente nos muestra la vista general del módulo. Para comenzar a usarlo de forma sencilla:

1. Observamos el encabezado de "Indicador" y seleccionamos un grupo de indicadores del listado de grupos.
2. Observamos los "Indicadores disponibles" y seleccionaremos algunos indicadores del listado pinchando sobre ellos (doble click).
3. Pinchamos en "Actualizar" en la barra superior y se desdobra un gráfico.

El visualizador de datos está diseñado en primer lugar para ser fácil de usar: podemos seleccionar los indicadores, elementos de datos, periodos y unidades organizativas que queramos incluir y pinchar en "Actualizar" para obtener una visualización. En segundo lugar, ha sido diseñado para ser rápido y lograr un buen funcionamiento incluso con conexiones lentas a Internet: los gráficos se generan en el navegador web y muy pocos datos se envían realmente por la red.



14.2. Seleccionando el tipo de gráfica

El módulo de visualización proporciona siete tipos diferentes de gráficos, cada uno de ellos con características distintas. Podemos seleccionar el tipo de gráfico que deseamos pinchando en uno de los iconos en la barra superior derecha llamado "Tipo de gráfico".

1. Diagrama de barras: es un gráfico que muestra la información en forma de columnas rectangulares en vertical cuya longitud es proporcional a los valores que representa. Es útil por ejemplo para comparar los resultados de diferentes distritos.
2. Diagrama de barras apiladas: es un gráfico con columnas rectangulares en vertical donde las barras representan varias categorías que se muestran apiladas unas sobre otras. Resulta útil por ejemplo para mostrar tendencias o sumas de elementos de datos relacionados entre sí.
3. Diagrama de barras horizontales: es igual que el diagrama de barras, pero las barras se muestran horizontales creciendo de izquierda a derecha.
4. Diagrama de barras horizontales apiladas: es igual que el diagrama de barras apiladas, pero las barras se muestran horizontales.

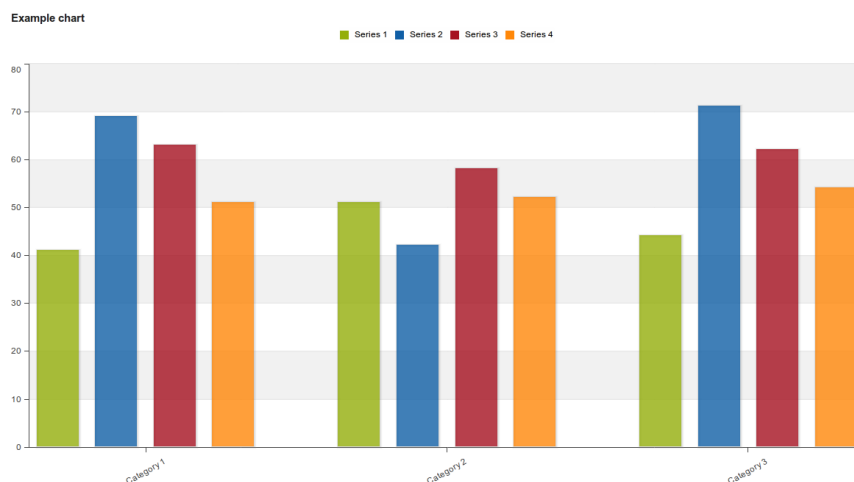
5. Gráfico lineal: es un gráfico que muestra la información en forma de series de puntos conectados mediante líneas rectas. También se conoce con el nombre de series temporales. Es útil por ejemplo para visualizar la tendencia de datos de un indicador a lo largo de múltiples periodos de tiempo.
6. Diagrama de área: es un gráfico basado en el gráfico lineal, donde el espacio entre los ejes y la línea aparece rellenado en color, y las líneas para cada elemento representado se apilan unas sobre otras. Resulta útil para comparar tendencias entre indicadores relacionados.
7. Gráfica circular: es un gráfico con forma de tarta dividida en sectores (o rodajas). Es útil por ejemplo para visualizar la proporción de datos de elementos de datos individuales en comparación con la suma total de todos los elementos de datos en el gráfico.

14.3. Seleccionando series, categorías y filtros

Esta sección nos permite definir qué dimensión de los datos queremos que aparezca como series, categorías o filtros. Aquí entendemos por dimensión los elementos que describen los valores de datos en el sistema. En DHIS2 hay tres dimensiones principales:

1. Datos: incluye elementos de datos, indicadores y sets de datos (tasas de reporte), que describen fenómenos o eventos de los datos, es decir, qué sucedió.
2. Periodos: que describen cuándo sucedieron los eventos.
3. Unidades organizativas: que describen dónde sucedieron los eventos.

El módulo de visualización nos permite usar estas dimensiones de forma totalmente flexible en el sentido de que aparezcan como series, categorías o filtros. Para comprender mejor su funcionamiento observemos la captura de pantalla siguiente:



Lo anterior se puede resumir formalmente como sigue:

1. Series: una serie es un conjunto de elementos continuos y relacionados (por ejemplo periodos o elementos de datos) que queremos visualizar para resaltar tendencias o relaciones entre estos datos.
2. Categories: una categoría es un conjunto de elementos (por ejemplo indicadores o unidades organizativas) cuyos datos queremos comparar.
3. Filtros: dado que la mayoría de los gráficos son bidimensionales, utilizamos filtros en la tercera dimensión con el objetivo de simplificar a un único elemento que dé sentido al gráfico.

14.4. Seleccionando indicadores y elementos de datos

El módulo de visualización puede mostrar tantos indicadores y elementos de datos en una gráfica y en una tabla de datos como queramos. Tanto los indicadores como los elementos de datos se pueden seleccionar a la vez y aparecerán

juntos en el gráfico. Podemos seleccionar los indicadores pinchando en el encabezado de "Indicadores" y seleccionando un grupo de indicadores del listado que aparece debajo. Esto hace que los indicadores en el grupo seleccionado se muestren en la lista bajo "Indicadores disponibles" a la izquierda. En esta lista podemos pinchar doble en cualquier indicador para seleccionarlo, y entonces se moverá a la lista de "Indicadores seleccionados". Otra forma de hacerlo es marcar uno o varios indicadores y pinchar a continuación en el botón de flecha simple. Si queremos seleccionar todos los indicadores pincharemos en el botón de flecha doble. Para desmarcar los indicadores podremos hacer esto mismo en el listado de "Indicadores seleccionados"

Para seleccionar elementos de datos pincharemos en el encabezado de "Elementos de Datos". Aquí seguiremos el mismo procedimiento explicado arriba para marcar y desmarcar indicadores.

14.5. Seleccionando tasas de reporte

El visualizador puede mostrar las tasas de reporte en un gráfico, bien solas bien junto con indicadores y elementos de datos. Las tasas de reporte se seleccionan pinchando en el encabezado de "Tasas de reporte". Las tasas de reporte se definen por los sets de datos, de modo que estos pueden marcarse pinchando doble en el listado de sets de datos disponibles en el lado izquierdo.

14.6. Seleccionando periodos relativos

Para seleccionar periodos relativos pincharemos en el encabezado de "Periodos relativos". Podemos seleccionar tantos periodos como queramos del conjunto de periodos listado bajo el encabezado, como por ejemplo "Último mes", "Meses del año actual" y "Últimos 5 años". Los nombres de los periodos deberán ser autodescriptivos, para agilizar estos procesos. Todos los periodos son relativos a la fecha actual, es decir, si el mes actual es marzo y seleccionamos "Último mes", entonces se incluirá el mes de febrero en el gráfico.

14.7. Seleccionando periodos absolutos

Para seleccionar periodos fijos (no relativos) pinchamos en el encabezado de "Periodos fijos" y seleccionamos un tipo de periodo del cuadro grupal. Podemos seleccionar tantos periodos fijos como queramos de cualquier tipo de periodo. Podemos combinar libremente periodos fijos y relativos en un mismo gráfico. Los periodos que se solapen se filtrarán de modo que aparecerán una sola vez.

14.8. Seleccionando unidades organizativas

Podemos seleccionar qué unidades organizativas incluir en el gráfico pinchando en el encabezado "Unidades Organizativas". Esta sección publica un árbol que incluye todas las unidades organizativas del sistema. Seleccionaremos algunas unidades organizativas pinchando en ellas. Si queremos seleccionar múltiples unidades organizativas, de forma arbitraria, podemos pulsar el botón Ctrl (en el teclado) y pinchar en el árbol. Si queremos incluir todas las unidades organizativas bajo una determinada unidad (es decir, todos los hijos de una unidad organizativa) pincharemos con el botón derecho sobre esa unidad y seleccionaremos "Seleccionar todos los hijos". También podemos seleccionar automáticamente todas las unidades organizativas de un grupo de unidades concreto: pinchamos en el botón "Grupo" en el extremo derecho de la barra de herramientas ubicada sobre el árbol y seleccionamos un grupo de la lista desplegable.

Este panel tiene también dos casillas de verificación. Seleccionando la casilla "Unidad Organizativa del usuario" se desactivará el árbol de todas las unidades organizativas y nos mostrará únicamente la unidad organizativa asociada al usuario logueado actualmente en el sistema. Esta funcionalidad es útil para los administradores, ya que pueden crear un "sistema" coherente predeterminado con esta opción activada, de modo que todos los usuarios encontrarán su respectiva unidad organizativa cuando abran esta sección. El funcionamiento es idéntico para la casilla de "Hijos de la Unidad Organizativa del usuario".

14.9. Seleccionando grupos de unidades organizativas

Podemos dividir desde el nivel nacional en grupos de unidades organizativas seleccionando un conjunto de grupos en el cuadro grupal. Los grupos del conjunto de grupos seleccionado serán sustituidos por cualesquiera unidades organizativas en el panel de unidades organizativas.

14.10. Seleccionando opciones de gráficas

Tenemos varias opciones disponibles para la graficación en el encabezado "Opciones de gráficas" a la izquierda del panel.

- **Mostrar datos de series:** representa el valor correspondiente junto a las barras del diagrama.
- **Mostrar tendencia:** destaca la línea de tendencia que muestra cómo los datos evolucionan en el tiempo, por ejemplo si su rendimiento está mejorando o empeorando. Esto tiene sentido cuando seleccionamos los periodos como categorías.
- **Ocultar subtítulo:** oculta el título y subtítulo del gráfico.
- **Ocultar leyenda:** oculta la leyenda y amplía el espacio para el propio gráfico.
- **Etiqueta de eje X:** muestra una etiqueta bajo el eje X (el eje horizontal). Puede ayudar a contextualizar la información del gráfico, por ejemplo mostrando el tipo de periodos que se están listando.
- **Etiqueta de eje Y:** muestra una etiqueta junto al eje Y (o eje vertical). Puede ayudar a contextualizar la información del gráfico, como por ejemplo mostrando la unidad de medida que está siendo utilizada.
- **Línea objetivo:** muestra una línea horizontal para el valor de referencia dado. Esto es útil cuando queremos comparar el resultado obtenido con el objetivo a alcanzar.
- **Etiqueta de línea objetivo:** muestra una etiqueta junto a la línea objetivo.
- **Línea base:** muestra una línea horizontal para el valor de referencia dado. Es útil por ejemplo cuando queremos visualizar cómo han evolucionado los resultados desde el principio del proceso.
- **Etiqueta de línea base:** muestra una etiqueta junto a la línea base.

14.11. Mostrando una gráfica

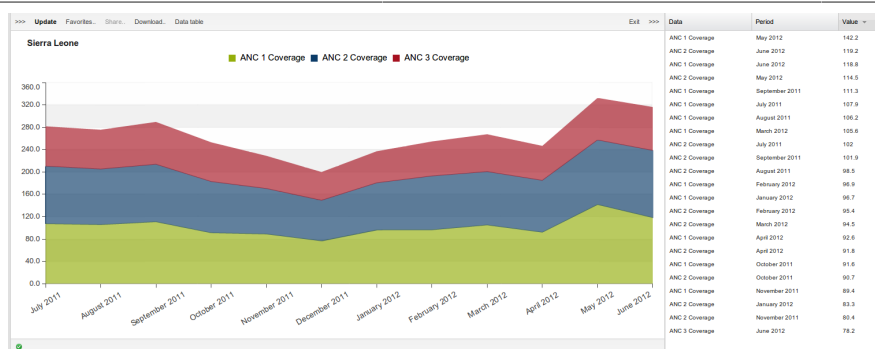
Podemos mostrar un gráfico basado en las selecciones que hemos realizado pinchando en el botón "Actualizar" en el menú superior central. Esto requiere que hayamos seleccionado uno o varios elementos en cada una de las tres dimensiones - datos (indicadores, elementos de datos, tasas de reporte), periodos (relativos, fijos) y unidades organizativas (unidades o grupos). Recordemos que "Meses del año actual" en la dimensión periodo y la unidad organizativa raíz aparecen seleccionadas por defecto.

Es importante tener en cuenta que podemos ocultar y mostrar series individuales de datos en el gráfico pinchando directamente en la etiqueta de series del gráfico - que aparece ya sea arriba o a la derecha del gráfico.

Si queremos ampliar el gráfico en nuestra pantalla podemos pinchar en el botón de flecha triple en el menú superior central. Esto hace que se pliegue el menú del lado izquierdo. Podremos volver a desplegarlo pinchando en este mismo botón de nuevo.

14.12. Mostrando una tabla de datos

Después de haber generado un gráfico podemos mostrar también sus datos en una tabla pinchando en el botón "Tabla de datos" en el menú superior central (junto al botón "Actualizar"). Esto mostrará una tabla con cuatro columnas: una para los datos (sean elementos de datos o indicadores), periodos, unidades organizativas y valor de los datos. Podremos ordenar la tabla en orden creciente o decreciente según cualquiera de las columnas.



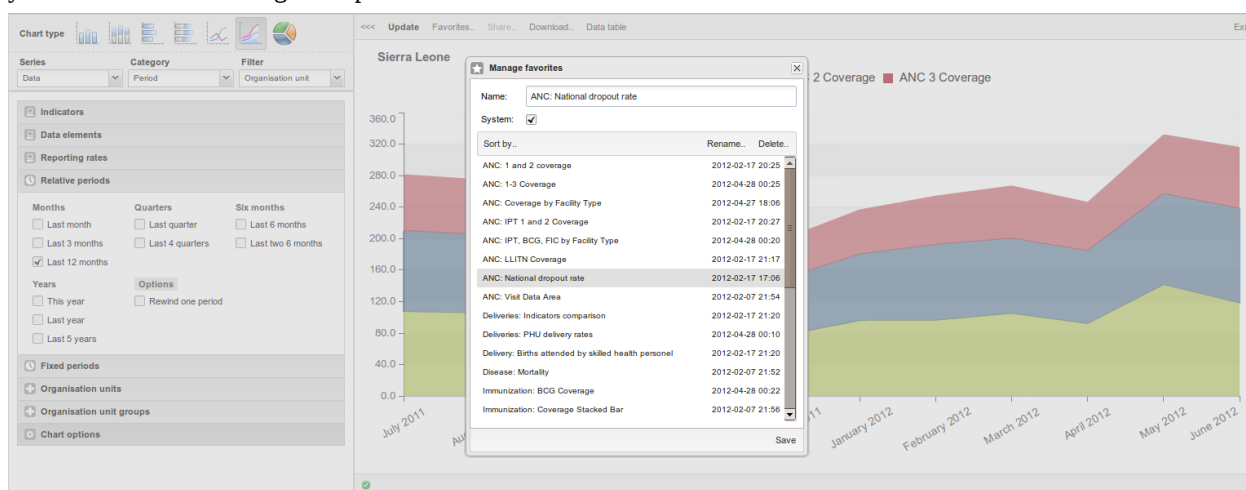
14.13. Descargando una gráfica como imagen o PDF

Una vez hemos generado una gráfica, podemos guardar esta vista como un fichero y descargarlo a nuestra computadora local pinchando en el botón de "Guardas como" en el menú superior central. Podemso seleccionar entre formato PNG (imagen) o PDF. El fichero se descargará inmediatamente a la computadora, de modo que posteriormente podemos por ejemplo insertar ese fichero imagen en un documento de texto como parte de un informe.

14.14. Guardando una gráfica como favorita

Tras generar una gráfica podemos también guardarla como favorita. Pincharemos en el botón "Favoritos" en el menú superior y luego en el enlace "Gestionar favoritos". En el campo de nombre introducimos el nombre deseado para la gráfica (es importante elegir nombres autodescriptivos). Seleccionando la casilla "Sistema" el gráfico se hará visible a todos los usuarios del sistema, mientras que si no la chequeamos el gráfico será visible sólo para el usuario logueado. Solo los usuarios con permiso específico para crear gráficos de sistema. Podemos renombrar nuestras gráficas favoritas seleccionándolas en la lista, modificando su nombre en el campo de entrada y pinchando "Renombrar". Podremos también borrar gráficas favoritas seleccionándolas y después pinchando "Borrar".

Estas gráficas favoritas se pueden incluir posteriormente en nuestro panel de control personal. Después de guardarlas, navegamos al módulo de panel de control (dashboard) y pinchamos en el enlace "Insertar" sobre las áreas de gráficas y seleccionamos nuestra gráfica preferida.



14.15. Compartiendo interpretaciones de los datos

En determinados recursos relacionados con el análisis de datos en DHIS2, como son las gráficas y las tablas de reporte, podemos compartir también interpretaciones de los datos. Una interpretación es sencillamente un enlace al recurso relevante junto a un texto explicativo sobre los datos. Si queremos compartir una interpretación de un gráfico primero guardamos el gráfico como favorito. Luego, sin realizar ningún cambio en el gráfico, pinchamos el botón "Compartir" en la barra de herramientas. Se abrirá una ventana donde podremos escribir nuestra interpretación.

Cuando hayamos terminado, pinchamos en el botón de "Compartir" en la esquina derecha de la ventana. La ventana se cerrará automáticamente y, si la interpretación se compartió con éxito, encontraremos una notificación en la barra de herramientas inferior.

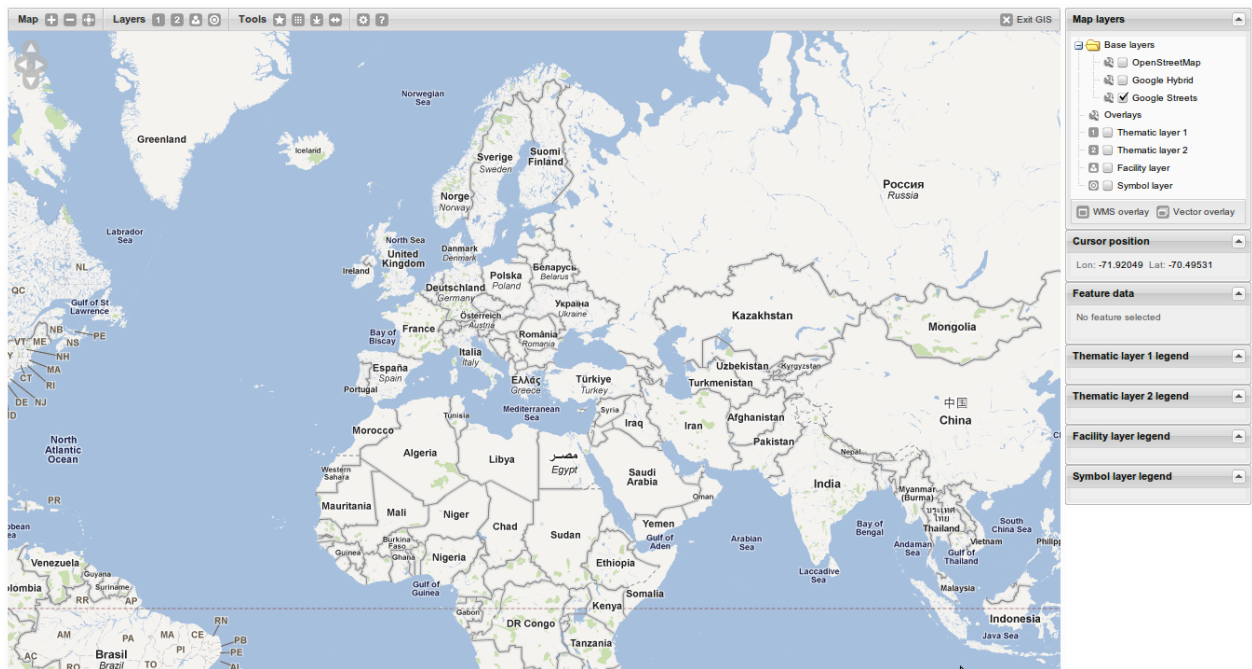
14.16. Saliendo del módulo de visualización de datos

Para salir del módulo y regresar a la página de inicio de DHIS, pincharemos en el botón "Salir" en el lado derecho del menú superior central.

Capítulo 15. Utilizando el Sistema de Información Geográfica (SIG)

15.1. Un vistazo al módulo SIG

Accedemos al módulo SIG en el enlace Servicios -> SIG del menú superior. La imagen siguiente muestra la portada del SIG.



En el lado derecho hay un panel nombrado "Capas". Hay tres "capas básicas": mapa de fondo, OpenStreetMap y Google Maps. Pincharemos en el texto para abrir un menú contextual que nos permita ajustar la opacidad/transparencia del fondo. Las otras capas se describen con detalle más adelante en este capítulo. Las cuatro capas superiores son capas de vectores que el usuario tiene a su disposición para el mapeado temático. Podemos usar este árbol de capas para mostrar/ocultar capas si marcamos/desmarcamos la casilla correspondiente. El panel siguiente, llamado "Posición de Cursos" nos indica a qué longitud y latitud está situado el puntero del mouse. El panel de "Destacar datos" ofrece información rápida sobre las unidades organizativas sobre las que colocamos el puntero en nuestros mapas temáticos. Y finalmente, hay un panel de leyenda para todas las capas temáticas.

El dibujo abajo muestra la barra de herramientas de mapas:



Los botones de "Mapas" en el lado izquierdo son: "Ampliar", "Reducir", "Ampliar extensión visible" (todos los datos del mapa temático se cuadran en la página principal).

Los botones de "Capas" en el lado izquierdo son: "Capa Temática 1", "Capa Temática 2", "Capa de Establecimientos", "Capa de Símbolos".

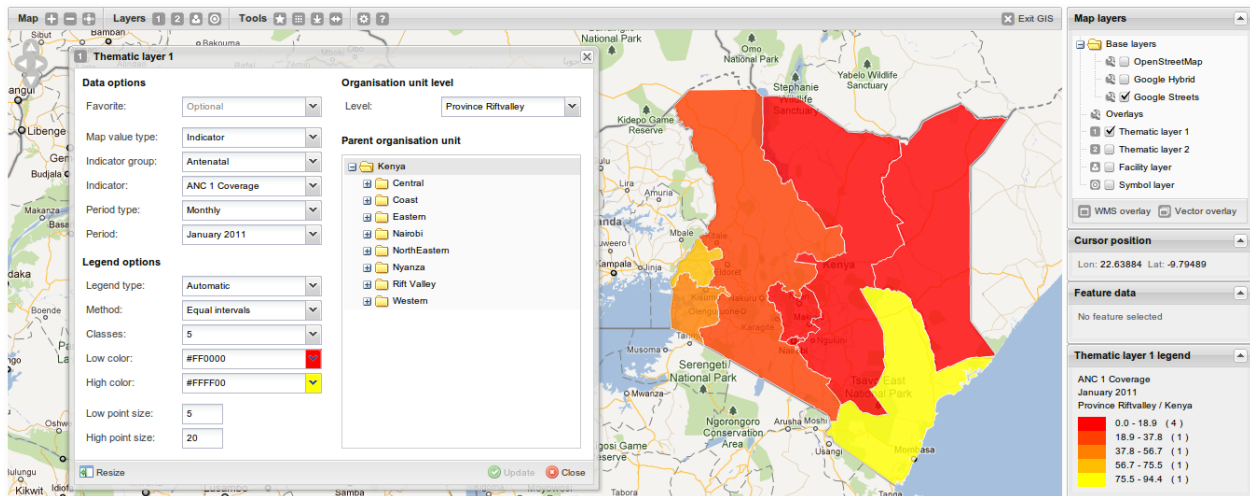
Los botones de "Herramientas" en el lado izquierdo son: "Vistas favoritas de mapa", "Predefinir sets de leyenda", "Exportar mapa a PNG", "Medir distancias en mapa".

Los últimos botones son "Configuración de Administrador" y "Ayuda".

15.2. Mapeado temático

Esta sección describe las cuatro capas vectoriales que el usuario puede usar para mapeado temático: "Capa Temática 1", "Capa Temática 2", "Capa de Establecimientos" y "Capa de Símbolos".

15.2.1. Capa temática 1 y 2



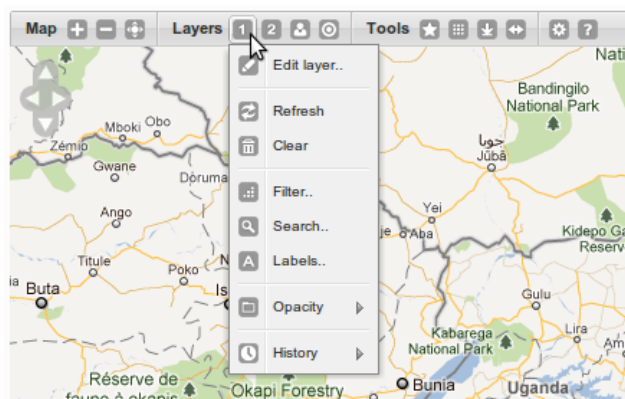
Los dos paneles de capas temáticas nos permiten incorporar nuestros datos al mapeado temático. Para ello, seleccionamos una combinación de indicador/elemento de datos - periodo - mapa, luego el nivel de unidad organizativa y finalmente la unidad padre para definir el límite. Si nuestra base de datos tiene coordenadas de estas unidades organizativas, entonces estas aparecerán en el mapa.

Podremos elegir entre varios tipos de leyenda: automática y predefinida. La leyenda automática significa que la aplicación creará un set de textos leyenda en base al método, número de clases, color superior y color inferior que elegiamos. El método se refiere al tamaño de las clases de leyenda. Para Intervalos regulares contendrá el valor más grande y más pequeño del mapa dividido entre el número de clases. Para Conteo de grupos iguales el generador de leyendas tratará de distribuir las unidades organizativas uniformemente. Para Límites fijos deberemos definir nuestros propios valores de corte de clases, por ejemplo "20,40,60" utilizando una coma para separar cada valor. La leyenda aparecerá como una gradación uniforme del color inicial al color final. Los conjuntos de leyendas predefinidos se describen en [Sección 15.3.2, "Registro de sets de leyendas"](#).

Los radios grande y pequeño solo tienen efecto en los establecimientos (puntos del mapa) y resuelven los radios circulares para los puntos con el valor mayor y el valor menor.

El cuadro de combinaciones en la vista de mapa lista todas las vistas de mapa (favoritas) guardadas por el usuario. La configuración se guarda en la vista del mapa y se aplica automáticamente al panel de mapa temático. Las vistas favoritas de mapas se explican más en [Sección 15.3.1, "Registro de vistas favoritas de mapa"](#).

Todas las opciones disponibles de capas están ahora agrupadas en el menú de capa temática, como se observa en la figura abajo..

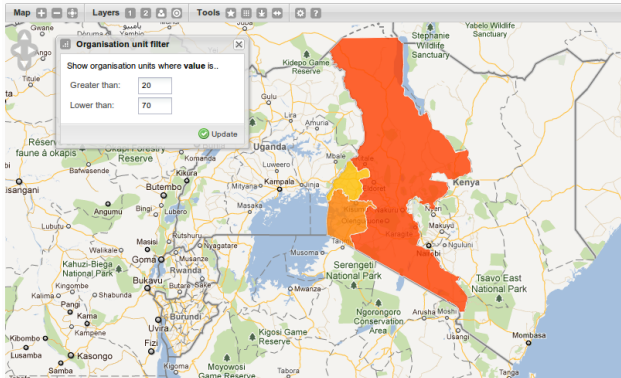


Editar capa: Abre la ventana de configuración de la capa, como la que se observa en la captura de pantalla de mapeo temático.

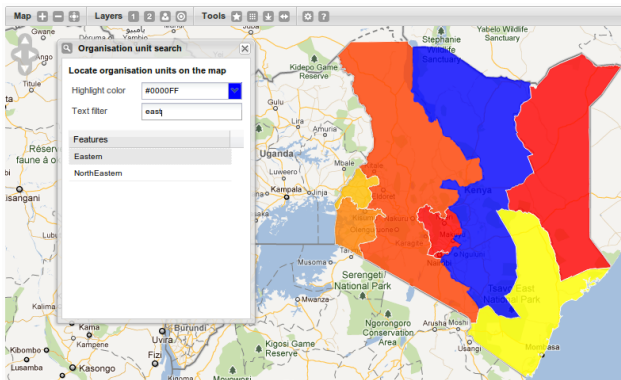
Refrescar: Recarga los datos, límites y leyenda del mapa. Generalmente no es necesario usarlo.

Limpiar: Vacía la capa completa, por ejemplo la ventana de configuración, el mapa y el panel de leyenda.

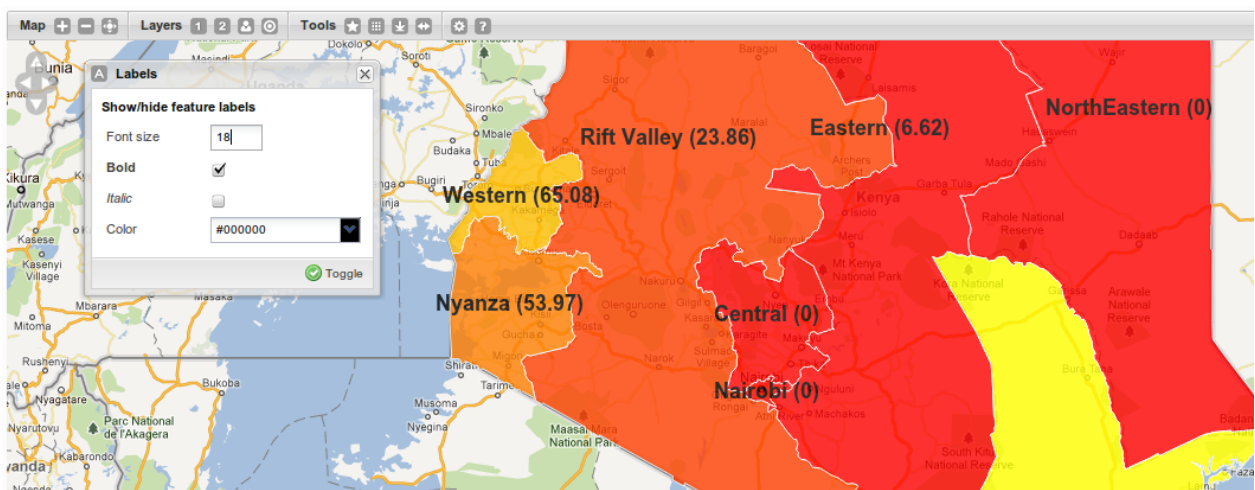
Filtrar: Abre la ventana de filtros y permite filtrar unidades organizativas del mapa por valor. Veamos la figura siguiente.



Buscar: abre la ventana de búsqueda y nos permite buscar y localizar unidades organizativas en el mapa, como muestra la imagen siguiente.



Etiquetas: abre la ventana de etiquetas y nos permite añadir etiquetado a las unidades organizativas en el mapa, como muestra la imagen.

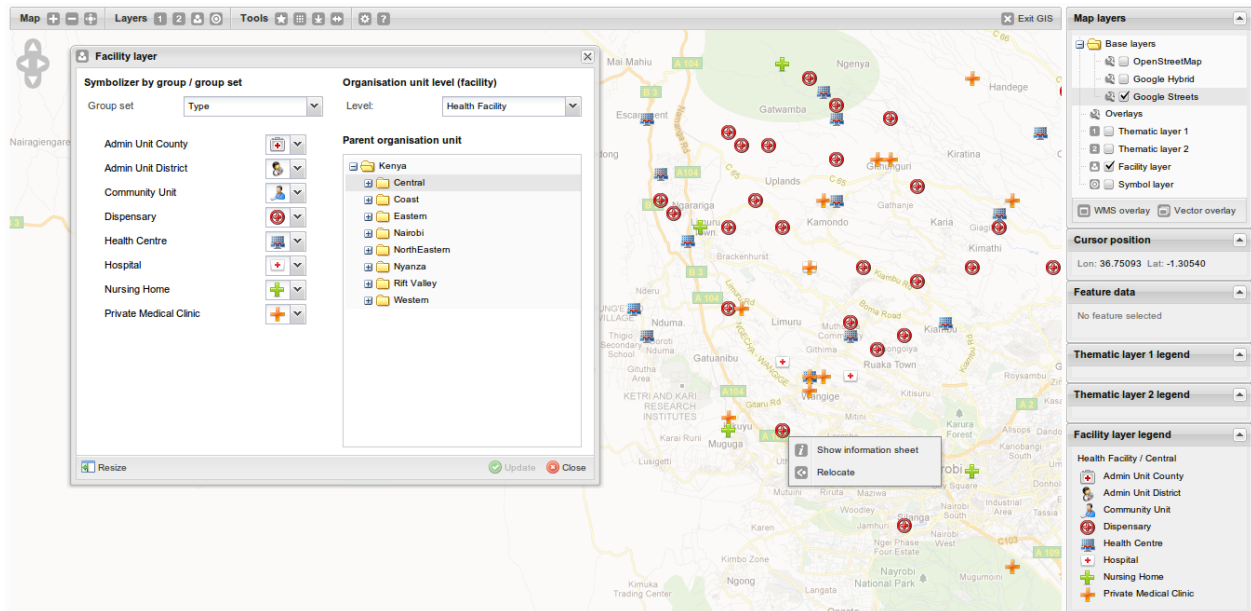


Transparencia: ajusta la capa de opacidad/transparencia al 10, 20, 30, 40, 50, 60, 70, 80, 90 ó 100%. Los valores grandes de transparencia hacen la capa más transparente, de modo que la capa subyacente se hace más visible. Un nivel de transparencia cero nos da una capa totalmente opaca.

Historial: facilita una lista de nuestras 10 selecciones y mapas más recientes. El listado es temporal y se borra cuando salimos de la aplicación.

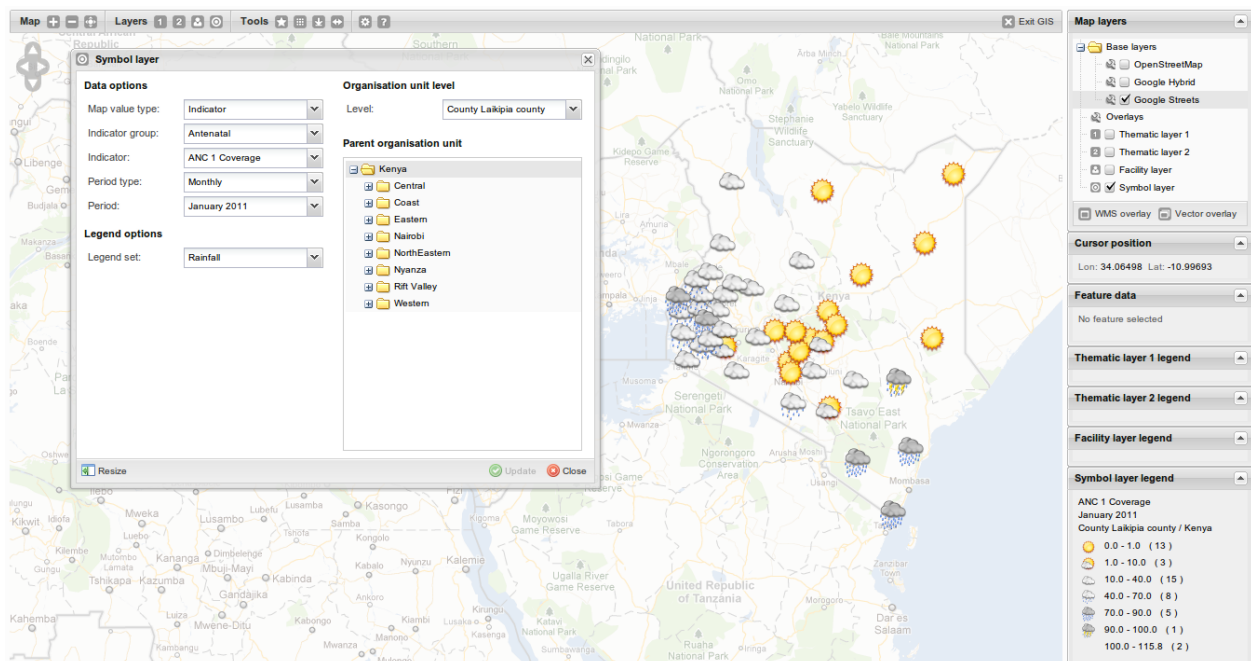
15.2.2. Capa de establecimientos

Esta capa muestra iconos que representan los establecimientos según su tipo. Actualmente, el único grupo soportado es el "Tipo". Los polígonos no se muestran en el mapa, de modo que deberemos asegurarnos de seleccionar un nivel de establecimiento de salud. Pincharemos un icono en el mapa para abrir el menú contextual con dos opciones: "Mostrar información" proporciona los datos de muchos elementos de datos de esta unidad organizativa (el grupo de elementos de datos y el tipo de periodo son "opciones de configuración" llamadas "Elementos de datos infraestructurales" y "Tipo de periodo infraestructural"); y "Reubicar", que nos permite mover gráficamente la unidad organizativa a una ubicación distinta (al hacer esto, las nuevas coordenadas se guardarán permanentemente).



15.2.3. Capa de símbolos

Esta capa muestra iconos que representan áreas o polígonos como provincias, distritos, etc. en lugar de establecimientos o puntos. Por tanto, en esta capa no podremos seleccionar un nivel de establecimiento sino un nivel administrativo (provincias, distritos, etc.). Para generar esta capa necesitamos crear un conjunto predefinido de imágenes leyenda, como se describe en [Sección 15.3.2, "Registro de sets de leyendas"](#).



15.3. Herramientas

Esta sección describe las herramientas disponibles en el Sistema de Información Geográfica, que se encuentran en la sección "Herramientas" de la barra de herramientas del mapa.

15.3.1. Registro de vistas favoritas de mapa

Pinchamos en el botón "Vistas favoritas de mapa" (con un icono estrellado) en la barra de herramientas para abrir el menú contextual. La primera opción es "Gestionar favoritos", que abre una ventana donde podemos tipear el nombre del mapa y seleccionar la capa que queremos guardar. Los administradores pueden chequear la casilla "Sistema" para hacer algunas vistas favoritas visibles a todos los usuarios. En el cuadro inferior podemos borrar un favorito o añadirlo al panel de control de DHIS2.

15.3.2. Registro de sets de leyendas

Un ejemplo de utilización de estos sets clave es la cobertura de vacunación: crearemos primero las leyendas que formarán el set. La primera puede ser "Deficiente" (nombre), 0 (valor inicial), 30 (valor final), rojo (color). Luego creamos "Intermedia" / 30 / 70 / amarillo, y finalmente "Elevada" / 70 / 100 / verde. Después, abrimos el panel "Set de leyendas", y tipeamos por ejemplo "Elevada es bueno" como nombre y seleccionamos las leyendas deseadas abajo. Hacemos una selección múltiple de las 3 leyendas pinchando y presionando a la vez la tecla Ctrl/May. al seleccionar. Luego pinchamos en el botón de registro para guardar el set de leyendas. Podemos asignar indicadores y elementos de datos al set de leyendas en uno de los dos últimos paneles. Seleccionamos el set de leyendas en el cuadro grande y seleccionamos múltiples elementos de la lista abajo. Pinchamos en el botón de "Asignar" para actualizar el set de leyendas. Recomendamos revisar de nuevo la imagen de la ventana mostrada en la sección 1.1.

15.3.3. Exportando/guardando imágenes de mapas

Pinchamos en el icono imagen en la barra de herramientas del mapa y se abrirá la ventana de impresión, donde podemos editar: Título (nombre de encabezado de la imagen), Capas (elegir si las áreas, los puntos o ambos se imprimirán), Altura/Anchura (resolución en pixels de la imagen, a escoger entre valores predefinidos "pequeño" (800x600), "mediano" (1190x880), "grande" (1920x1200) o tipeamos el número exacto de pixels). Para ocultar la leyenda en la impresión de la imagen, desmarcamos la casilla de leyenda. Finalmente, pinchamos en el botón de exportar para imprimir la imagen (PNG). Recomendamos revisar de nuevo la imagen de la ventana mostrada en la sección 1.1.

15.3.4. Medida de distancia

Pinchamos en el icono de flecha de doble dirección en la barra de herramientas del mapa para acceder al modo de medición. A continuación, pinchamos nuestra ubicación deseada de comienzo en el mapa y aparecerá una línea de puntos que sigue al cursor hacia la ubicación de destino. Solo hace falta pinchar de nuevo para fijar la línea de puntos y doble click para terminar la línea. Para salir del modo de medición, pinchamos en el icono de la barra de herramientas o cerramos la ventana.

Capítulo 16. Setting up GIS

16.1. Context

Setting up the GIS simply means storing coordinates for the organisation units you want to show on the map in the database. Coordinates are often distributed in proprietary formats and will need to be converted to a format which DHIS2 understands. ESRI shapefiles are the most common geospatial vector data format for desktop applications. You might find shapefiles for your country [here](#) or in many other geospatial data repositories on the web. Some amount of work needs to be done in order to use these coordinates in DHIS 2 GIS, namely transforming the data into a suitable format and ensuring the name which are contained in the geospatial data match exactly with the names of the organization units which they should be matched to.

If you go to the organisation unit module and edit one of the units, you can see a text field called Coordinates. Here you may fill in its coordinates directly (geojson format) which is useful if you just want to update a couple of units.

An example point/facility coordinate:

```
[29.341, -11.154]
```

An example polygon/area coordinates string:

```
[[[[29.343, -11.154], [28.329, -11.342], [28.481, -10.239], [29.833, -10.412]]]]
```

However, if you are going to e.g. add coordinates for all units at a certain level you don't want to do that manually. This is where the automatic GML import comes into play and the following section explains the preferred way of using it.



Importante

The only co-ordinate reference system supported by DHIS2 is EPSG:4326, also known as geographic longitude/latitude. Coordinates must be stored with the longitude (east/west position) proceeding the latitude (north/south position). If your vector data is in a different CRS than EPSG 4326, you will need to reproject the data first before importing into DHIS2.

16.2. Importing coordinates

Step 1 - Simplify/generalize your geographical data

The boundaries in geographical data files are usually very accurate, too much so for the needs of a web-based GIS. This usually does not affect the performance when using GIS files on a local system, but it is usually necessary to optimize the geographical data for the web-based GIS system of DHIS2. All geographical data needs to be downloaded from the server and rendered in a browser, so if the data is overly complex, the performance of the DHIS2 GIS will be negatively impacted. This optimization process can be described as follows:

Coordinates: The number of significant decimal digits (e.g. 23.02937874993774) should be shortened to fewer digits (e.g. 23.03). Although this will result in some inaccuracies on the map, given the usual scale at which maps in DHIS2 are produced (> 1:50,000), the loss of precision should not be noticeable. Normally, no more than four significant digits after the decimal point should be necessary.

Polygons: In addition to shortening the number of significant digits, the actual number of points should also be reduced to an optimal level. Finding this optimal level may take a bit of experimentation. Decreasing the precision of the points as well as the number of points through generalization, will lead to degradation of the polygon. However, after a bit of experimentation, an optimal level of generalization can be found, where the accuracy of the polygon is visually acceptable, and the performance of the GIS is optimal.

For polygons, we need to make the boundary lines less detailed by removing some of the line points. One possible method is the use of [MapShaper](#) which is an online tool which can be used to generalize geographical data. To use

MapShaper, simply upload your shapefile to the site. Then, at the center bottom you see a slider that starts at 0%. It is usually acceptable to drag it up to about 80%. In the left menu you can check "show original lines" to compare the result and you may want to give a different simplification method a try. When you are happy with the result, click "export" in the top right corner. Then check the first of the four options called "Shapefile - polygons", click "create" and wait for the download buttons to appear. Now, download the two files to your local computer (being sure to rename the file so that you do not overwrite your existing, original data). Move on to the next step with your new simplified shapefile.

Step 2 - Convert the shapefile to GML

The recommended tool for geographical format conversions is called "ogr2ogr". This should be available for most Linux distributions **sudo apt-get install gdal-bin**. For Windows, go to <http://fwtools.maptools.org/> and download "FWTools", install it and open up the FWTools command shell. During the format conversion we also want to ensure that the output has the correct coordinate projection (called EPSG:4326 with geographic longitude and latitude). For a more detailed reference of geographic coordinates, please refer to this [site](#). If you have already reprojected the geographic data to the geographic latitude/longitude (EPSG:4326) system, there is no need to explicitly define the output coordinate system, assuming that **ogr2ogr** can determine the input spatial reference system. Note that most shapefiles are using the EPSG:4326 system. You can determine the spatial reference system by executing the following command.

```
ogrinfo -al -so filename.shp
```

Assuming that the projection is reported to be EPSG:27700 by **ogrinfo**, we can transform it to EPSG:4326 by executing the following command.

```
ogr2ogr -s_srs EPSG:27700 -t_srs EPSG:4326 -f GML filename.gml filename.shp
```

If the geographic data is already in EPSG:4326, you can simply transform the shapefile to GML by executing the following command.

```
ogr2ogr -f GML filename.gml filename.shp
```

You will find the created GML file in the same folder as the shapefile.

Step 3 - Prepare the GML file

Unfortunately, the GML file is not ready for importation yet. Open it in a robust text editor like Geany (Linux) or Notepad++ (Windows). GML is an XML based format which means that you will recognize the regular XML tag hierarchy. In the GML file an organisation unit is represented as a `<gml:featureMember>`. Inside the feature members we usually find a lot of attributes, but we are just going to import their coordinates. In order to do this DHIS 2 will match the name of the feature members to the organisation unit names in the database. To get the name of the feature members in the GML file the importer will look for a property called "ogr:Name". Figure out what property that is holding the name of the feature members (could be "ogr:DISTRICT_NAME", "ogr:NAME_1" or whatever, this differs from shapefile to shapefile) and rename it to "ogr:Name". Ensure that both the start and the end tags are renamed properly. They are supposed to look like e.g.: `<ogr:Name>Moyamba District</ogr:Name>`

Note that the name of the feature members in the GML file must be spelled exactly the same as the organisation units in the database. Otherwise the importer will not recognize it and thus not transfer any coordinates. E.g. "Moyamba" in the GML file might be called "Moyamba District" in the database. Creative use of the "rename all" function in the text editor is usually of great help in these situations, as you do not want to edit numerous feature members manually. Have a brief look at the names and compare them to the names in the database. If they seem to match fairly good, it is about time to do a preview in the import-export module.

Go to Services -> Import-Export, select "Preview", select the GML file and click "Import". Look for new/updated organisation units. Our intention is to add coordinates to already existing organisation units in the database, so we want as many updates as possible and 0 new. Those listed as new will be created as root units and mess up the organisation unit trees in DHIS 2. If any listed as new, click the number and the organisation units in question will appear in the list below. If there are any slight misspellings compared to the organisation unit names in the database - fix them and do the preview again. Otherwise, click the "discard all" button below the list and then the "Import all" button above the list.

If the import process completes successfully, you should now be able to utilize the geographical data in the DHIS2 GIS. If not, check the log for hints and look for common errors such as:

- Name duplicates in the GML file. The name column in the database is unique and does not accept two organisation units with the same name.
- The "shortname" column in the organisationunit table in your database has a too small varchar definition. Increase it to 100.
- Special name characters in the GML file. Be sure to convert these to appropriate XML equivalents or escape sequences.

Capítulo 17. Import and export

Learning objectives:

After reading this module you will be able to understand:

- Why do we need functions of export and import data.
- How to export data from DHIS2
- How to import data into DHIS2

17.1. What is import and export?

In a primary health system, the HMIS typically involves a distributed application, where the same application is running in different geographical locations (PHCs, CHCs, hospitals, districts, and state). Most of these physical locations do not have Internet connectivity, and hence they work offline. At some point (normally at the district level), the data needs to be synchronised in order to have a consolidated database for the a particular geographical region. For this, it is important to be able to export data from one location (which is working offline, say at the health facility level) to another one say at the district level where the data would need to be imported. This feature of exporting and importing is thus a crucial function of a HMIS. This feature also helps us overcome the dependency on Internet to some degree, as data updates can be transferred via USB key where there is no connectivity, or through email where there is limited Internet connectivity. DHIS 2 provides robust export-import functionality to fulfil these needs.

17.2. Exporting data

In the case on on-line data entry, all data is saved into one database only. In an offline deployment, each deployment will have a separate database in their local system. So the data will be stored in their local database. In an offline deployment, after the data entry is finished, it will need to be manually sent to the next level of where the application is running. In an on-line application, however, that is not required, as all data is stored at a central location using the Internet.

17.2.1. Exporting from DHIS 2

The export option can be made use of by selecting it as follows. The import or export is available only when the selected organisation (source/destination) has defined datasets. This is because datasets help to define which data is to be or is being exported. Further, which specific data elements get exported is determined by the composition of the dataset being exported. If there are no datasets defined for an organisation unit, it indicates that no data values are registered for this level of organisation or lower. To access the main Import-Export module, choose Services->Import-Export

The exported data values are stored in an 'xml file'. The file name is defined by the name of the source organisation unit and the period to allow the receiving organisation unit to identify the source and the period of the export file. The XML is placed in your home directory (On Windows this is normally C:\Documents and Settings\ under the sub-directories /dhis / import-export).

17.2.2. Exporting data to other DHIS 2 systems

Once the data export screen is displayed, select the Organisation unit, period and dataset for which data export should be selected. Finally click on the export option that will be available on the lower left side of displayed screen. If there are no datasets defined for an organisation unit, it indicates that no data values are registered for this level of organisation or lower.

A pop-up save option will appear on the displayed screen (see picture below) prompting the saving of the exported data. You may save the export folder on your desktop or any other folder by selecting the 'Save to Disk' option from the pop-up prompt.

17.2.3. Exporting metadata to other DHIS 2 systems

17.2.3.1. Metadata export

Metadata is "data about data". In the context of DHIS 2, metadata consists of definitions of data elements, indicators, the structure and names contained in the organizational hierarchy, and other options. Click on the "Metadata export" link from the main "Data export" screen in order to access this. Just select the feature that you wish to export and click "Export". This metadata file can then be transmitted just like a data file, except it will contain information on the definitions of the various features, as opposed to the values of the data themselves.

17.2.3.2. Detailed metadata export

The "Detailed metadata" function will allow you to export specific data element and indicator definitions. Just click "Detailed Metadata Export" and select the data elements and indicators that you wish to export. Click "Export" and save the file to a desired location. This file can then be transmitted via email or USB key to other DHIS 2 installations.

17.2.4. DHIS 1.4 Metadata export

The DHIS 1.4 Metadata export functionality provides the same functionality as the standard DHIS 2 metadata export, except that the resulting file can be used to transmit metadata information to DHIS 1.4 systems.

17.2.5. DHIS 1.4 Detailed Metadata Export

The DHIS 1.4 Metadata export functionality provides the same functionality as the detailed DHIS 2 metadata export, except that the resulting file can be used to transmit metadata information to DHIS 1.4 systems. Simply select the data elements and indicators that you want and click "Export" to begin the export process.

17.2.6. PDF Metadata Export

Auctor natoque ve vulputate quam. Quam dui posuere risus felis mus class tempor eu sociosqu. Risus dui penatibus turpis, tristique dictum enim est. Quisque mi pulvinar ultrices, fusce diam porttitor mi hendrerit viverra, augue leo vestibulum rutrum. Ridiculus dictumst luctus. Eros.

17.3. Importing data

The import option allows different instance of DHIS 2 to receive standardised set of data in the absence of a networked system. Typically, a data set is exported from one DHIS instance (e.g. a district level system) to another system (e.g. a provincial level system). DHIS 2 is capable of importing data from other systems that either support the DXF or IXXF formats. DHIS 2 is capable of importing data directly from a DHIS 1.4 Access database. Each of these options will be discussed in the following sections.

17.3.1. Importing data from another DHIS 2 instance

Data can be imported into different instances of DHIS 2 through the use of the DXF data exchange format. There are two screens that are used to import data, with default and advanced options.

The default data import menu can be accessed by clicking the "Import" from the main Import-Export screen.

By clicking the "Browse" button, you can select a file from your local file system. This file may have been received by email, copied from another user's system, or received on a CD for example. Simply select the file that you wish to import.

There are three separate options for importing data.

- **Import:** This option will import the contents of the import file directly into the database.
- **Preview:** This option will enable a preview of the contents of the import file. In the preview one can get an overview of the data to be imported, discard unwanted elements and match import elements to existing ones.
- **Analysis:** This option will enable an analysis of the contents of the import file. The analysis will search for and examine anomalies in the data, like violations of unique names constraints and invalid indicator formulas. This is useful when importing from external applications where data constraints might be less rigid than in DHIS 2.
- **NOTE: We highly recommend always using the Preview option** when importing data to make sure you keep control over any changes to your metadata and databases being out of synch on data elements or orgunit names.

17.3.1.1. Preview before importing

Before doing the import into your database it is highly recommended to preview the data to make sure no changes to the metadata (data element and/or orgunit names) have taken place at the source DHIS 2 installation. Select Preview in the Type field in the Import window. In the preview window it is **IMPORTANT to look for New and Updates in metadata**. DO NOT just click the Import all button without carefully reviewing the information in the preview window. Importing new data elements or orgunits without checking properly whether they are really new or just old names can cause a corrupted database with duplicate or incomplete data, so be careful!

Procedure for handling New or Updates in the preview:

If new:

If there are new data elements, indicators, or orgunits, first make sure whether they really are new or not. Data elements are rarely new, most of the time they are the old name of something that has been changed in the destination database (e.g. a master db at the national level). If you have changed some data elements names at the national level and these have not yet been updated in the district database, the old names that are in the district export files will appear as new data elements in your import preview. It is very important that you tell the DHIS that these are only just old names of a data element that already exists in your database, if not you will have two data elements meaning the same thing and both with an incomplete set of data. Use the 'match new to existing' button to link the new data elements (that really are old) to the updated names in your national database, and make sure that the source database updates its metadata before the next data export.

If updates:

Only the newer updates are shown in the preview. This means the record has been updated more recently in the district/hospital than in the zonal/national database you are importing into. If you are not sure whether you want to import the update or not, you can select the record and click on the compare to existing button to see exactly which changes that have been made in the updated object.

17.3.2. Importing data from DHIS 1.4

There are two ways to import data from a DHIS 1.4 database; 1) through the 1.4 XML-based export files, or 2) directly from the DHIS 1.4 data file (.mdb). Both are accessible from the DHIS 1.4 Import menu under Import in the Import-Export module.

It is critical that all data integrity violations which are present in the DHIS 1.4 database be fully resolved before attempting an import into DHIS 2. You can check the data integrity of DHIS 1.4 through the CORE Module->Advanced->Data integrity checks. A report will be generated of all data integrity violations which should be resolved prior to importing into DHIS 2.

17.3.2.1. DHIS 1.4 File (database) Import

This method is recommend when doing large imports from 1.4, and especially when importing into a new DHIS 2 database.

DHIS 1.4 File Configuration

Before you can start the 1.4 file import you need to provide a few details about the 1.4 database:

Datafile(#): Here you put the full path to the DHIS 1.4 data file you want to import from, e.g. C:\DHIS14\DHIS_#LR_LIBERIA.mdb.

Username: Leave blank (unless you have set up extra security measures on the file)

Password: Leave blank (unless you have set up extra security measures on the file)

Levels: Provide the number of levels in the orgunit hierarchy in your 1.4 database, e.g. 5.

Click "Save" and you will return to the DHIS 1.4 File Import window.

Import Type:

As with other imports you have the options to Import (directly), Preview, or Analyse the import. We recommend using the Analyse option first to check that the 1.4 database is OK and ready to be imported.

When importing a large database into a new blank DHIS 2 database we recommend using the Import option to save time.

For smaller incremental imports the Preview is OK.

Last Updated:

If you want the full import, all the data in the 1.4 database you leave this field blank.

If you only want to do an incremental import into an already existing DHIS 2 database you can use this field to filter which data values to import. Only values added or edited after the date you specify will be imported. This filter makes use of the LastUpdated column in the RoutineData table in the DHIS 1.4 data file.

Import process:

When you are done selecting Method, and LastUpdated you can begin the import by clicking on the Import button. This process might take a long time, depending on how many data values you are importing. On a reasonable spec. computer the import takes about 2 million records per 30 minutes.

17.3.2.2. DHIS 1.4 XML Import

Import of XML data from DHIS 1.4 is also possible using the standard DHIS 1.4 export format. Just be sure that the DHIS 1.4 export format has been set to "DHIS 2.0" as illustrated in the screen shot below. After the data has been exported by DHIS 1.4, you can import the data by choosing "Services->Import-Export->DHIS 1.4 Import->DHIS 1.4 XML Import" and proceeding via the procedure outline in the [previous section](#).

17.3.2.3. Limitations to DHIS 1.4 imports

Although it is possible to import and export data between instances of DHIS 1.4 and DHIS 2, there are significant limitations. Currently, the import of some metadata is not supported from DHIS 1.4 to DHIS 2. This includes:

- Validation rules
- Organisational unit alternate names
- Compulsory data element pairings
- Custom data entry forms
- Dataset data entry levels

It is also important that the aggregation operator defined in DHIS 1.4 be set to the correct value. Some data, such as population, should have their aggregation operator set to "Average" in DHIS 2, as this controls how the aggregation of data is handled over time (but not within the organisational unit hierarchy).

17.4. Importing CSV data

DHIS 2 supports import of data in the CSV format. This can be used to import exchange file produced by DHIS 2 itself. It also comes in handy when you want to import data from a third-party system as CSV is widely supported in applications and is easy to produce manually.

To import a CSV data exchange file navigate to the *CSV Data Import* item in the left-side menu. Upload the exchange file and click *Import*.

The following section describes the CSV format used in DHIS 2. The first row is assumed to be a header row and will be ignored during import.

Tabla 17.1. CSV format of DHIS 2

Column	Required	Notes
Data element	Yes	Refers to uid by default, can also be name and code based on selected id scheme
Period	Yes	In ISO format
Org unit	Yes	Refers to uid by default, can also be name and code based on selected id scheme
Category option combo	No	Refers to uid
Value	No	Data value
Stored by	No	Refers to username of user who entered the value
Timestamp	No	Date in ISO format
Comment	No	Free text comment
Follow up	No	true or false

The following is an example CSV file which can be imported into DHIS 2. It can be imported both as plain text file or as compressed ZIP file archive.

```
"dataelement","period","orgunit","categoryoptioncombo","value","storedby","timestamp","comment"
"DUSpd8Jq3M7","201202","gP6hn503KUX","Pr1t0C1RF0s","7","bombali","2010-04-17","false"
"DUSpd8Jq3M7","201202","gP6hn503KUX","V6L425pT3A0","10","bombali","2010-04-17","false"
"DUSpd8Jq3M7","201202","0jTS752GbZE","V6L425pT3A0","9","bombali","2010-04-06","false"
```

17.5. Importing XML data

DHIS 2 supports import of data in XML format. The format is called DXF (DHIS Exchange Format). To import an XML file navigate to the XML Data Import item in the left side menu. Upload the exchange file and click *Import*. After the import process is finished you can follow the link to the import summary, which will inform you about the outcome of the import process in terms of number of records imported, updated and ignored and potential conflicts.

If you need to manually produce such XML files please refer to the Web API chapter where you can find detailed documentation of the DXF format.

Capítulo 18. Data Administration

The data administration module provides a range of functions to ensure that the data stored in the DHIS2 database is integral and that the database performance is optimised. These functions should be executed on a regular basis by a data administrator to ensure that the quality of the data stored is optimal.

18.1. Data browser

The data browser maintenance and analysis module which allows the user to produce a summary of the data contained in the DHIS2 database. The summary view provides a count of data elements which have been entered at the selected organisation unit as well as its descendants. Raw data for all data elements for a range of time periods and a given organisational unit can be browsed and exported to Excel, CSV, or PDF formats. There are four modes of the data browser, which determine how the data is summarized

- Data sets
- Data element groups
- Organisational unit groups
- Organisational units

Each of these options can be accessed by selecting the desired option from "Browse by" drop-down menu.

In order to produce a summary of submitted data for a given period and grouped by data sets, the user should follow this procedure. Begin by selecting a given periodicity type (e.g. Weekly, monthly, yearly, etc) and then a "From date" and "To date". (e.g. January 2009 to March 2009). Select the type of summary to be produced (e.g. Dataset) from the "Browse by" drop-down menu. Click the "Browse" button to view the summary.

The screenshot displays the DHIS2 Data Browser interface. At the top, the DHIS2 logo and 'District Health Information Software 2' are visible, along with navigation links for Maintenance, Services, Help, and Log out. The left sidebar contains a 'Data Administration' menu with options like Data Browser, Data Integrity, Data Archive, Beneficiary Data Archive, Maintenance, Resource Table, Sql View, Organisation Unit Merge, Duplicate Data Elimination, Data Statistics, Data Locking, Zero Value Storage, Organisation Unit Pruning, and Min-Max Value Generation. Below this is a 'System Administration' section with 'Cache Statistics'. The main content area, titled 'Data Browser', features a form with the following fields: 'Period Type' set to 'Monthly' with a green checkmark; 'From date' set to '2010-01-01' with a calendar icon; 'To date' set to '2010-01-31' with a calendar icon; and 'Browse by' set to 'Data sets' with a green checkmark. A 'Browse' button is located at the bottom of the form.

A summary of the number of data element values that have been submitted over the user selected time period is shown below.

DHIS2 District Health Information Software 2 Maintenance Services Help Log out

Data Administration

- Data Browser
- Data Integrity
- Data Archive
- Beneficiary Data Archive
- Maintenance
- Resource Table
- Sql View
- Organisation Unit Merge
- Duplicate Data Elimination
- Data Statistics
- Data Locking
- Zero Value Storage
- Organisation Unit Pruning
- Min-Max Value Generation

System Administration

- Cache Statistics

Search results for Data Set

Request returned in: 32 ms. Query took: 18 ms. Number of queries executed: 1.

Navigation

[Start](#) » [Data Set list](#)

File name: ✓ Font size: Page layout:

From date: 2010-01-01 To date: 2010-01-31 Period Type: Monthly

Data Set	The count of data entered
Outpatient	7809
Vaccines and Immunisation	2288
Integrated RH, HIV/AIDS, Malaria, TB & Nutrition	627
IDSR	180

By clicking on the name of the individual dataset, a more detailed summary of each data element can be obtained as shown below. A cross-tab table summarising each time period will be shown.

DHIS2 District Health Information Software 2 Maintenance Services Help Log out

Data Administration

- Data Browser
- Data Integrity
- Data Archive
- Beneficiary Data Archive
- Maintenance
- Resource Table
- Sql View
- Organisation Unit Merge
- Duplicate Data Elimination
- Data Statistics
- Data Locking
- Zero Value Storage
- Organisation Unit Pruning
- Min-Max Value Generation

System Administration

- Cache Statistics

Search results for Data Set - Outpatient

Request returned in: 34 ms. Query took: 24 ms. Number of queries executed: 2.

Navigation

[Start](#) » [Data Set list](#) » [Outpatient](#)

File name: ✓ Font size: Page layout:

From date: 2010-01-01 To date: 2010-01-31 Period Type: Monthly

Data Element	January 2010
Abortion	123
Accidents	248
All other diseases	249
Anaemia cases	242
Bilharzia	104
Bites - Animal, Snake, etc	248
Brucellosis	110
Burns	244
Chicken Pox	227
Cholera	0
Clinical Malaria	250
Confirmed Malaria	245

The functionality of the grouping by Datasets, Data element groups, and Organisational groups is essentially the same.

The functionality of grouping by organisation units will be discussed below. Begin by selecting "Organisation units" from the "Browse by" drop-down menu. The organisational hierarchy present in the database will now be displayed. Organisational units can be expanded by clicking on the plus symbol in the organisational tree view.

Data Browser

Period Type  

From date 

To date 

Browse by 

Allow Zero showed ☐

Select parent organisation unit

- ☒ Sierra Leone
 - ☒ Bo
 - ☒ Bombali
 - ☒ Bonthe
 - ☒ Kailahun
 - ☒ Kambia
 - ☒ Kenema
 - ☒ Koinadugu
 - ☒ Kono
 - ☒ Moyamba
 - ☒ Port Loko
 - ☒ Pujehun

☐ Browse data at this level only

By clicking on an organisational unit, and the clicking the "Browse" button, a summary of submitted data elements present in the database is returned for all immediate children of the selected organisational as shown below:

Organisation units - Bo

From date: 2010-01-01 To date: 2010-03-31, Period Type: Monthly

[Download as Excel](#)
[Download as CSV](#)
[Download as PDF](#)
[Back](#)

[Start](#) » [Sierra Leone](#) » **Bo** (Hit(s))

Organisation Unit	January 2010	February 2010	March 2010
Badjia	836	451	460
Baoma	2673	2691	2730
Bargbe	1257	1175	1316
Bargbo	1128	1214	974
Bumpe Ngao	1672	1587	1792
Gbo	253	234	229
Jaiama Bongor	1313	1283	1267
Kakua	3547	3393	3435
Komboya	707	792	675
Lugbu	1625	1491	1824
Niawa Lenga	477	784	770
Selenga	359	344	337
Tikonko	1273	1020	1144
Valunia	987	1045	1286
Wonde	418	476	511

By clicking on one of the organisational units, two drill down modes are presented to the user.

- Summary drill down- Drill down to the selected organisational units children to see the count of data elements.
- View raw data at this level: View the actual raw data at the selected organisational unit. A typical view of the raw data export can be seen below.

Organisation units - Ngelehun CHC

From date: 2010-01-01 To date: 2010-03-31, Period Type: Monthly

[Download as Excel](#)
[Download as CSV](#)
[Download as PDF](#)
[Back](#)

[Start](#) » [Sierra Leone](#) » **Bo** » **Badjia** » **Ngelehun CHC** (Raw data)

Data Element	January 2010	February 2010	March 2010
Acute Flaccid Paralysis (AFP) follow-up (0-11m)	1		
Acute Flaccid Paralysis (AFP) follow-up (12-59m)			
Acute Flaccid Paralysis (AFP) follow-up (15y+)			
Acute Flaccid Paralysis (AFP) follow-up (5-14y)			
Acute Flaccid Paralysis (AFP) new (0-11m)	11		
Acute Flaccid Paralysis (AFP) new (12-59m)			
Acute Flaccid Paralysis (AFP) new (15y+)			
Acute Flaccid Paralysis (AFP) new (5-14y)			
Acute Flaccid Paralysis (AFP) referrals (0-4y)	1		
Acute Flaccid Paralysis (AFP) referrals (5y+)			
Albendazole given at ANC (2nd trimester) (Fixed)	5	8	10
Albendazole given at ANC (2nd trimester) (Outreach)			
All other deaths (At PHU, 0-28d.)	1		

Data can be exported into Excel, CSV and as a PDF report by clicking the appropriate button.

18.2. Data integrity

DHIS2 can perform a wide range of data integrity checks on the data contained in the database. Identifying and correcting data integrity issues is extremely important for ensuring that the data used for analysis purposes is valid.

Each of the data integrity checks that are performed by the system will be described, along with general procedures that can be performed to resolve these issues.

18.2.1. Data elements without data set

Each data element must be assigned to a data set. Values for data elements will not be able to be entered into the system if a data element is not assigned to a data set. Choose Maintenance->Datasets->Edit from the main menu and then add the "orphaned" data element to the appropriate data set.

18.2.2. Data elements without groups

Some Data Elements have been allocated to several Data Element Groups. This is currently not allowed, because it will result in duplication of linked data records in the PivotSource recordsets that `feed` the pivot tables. Go to Maintenance -> Data Element Groups to review each Data Element identified and remove the incorrect Group allocations.

18.2.3. Data elements violating exclusive group sets

Some data elements have been allocated to several data element groups that are members of the same data element group set. All group sets in DHIS are defined as exclusive, which means that a data element can *only* be allocated to *one* data element group within that group set. Go to Maintenance -> Data elements and indicators ->Data element groups to review each data element identified in the integrity check. Either remove the data element from all groups except the one that it should be allocated to, or see if one of the groups should be placed in a different group set.

18.2.4. Data elements assigned to data sets with different period types

Data Elements should not be assigned to two separate data sets whose period types differ. The recommended approach would be to create two separate data elements (for instance a monthly and yearly data element) and assign these to respective datasets.

18.2.5. Data sets not assigned to organisation units

All data sets should be assigned to at least one organisation unit.

18.2.6. Indicators with identical formulas

Although this rule will not affect data quality, it generally does not make sense to have two indicators with the exact same definition. Review the identified indicators and their formulas and delete or modify any indicator that appears to be the duplicate.

18.2.7. Indicators without groups

All Data Elements and Indicators must be assigned to at least one group, so these Indicators need to be allocated to their correct Data Element and Indicator Group. Go to Maintenance -> Indicator Groups, and allocate each of the `Orphaned` Indicators to its correct group.

18.2.8. Invalid indicator numerators

Violations of this rule may be caused by an incorrect reference to a deleted or modified data element. Review the indicator and make corrections to the numerator definition.

18.2.9. Invalid indicator denominators

Violations of this rule may be caused by an incorrect reference to a deleted or modified data element. Review the indicator and make corrections to the denominator definition.

18.2.10. Indicators violating exclusive group sets

Some indicators have been allocated to several indicator groups that are members of the same indicator group set. All group sets in DHIS are defined as exclusive, which means that an indicator can *only* be allocated to *one* indicator group within that group set. Go to Maintenance -> Data elements and indicators -> Indicator groups to review each indicator identified in the integrity check. Either remove the indicator from all groups except the one that it should be allocated to, or see if one of the groups should be placed in a different group set.

18.2.11. Organisation units with cyclic references

Organisation units cannot be both parent and children of each other, directly nor indirectly.

18.2.12. Orphaned organisation units

All organisation units must exist within the organisation unit hierarchy. Go to Organisation->Hierarchy Operations and move the offending organisation unit into the proper position in the hierarchy.

18.2.13. Organisation units without groups

All organisation units *must* be allocated to at least *one* group. The problem might either be that you have not defined any `compulsory` OrgUnit Group Set at all, or that there are violations of the `compulsory` rule for some OrgUnits. NOTE: If you have defined no `compulsory` OrgUnit Group Sets, then you must first define them by going to Maintenance -> Organisation units->Organisation unit group sets and define at least one `compulsory` Group Set (the group set `OrgUnitType` are nearly universally relevant). If you have the relevant group sets, go to Maintenance -> OrgUnit Groups to review each OrgUnit identified and add the relevant Group allocation.

18.2.14. Organisation units violating compulsory group sets

These organisation units have not been assigned to the any organisation unit group within one of the *compulsory* organisation unit group sets. When a group set is defined as `compulsory`, it means that an organisation unit must be allocated to at least one organisation unit group within that group set. For instance, all organisation units must belong to one of the groups in the `organisation unitType` group set. It might belong to the `Hospital` or the `Clinic` or any other `type` group - but it must belong to exactly one of them. Go to Maintenance -> organisation unit->Organisation unit groups to review each organisation unit identified in the integrity check. Allocate all organisation units to exactly one group.

18.2.15. Organisation units violating exclusive group sets

Some organisation units have been allocated to several organisation unit groups that are members of the same organisation unit group set. All group sets in DHIS are defined as exclusive, which means that an organisation unit can *only* be allocated to *one* organisation unit group within that Group Set. For instance, one organisation unit cannot normally belong to the both the 'Hospital' and 'Clinic' groups, but rather to only to one of them. Go to Maintenance -> organisation unit->Organisation unit groups to review each organisation unit identified in the integrity check. Remove the organisation unit from all groups except the one that it should be allocated to.

18.2.16. Organisation unit groups without group sets

The organisation unit groups listed here have not been allocated to a group set. Go to Maintenance->Organisation unit->Organisation unit group sets and allocate the Organisation unit group to the appropriate group set.

18.2.17. Validation rules without groups

All validation rules must be assigned to a group. Go to **Services->Data quality->Validation rule group** and assign the offending validation rule to a group.

18.2.18. Invalid validation rule left side expressions

An error exists in the left-side validation rule definition. Go to **Services->Data quality->Validation rule** and click the "Edit" icon on the offending rule. Press "Edit left side" and make the corrections that are required.

18.2.19. Invalid validation rule right side expressions

An error exists in the left-side validation rule definition. Go to **Services->Data quality->Validation rule** and click the "Edit" icon on the offending rule. Press "Edit right side" and make the corrections that are required.

18.3. Data Archive

The purpose of the data archive function is to move data which is currently not being used for analysis to a secondary storage location in order to improve performance of the application. Data can be both archived and unarchived. When archiving data one moves it from the primary storage to the secondary storage location, while unarchiving moves it from the secondary storage location to the primary. Analysis functionality in DHIS 2 heavily utilizes queries to the data value database table, and by reducing the size of this table these operations will be significantly faster. Typically one would want to archive data that is older than two years.

To archive data, first enter a start date and an end date for the time span of the data which should be archived. Then press the archive button. The operation might take a few minutes.

To unarchive data, first enter a start date and an end date for the time span of the data which should be unarchived. Then press the unarchive button. The operation might take a few minutes.

In some cases you might end up with overlapping data. For instance one might archive data for a given timespan, then later enter data for a period in that timespan. In such cases the system will automatically overwrite the oldest of the overlapping values with the newest during the archive or unarchive operation.

18.4. Beneficiary Data Archive

The purpose of the beneficiary data archive function is to move beneficiary data value which is currently not being used for analysis to a secondary storage location in order to improve performance of the application. Data can be both archived and unarchived. When archiving data one moves it from the primary storage to the secondary storage location, while unarchiving moves it from the secondary storage location to the primary. Analysis functionality in DHIS 2 heavily utilizes queries to the data value database table, and by reducing the size of this table these operations will be significantly faster. Typically one would want to archive beneficiary data that is older than two years.

To archive beneficiary data, first enter a start date and an end date for the time span of the data which should be archived. Then press the archive button. The operation might take a few minutes.

To unarchive beneficiary data, first enter a start date and an end date for the time span of the data which should be unarchived. Then press the unarchive button. The operation might take a few minutes.

In some cases you might end up with overlapping data. For instance one might archive beneficiary data for a given timespan, then later enter data for a period in that timespan. In such cases the system will automatically overwrite the oldest of the overlapping values with the newest during the archive or unarchive operation.

18.5. Maintenance

The data maintenance module has five options, each described below.

- Clear data mart (aggregated data values)

The data mart is where DHIS 2 stores aggregated data produced during the export to data mart process. This function clears the database table which contains aggregated data element values.

- Clear data mart (aggregated indicator values)

The data mart is where DHIS 2 stores aggregated data produced during the export to data mart process. This function clears the database table which contains aggregated indicator values.

- Clear zero values

This function removes zero data values from the database. Values registered for data elements with aggregation operator *average* is not removed, as such values will be significant when aggregating the data, contrary to values registered for data elements with aggregation operator *sum*. Reducing the number of data values will improve system performance.

- Clear dataset completeness

This function removes aggregated dataset completeness values. This data is produced and used by report tables.

- Prune periods

This function removes all periods which have no registered data values. Reducing the number of periods will improve system performance.

18.6. Resource tables

Resource tables are supporting tables that are used during analysis of data. One would typically join the contents of these tables with the data value table when doing queries from third-party applications like Microsoft Excel. Simply select the tables that should be regenerated and press "Generate tables". Regeneration of the resource tables should only be done once all data integrity issues are resolved.

- Organisation unit structure (orgunitstructure)

This table should be regenerated any time there have been any changes made to the organisational unit hierarchy. This table provides information about the organisation unit hierarchy. It has one row for each organisation unit, one column for each organisation unit level and the organisation unit identifiers for all parents in the lineage as values.

- Exclusive organisation unit groupset structure normalized (orgunitgroupsetstructure)

This table provides information about the which organisation units are member of which organisation unit group sets.

- Data element group set structure (_dataelementgroupsetstructure)

This table provides information about which data elements are members of which data element group sets. The table has one row for each data element, one column for each data element group set and the names of the data element group as values.

- Indicator group set structure (_indicatorgroupsetstructure)

This table provides information about which indicators are members of which indicator group sets. The table has one row for each indicator, one column for each indicator group set and the names of the indicator group as values.

- Organisation unit group set structure (_organisationunitgroupsetstructure)

This table provides information about which organisation units are members of which organisation unit group sets. The table has one row for each organisation unit, one column for each organisation unit group set and the names of the organisation unit groups as values.

- Category structure (_categorystructure)

This table provides information about which data elements are members of which categories. The table has one row for each data element, one column for each category and the names of the category options as values.

- Data element category option combo name (categoryoptioncomboname)

This table should be regenerated any time there have been changes made to the category combination names. It contains readable names for the various combinations of categories.

18.7. SQL View

Database administrators must be very careful about creating database views directly in the DHIS 2 database. Certain DHIS 2 operations drop and recreate tables, for instance when the resource tables are regenerated. If any SQL views depend on these tables, an error will occur, since the tables are referenced in an SQL view.

The SQL View functionality of DHIS2 will store the SQL view definition internally, and then materialize the view when requested.

18.7.1. Creating a new SQL view

To create a new SQL view, choose Maintenance->SQL view and click the "Add new" button.

Add new Sql view

Details

Name *

Total malaria deaths ✓

Description *

Get all aggregated data values from the database for the data element named "[CDE] Deaths malaria confirmed total" ✓

SQL Statement *

SELECT * FROM aggregateddatavalue where dataelementid = (SELECT DISTINCT dataelementid from dataelement where name ~*("[CDE] Deaths malaria confirmed total"))

✓

Save

Cancel

The "Name" attribute of the SQL view will be used to determine the name of the table that DHIS2 will create when the view is materialized by the user. The "Description" attribute allows one to provide some descriptive text about what the SQL view actually does. Finally, the "SQL statement" should contain the SQL view definition. Only SQL "SELECT" statements are allowed and certain sensitive tables (i.e. user information) are not accessible. Press "Save" to store the SQL view definition.

18.7.2. SQL View management

In order to utilize the SQL views, simply press the "Execute query" button  from the "SQL View management" page. Once the process is completed, you will be informed that a table has been created. The name of the table will be provided, and is composed from the "Description" attribute provided in the SQL view definition. Once the view has

been materialized, click on the "View" button .

18.8. Organisation unit merge

This function is useful when two organisation units need to be merged, eg. it is decided that one facility will be shut down and its services will be provided by a nearby facility.

Start by selecting the organisation unit to eliminate from the tree and click *confirm*. Then select the organisation unit to keep and click *confirm* again. Finally, verify the selection and click *merge*.

In the situation where data exist for the organisation unit to eliminate and not for the one to keep, the data will be moved to the one to keep. When data exists for both organisation units, the data will be summarized and moved to the one to keep. When data exists only for the one to keep, no action is taken. The organisation unit to eliminate will eventually be deleted.

18.9. Duplicate data elimination

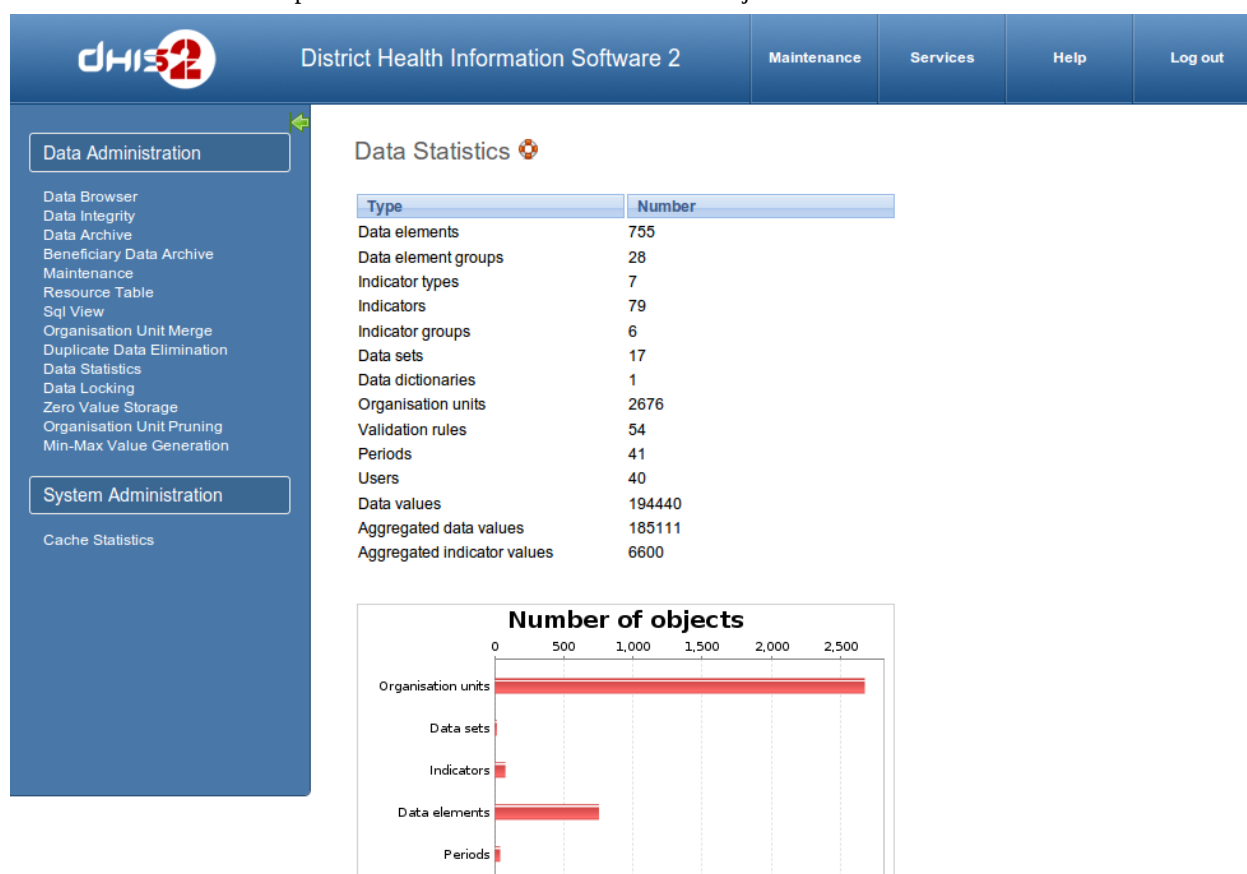
This function is useful when data has been entered mistakenly for two data elements which represents the same phenomena.

Start by selecting the data element to eliminate from the list and click *confirm*. Then select the data element to keep and click *confirm* again. Finally, verify the selection and click *merge*.

In the situation where data exists for the data element to eliminate and not for the one to keep, the data will be moved to the one to keep. When data exists for both data elements, the data which was updated last will be used. When data exists only for the one to keep, no action will be taken. The data element to eliminate will eventually be deleted, except when it is a multidimensional data element and has other data registered.

18.10. Data statistics

The data statistics module provides an overview of the number of objects stored in the DHIS2 database.



The total number of each type of object is presented in a table, as well as a graph.

18.11. Lock exceptions

Lock exceptions provide fine-grained control over exemption from a locked data set. After the expiry of the data set, data entry will be denied by default, unless an exception has been granted through the Lock exception interface. To enable a lock exception, select the desired organization units, data sets, and time period and press "Add". By granting a lock exception, data entry will be enabled even after the expiry period of the data set has passed.

Create new lock exception

In the example above, a data lock exception would be created for "ab Abundant Life Organization" and "ab Seventh Day Hospital" for the "Care and Support" dataset for "February 2012".

18.12. Zero value storage

The zero value storage function makes it possible to define for which data elements the system should store zero values. In most cases zeros are significant only for a subset of the data elements in the database. Any zeroes entered during data entry will be ignored by default, except for data elements where the zero value storage has been enabled.

18.13. Organisation unit pruning

If you need to prune out branches of the organisational unit hierarchy, you can use the organisational unit pruning function. Keep in mind that the only selected organisational (and its children) will be kept. All other orgunits (and any data associated with them) will be deleted from the database.

18.14. Min-Max Value Generation

This administrative function can be used to generate min-max values, which are used as part of the data quality and validation process for specific organization units and data sets. Simply select the dataset from the left hand frame, and then select the required orgunits to generate the min-max values for from the organisational units selector on the right. Press the "Generate" button to generate or regenerate all min-max values. Press "Remove" to remove all min-max values which are currently stored in the database.

Min-Max Value Generation

Available data sets	Organisation Unit Selection
Care & Support HCTesting HSS Dataset PMTCT Prevention Treatment OVC Dataset	Select at level Federal Governn Un-select at level Unselect all Select in group AIDSRelief Un-select in group Select children ☐ ng Federal Government ☐ ab Abia State ☐ ab Aba North Local Government Area - ab Seventh Day Hospital ☐ ab Aba South Local Government Area - ab Aba Health Office - ab Aba IDH Hospital

18.15. Constant

Constants are static values which can be made available to users for use in data elements and indicators. Some indicators, such as "Couple year protection rate" depend on constants which usually do not change over time. Simply press "Add" and provide a name in the "Name" field and define it's value in the "Value" field. Press "Add" . The constant will now be available to users for use in their expressions.

Add Constant

Details	
Name *	Pi ✓
Value *	3.14159265 ✓
Add Cancel	

18.16. Option sets

Option sets can be associated with data elements in the add / update data element interface for name-based data elements. You can define any kind of options, for instance an option set called "Delivery type" where "Normal", "Breach", "Caesarian" and "Assisted" would be the options. This option set can later be associated with any number of data elements. When doing data entry in name-based records module those elements will then appear in the form as drop-down lists with auto-completion support.

18.17. Cache Statistics

This option is for system administrators only to use. The cache statistics shows the status of the application level cache. The application level cache refers to the objects and query results that the application is caching in order to speed up performance. If the database has been modified directly the application cache needs to be cleared for it to take effect.

18.18. Dynamic attributes

Dynamic attributes can be used to add additional information to certain objects (namely data elements, indicators, organisation units and users). In addition to the standard attributes each of these objects have, it may be required in certain installations to have additional attributes, such as a fax number which is associated with an organisation unit. To add a new dynamic attribute to an object, select "Maintenance->Data administration" from the main menu, then "Attribute" from the left side panel, and press the "Add new" button.

To create a new attribute, assign it a name. Each attribute should have a unique name. Check the tick-box "Mandatory" if the object should always have the dynamic attribute. Next, select which object (or objects) the attribute should be assigned to. Lastly, select the value type. You can choose from "Text", "Yes/No", "Date", "Number", "Integer", "Positive integer" and "Negative integer". If the value supplied for the attribute does not match the value type, an error will result. Finally, click "Save" to save the attribute.

The dynamic attribute will now be present in the object which you assigned it to in the respective "Edit" screen of each the object.

18.19. Scheduling

Data mart jobs can be automatically scheduled to run on regular intervals. Simply select the aggregation period types, organisation unit group set aggregation level, and strategy to configure how the scheduled job should run. Pressing "Start" will enable the scheduled job to run at a pre-determined time or can be run immediately by pressing "Execute now"

Capítulo 19. Settings

The settings module provides a set of application configuration options. There are two main groups of settings: the *system settings* apply to the whole system and all its users while the *user settings* apply to the environment of the currently logged in user.

19.1. User settings

The user settings section provides general configuration options and options specifically for email.

19.1.1. User general settings

- **Interface language:** Sets the locale / language of the user interface, such as labels, menus and headers. You can currently select between 18 languages.
- **Database language:** Sets the locale / language of the database contents in the system, such as the list of data elements and reports.
- **Sort order property:** Sets the property for which to base the sorting of the element lists in the system, such as the list of data elements and indicators. Available properties are *name*, *short name*, *alternative name* and *code*. For instance, if you set the sort order property to short name, all lists will be sorted based on the short name property. You can also do manual sorting of all lists by going to the desired list and click "sort" and perform the sorting. This sorting can then be enabled by selecting *custom* as the sort order property.
- **Display property:** Sets the property which will be displayed in the element lists in the system, such as the list of data sets.
- **Style:** Sets the style / look-and-feel of the system. You can choose among four different styles while the *light blue* style is the default and recommended style. The user setting overrides the corresponding style system setting.
- **Dashboard charts to display:** Sets the number of charts to display on the front page of the dashboard module. For small screens, four charts are recommended while eight charts are recommended for widescreens.

19.1.2. User message settings

- **Message email notification:** Decides whether you want to receive email notifications. Currently the system offers email notifications of messages received in the dashboard. This requires that you have entered your email address in your personal account details - you can access it under "Help" - "User account".

19.2. System settings

The system settings section provides general configuration options and options specifically for appearance and email.

19.2.1. System general settings

- **Aggregation strategy:** This setting defines how the system generates and provides aggregated data to the output tools. There are two options available: *Batch* means that all output tools like reports, charts and maps will read aggregate data from pre-built data mart tables in the database. This strategy provides the best performance and inflicts less load on the application since data retrieval only implies reading from one or a few database tables using a simple query.

This strategy requires that those data mart tables are populated with the relevant data before the reports are requested. This can preferably be done using nightly scheduled jobs or manually through the data mart user interface. A potential downside is that users will have to wait to the next day to view their reports after doing data entry. This approach is the recommended for large online deployments where there are medium to high user concurrency.

Real-time means that aggregated data is generated and retrieved on-the-fly every time a report is requested. This implies that there is no delay after doing data entry before the data is accessible in reports. Performance will not scale adequately and hence this strategy is suitable for small, typically offline, deployments.

- **Infrastructural data elements:** This setting defines a data element group where the member data elements should describe data about the infrastructure of organisation units. Examples of such infrastructural data elements could be population, doctors, beds, internet connectivity and climate. This infrastructural data can currently be viewed in the GIS module in the facility information sheet.
- **Infrastructural period type:** 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 time period of the data source.
- **Feedback recipients:** This setting defines a user group where the members will receive all messages being sent through the function for writing feedback in the dashboard module. This will typically be members of the super user team who are able to support and answer questions coming from end-users.
- **Completeness notification recipients:** This setting defines a user group where the members will receive messages as notifications when a form has been marked as complete. A typical use of this is when the forms are considered to be an order of some commodity and a group of users want to be notified when such orders are placed.
- **Omit indicator values with zero numerator value in data mart:** Defines whether aggregated indicator values with zero as the numerator value should be written to the indicator data mart table. Having such values written is required for instance when connecting Excel pivot tables to the data mart as Excel will need the numerator data to correctly aggregate up in the organisation unit hierarchy. If third-party tools like Excel are not used with the application this will reduce the total number of values written to the data mart (which again will improve performance) and could safely be set to omit.
- **Disable data entry when data set completed:** This setting defines whether the data entry forms should be disabled and prevent from further entry after they have been marked as complete.
- **Data analysis std dev factor:** Sets the number of standard deviations for use in the outlier analysis performed on the captured data in the data entry module. The default value is 2; a high value will catch less outlier values than a low value.
- **Days after period end to qualify for timely data submission:** Sets the number of days after the end of a period in which a data entry form must be marked as complete in order to be considered timely. This affects the "reporting rate" tool in the reporting module which lists forms marked as complete as well as marked as complete in time. The default value is 15.

19.2.2. System appearance settings

- **Application title:** Sets the application title to the left on the top menu.
- **Style:** Sets the style / look-and-feel of the system. The corresponding user style setting overrides this.
- **Flag:** Sets the flag which is displayed in the left menu of the dashboard module.
- **Start page:** Sets page / module which the user will be redirected to after logging in. The dashboard module is the recommended start module.

19.2.3. System email settings

- **Host name:** Refers to the host name of the SMTP server. For instance when using Google SMTP services this should be smtp.gmail.com.
- **User name:** The user name of the user account with the SMTP server. For instance mail@dhis2.org.
- **Password:** The password of the user account with the SMTP server.

Capítulo 20. DHIS Mobile

20.1. Introduction

DHIS2 provides a range of options to allow data entry from mobile devices, including a dedicated GPRS/3G J2ME client, a SMS based client, and a version of DHIS2 which has been optimized specifically for mobile browsers. Each of these solutions will be described in detail in the following sections.

Collection of data in the field can be technically challenging and expensive. Mobile phone solutions has the potential to significantly reduce the complexity of deploying a distributed data collection system. Using a simple Java client installed on a mobile phone or a web browser which works on the mobile phone, field workers can report directly to the DHIS2 database through their mobile device.

While mobile phone solutions have a great potential, it is also an area that can be difficult to "get right". Phones lack processing power and have a small display, need to be charged and often makes the most sense in areas where mobile network coverage is weak and patchy.

There are currently three main mobile solutions for DHIS2, and we continue to evolve these as well as look at other possible solutions:

- A mobile browser optimized data entry module

This module allows for data entry directly with the browser of the mobile device. A wide range of devices and mobile browsers are supported including: Opera mini 3 & 4 (basic and advanced) - Opera mini 4, Nokia S40 mobiles, Windows Phone 7, Windows Mobile 6, Palm Pre, Blackberry (v5 and v6), Firefox mobile, iOS devices (iPhone) and Android devices. This client does not have offline-support, and an active GPRS/3G connection is required. It does not require a new application installation on the phone to support new features, but does require a stable data connection for use. This solution is described in [Sección 20.2, "Mobile browser based data entry"](#)

- J2ME GPRS/3G client (one client for facility reporting and one for program tracking)

DHIS-mobile includes two separate J2ME clients supporting GPRS as a transport. One client supports facility aggregate reporting and the second client supports name-based program tracking. These clients are split into separate applications to make deployment easier. Some health workers may have both applications installed on their phone. Both of these clients support offline-storage of data. [Sección 20.3, "J2ME GPRS/3G Client"](#)

An active GPRS/3G connection is required in order to send data to the DHIS2 database, but data can be entered offline and transmitted when a connection is present. This client is intended primarily for low-end devices which support J2ME applications, although the offline-support adds some memory requirements which limits the handset selection. While the solution is primarily tested on Nokia phones, it also works on several other J2ME capable handsets.

The facility reporting J2ME client is described in [Sección 20.3.2, "J2ME GPRS 3G facility reporting client"](#)

The name-based program tracking J2ME client is described in [Sección 20.3.3, "J2ME GPRS 3G program reporting client"](#)

- Legacy J2ME client with SMS transport

DHIS2 can also be used with an earlier J2ME-client that uses SMS as a transport. This client requires some manual configuration on the server side, and is not supported by the standard build of DHIS2. The client is a custom built J2ME mobile application. The SMS-support is separate from the SMS support used in other parts of DHIS2. The solution has mainly been deployed using GSM modems, which are not good for high-volume applications, but can also be used as a basis for a more reliable SMSC-connection. Using SMS as a transport would be an appropriate solution where GPRS/3G is not available, but GSM coverage is available. Updating of forms to the client is not supported at this point in time, and new data sets require a new application install. This solution is described in [Sección 20.4, "Legacy J2ME client with SMS transport"](#)

The DHIS-mobile team is working on a hybrid GPRS and SMS solution that is based on the newer J2ME-client and the new SMS-support within the platform.

- SMS connection

When deploying SMS solutions, the quality and stability of the SMS link is critical for the overall service quality. For small demos and tests, one can use phone modems to send and receive SMS, but our experience is that for any larger installation, one should connect to the mobile operator SMS infrastructure (SMSC) via more robust interfaces. We can either connect directly to the mobile operator SMSC (typically through a protocol called SMPP but sometimes using HTTP or other protocols) or via a service provider called an SMS gateway provider.

When connecting directly to the operator, for receiving SMS, one has to connect to all the operators whose subscribers should be able to send us messages. The typical scenario is that the operator assigns a short number (4 or 5 digits) to our service, and forward the messages sent to this number to our/your server. The best is to have all operators assign the same number, but this isn't necessarily automatic.

If connecting via an SMS gateway company, they connect to all operators for us and typically put some additional charge on the message price. Since there is a cost per number and per operator, this may sometimes still be price efficient. SMS gateway providers typically connect via HTTP or SMPP.

The simplest and cheapest would be if you already have some SMS connection greement that we could leverage. I would be useful to get this interface up and running as soon as possible, as this really might be the most complex integration point (though in principle it really is quite simple to do when everything runs smoothly). If you do not yet have such an agreement, we can help you in the process.

Note that some operators offer long numbers as a service in addition to short numbers. Then you get what looks like a real mobile number, and it can be accessed by all other operators' customers also. This is often a very simple way of offering SMS as you do not need to connect to all operators. But not many operators offer this.

It is quite relevant for the deployment if the users have subscriptions from a single operator or if many operators are used. One operator is simpler.

20.2. Mobile browser based data entry

20.2.1. Getting started with mobile browser data entry

This approach is for data-entry on a smart phone with a mobile browser by navigating to the URL of the DHIS2 instance, for example: the full URL link for demo on [dhis2.org http://apps.dhis2.org/dev/mobile/index.action](http://apps.dhis2.org/dev/mobile/index.action) . And your mobile browser will automatically detect the DHIS2 application where the server URL is given (e.g: <http://apps.dhis2.org/dev>). Here is the login form to access the application with user-name and password. Click on "Login" to continue or "Reset" to reset:

After logging in, there are the list of functions:

- **Aggregate Reporting:** Entries for aggregate data with defined/assigned dataset by organisation-units
- **Tracking:**
 - Find Person: find person based on Name, Phone Number or ID, and Organization unit.
 - Activity Plan: Entries data for the persons by organisation-units, persons and programs/program-stages
 - Person Registration: Registry a new person
 - Anonymous: Entries for anonymous person based on programs
- **Messages:** Manage the messages and discussions from the server. Message reply is available. User can send feedback message in Messages.

- **Reports:** The output reports from the server.
- **Settings:** User-information (e.g: First-name, Surname, Phone number, E-mail) and the Interface language.
- **Logout:** to log out the application.
- **Desktop version:** navigate to the desktop version of DHIS2 for administration. This require a lot of resources from the client mobile, for example: the sufficient memory to load the pages. Not recommended for the normal GPRS/3G/... phones.

The list above will be explained in details:

1. **Aggregate Reporting:** Entries for aggregate data with defined/assigned dataset by organisation-units.

Click on the "Aggregate Reporting", then choose an Organisation Unit from the list and the list of the datasets will be appeared for entering aggregate data. See the below example:

Step 1: Select an Organisation Unit from the list

Step 2: Select a Dataset (entry form) from the list

Step 3: Select a period (based on the period type of the chosen dataset) from the list

Step 4: Entering the data

Step 5: Save the data entered after completing the data, choose the option for data completeness if having.

2. **Tracking: Find/Add Person, Visit Schedule, Person Registration, Anonymous**

2.1 **Find/Add Person** : find person based on Name, Phone Number or ID, and Organization unit.

- Step 1: insert Name, Phone Number or ID and select the Organization Unit, then click Search.
- Step 2: select a person

Then all the information of that person will be displayed

- Step 3: choose the next program stage for entering the data

To view all the program stages, click on the name of that program (Child Heath Program as the screen shot)

2.2: **Visit Schedule:** Choose An Organization Unit

- Current Activity Plan: the list of the beneficiaries registered, enrolled, not yet finish/complete a/many program and there is at least a program-stage open for data-entry.

+ *Step 1: Choose a Person for entry*

+ *Step 2: Choose a current and active program-stage for entering the data*

You can also see the person's information (ID, gender, Date of Birth, and Blood Group) by clicking on the Details (on top of the list appeared)

The details information of the chosen person:

- All Activity Plan: the list of all beneficiaries registered, enrolled, not yet finish/complete a/many program.
- Single Event:

2.3: **Person Registration:** Registry a new Person

- Step 1: Entry personal information
- Step 2: Enroll program for the person just been registered, then click "Enroll".
- Step 3: Entry required information for the chosen program, then click "Enroll"

Here is the result:

2.4: **Anonymous:** Entries for anonymous person based on specific programs

3. **Messages:** Manage the messages and discussions from the server. Message reply is available.

The number showed is the unread messages. Click on that to view the list of the messages (the unread messages are in bold and dark blue color):

Then you can pick up the message/topic for the discussions by leaving the reply message, see this example:

User can create and send a feedback to server in messages section. After sending out the new feedback, the message (feedback) will be listed under "Messages" for further following up.

(will be updated)

5. **Settings:** User-information (e.g: First-name, Surname, Phone number, E-mail) and the Interface language.

Here is the form for setting the user account/access and the interface language. Click on "SAVE" for completing the settings, see the example below:

6. **Logout:** to log out the application

7. **Desktop version:** navigate to the desktop version of DHIS2 for administration.

Here is the GUI of the desktop version (which require much memory for loading), not recommended for normal mobile. The example with DHIS2 Demo (from dhis2.org)

1.

After clicking on the "Namebased Data Entry", the next will guiding to the selections in the following steps:

Step 1: Choose an Organisation Unit

Step 2: Choose the Activity Type

(the screen-shot with an example with "Current Activity Plan" option)

There will be normally these two type of Activity:

+ "Current Activity Plan": the list of the beneficiaries registered, enrolled, not yet finish/complete a/many program and there is at least a program-stage open for data-entry.

+ "All Activity Plan": the list of all beneficiaries registered, enrolled, not yet finish/complete a/many program.

Step 3: Choose a Beneficiary for entry

(the screen-shot with an example with "Hybia Welde" option)

Step 4: Choose a current and active program-stage for entering the data

(the screen-shot with an example with "16-24 months after birth" option)

You can also see the beneficiary's information (ID, gender, Date of Birth, and Blood Group) by clicking on the Details (on top of the list appeared)

2. **Beneficiary Registration:** Registry a new beneficiary

Step 1: Choose an OrganisationUnit

Step 2: Fill in the Beneficiary Registration form

There necessary information: Full Name, Gender, Date of Birth (and Blood Group).

Click on "SAVE" to register a new beneficiary.

A message "Successfully Saved" will appear when the beneficiary is created/registered successfully.

3. **Beneficiary Enrollment:** Enroll a beneficiary to one or many programs

Before enrolling a beneficiary to a program, the search function for a beneficiary is provided:

If the beneficiary is found, the result will be listed. The simply click on the beneficiary name for navigating to the programs in which the beneficiary enrolled:

The below screen-shot example describes the beneficiary named "Nguyen Van A":

- Has not enrolled any programs before
- There is one program: "Child Health Program" available for enrollment

The list of the available programs for enrollment will be listed. Just click on the program for enrollment by specifying the date of enrollment and the date of incident. See the example:

After clicking on the "ENROLL" button, if successful, the program enrolled will be listed under "Enrolled Programs for" + <Name of the beneficiary>, see the example:

4. **Messages:** Manage the messages and discussions from the server. Message reply is available.

The number showed is the unread messages. Click on that to view the list of the messages (the unread messages are in bold and dark blue color):

Then you can pick up the message/topic for the discussions by leaving the reply message, see this example:

5. **Reports:** The output reports from the server

(will be updated)

6. **Settings:** User-information (e.g: First-name, Surname, Phone number, E-mail) and the Interface language.

Here is the form for setting the user account/access and the interface language. Click on "SAVE" for completing the settings, see the example below:

7. **Feedback:** the extra function for creating a new message to send to the server. The new created feedback from this will be listed under "**Messages**"

After clicking on the "Feedback", there will be a form for editing/sending out a new message/discussion. See the example below:

After sending out the new feedback, the message (feedback) will be listed under "Messages" for further following up.

8. **Logout:** to log out the application

9. **Desktop version:** navigate to the desktop version of DHIS2 for administration.

Here is the GUI of the desktop version (which require much memory for loading), not recommended for normal mobile. The example with DHIS2 Demo (from dhis2.org)

20.3. J2ME GPRS/3G Client

The DHIS2 GPRS/3G mobile module provides a mechanism for remote clients using mobile phones to enter data directly into the DHIS2 system. There are two functions of the client, namely:

The solution relies on the mobile phone having a data connection available (i.e. GPRS, Edge, 3G), over which it communicates with a DHIS2 instance which must be publicly available on the internet, as any other web server. The client application on the phone downloads the data entry forms to the phone from the server, and the forms can therefore be updated without installing a new application. This is also a crucial feature for community reporting, which relies on regularly downloading activity plans from the server.

- Facility reporting, for data entry and reporting of regular DHIS2 aggregate data,
- Activity reporting, for supporting individual activity reporting with the Community module.

20.3.1. Data connection availability

Data connection availability can be a problem in many of the contexts where DHIS2 mobile reporting would otherwise be a good solution for getting data directly into DHIS2. If that is the case for you, you might want to consider trying the SMS based solution described in a separate document. Keep in mind that even though a data connection is currently

required for communication between the server and the mobile phone, it is only required when initializing or updating the mobile application and when sending reports to the server. The phone stores all entered data locally, so it can work fine with only temporary access to a data connection on a regular basis.

20.3.2. J2ME GPRS 3G facility reporting client

The server side component of the web based solution is included in the general build of DHIS2.

In order to configure the DHIS2 web-based mobile reporting, you should follow the following steps.

- Set the "Available for Mobile Reporting" flag for the data sets you want reported: Under *Maintenance->DataSet->Edit* mark the "Available for Mobile Reporting" check box and save.
- Create a user role for the mobile user. Select *Maintenance->Users->User Role->Add new*. Add a user role name and description. Add the desired data sets for the role. The mobile user role will need to have at least privileges for DHIS Web API. Save the user role by clicking "Save".
- Create a user which will be used by the client to login from *Maintenance->Users->User ->Add new*. Fill in all of the required details, keeping in mind that the password must be at least 8 digits long, contain one capital letter, and one digit. Assign the desired user role to the user which was created in the previous step.



Importante

Assign the user to exactly **one** organisation unit. Each mobile reporting client will need their own user name and password.

20.3.3. J2ME GPRS 3G program reporting client

Like facility reporting module, sever side of activity reporting included in DHIS2 war file.

Basically, server side setup for activity does not require any additional step. The mobile application use the same user name and password as the web-based application. Make sure that the user is assigned to the correct organization unit.

In short, if a user is able to enter data for activity reporting in DHIS2 web-based application, he/she is able to download and enter data in mobile application.

20.3.4. Detailed configuration of data sets and reporting forms

Though the previous steps is all that should be needed for testing the solution more detail configuration of the datasets may be required and are described in the following sections.

20.3.4.1. The mapping of data sets to form layout on the phone

By default, a data set is mapped to a single form on the phone. If the data set is divided into sections, each section is displayed as a separate page on the phone. If a data element has more than one category option combo it will be displayed as a heading with the category combination options following.

Tabla 20.1.

Form design element	DHIS2 Metadata	Metadata element
Form title	Data set	Short Name if it exists, otherwise Namw
Page tile	Section	Section name (or form name if no sections)
Question	Data element	Alternative name if it exists, otherwise Name
Question name if combos	Category option combo	name

20.3.4.2. Sorting of forms

By default, data elements will be sorted according to the global sorting assigned in DHIS2. If sections are used, their section specific sorting order will be used. In some cases, when sections are not used, a data element might be used in multiple data sets, and conflict in the way it should be sorted in individual data sets. A work around for this situation is to wrap the whole dataset in one section (note that this will only work if the data elements have the same category option combo)

20.3.4.3. Versioning of data sets

To make it possible to compare and update the data sets on the mobile phone with the version on the server, data sets are automatically versioned when you edit the data set structure. Some changes which occur on the DHIS2 server, will cause the mobile client to update its forms with a new version.

Changes that currently trigger a new data set version

- Create DataSet
- Edit DataSet
- Create/edit/delete Section in DataSet
- Sort Section Order
- Update DataElement (affect many related DataSets)
- Delete DataElement (affect many related DataSets)
- Edit DataElement Category
- Edit DataElement Category Combo

20.3.4.4. Language support

Multi-language support is available.

DataSet and DataElement are translated through web-based function. Default language on server is used on mobile in cases requested language from mobile is not available.

20.3.5. Mobile application setup

20.3.5.1. Installation and initialization

20.3.5.1.1. Installation

Download the jar packages from the DHIS 2 homepage: dhis2.org

The URL download for each packages:

+ [Facility reporting](#)

+ [Program Tracking](#)

20.3.5.1.2. Initialization

Initialization should be performed before the phones are delivered end-users. Given the large variation in possible phone configurations, it is impossible to describe the exact steps which are required in order to enable the client on the phone. However, for most phones, simply copying the DHIS Web Mobile client "JAR" file to the phone with a USB cable or via Bluetooth is sufficient. Of course, GPRS/3G connectivity must be enabled. Contact your mobile service provider for exact details on the configuration of the phones and networks.

Once the client has been installed on the phone, an initialization process must occur by providing a user name, password and server URL.

1. Logging into the server for the first time.

The first time the client logs to the server, or if the client is reinitialized, the username, password and server URL must be entered.

If the client is unable to login, there could be several possible error messages which you see.

- Connection Not Found: The specified server URL is not correct. Check the server address, ensure that the server is actually reachable, and try again.
 - Invalid User Name Or Password: the username or password is incorrect
 - Application not authorized to access restricted APIe : The server can be contacted, but the user does not have the necessary permissions to access the mobile reporting module
2. Setting the PIN number: After the initial login process, a PIN number can be entered by the user. This will make the login process much easier, as the user only has to remember the four digit pin number, as opposed to typing in the user name and password each time. The PIN number can be preset if the phone is initialized prior to delivery, or it can be set by the users themselves if they have been provided with usernames and passwords.

After entering the PIN, press (Menu)->Next.

3. Download all forms: After the PIN has been specified, all forms will be downloaded from the server and stored locally on the phone..

If the user has been configured to report on aggregate datasets, a list of appropriate datasets will be displayed. If the user is responsible for community based reporting, the list of assigned activities is displayed.

Notes: If the Health Worker is responsible for both Facility Reporting and Community Reporting, DHIS server will send all forms of both Facility Reporting and Community Reporting to mobile and on mobile, there will be a screen to choose whether displaying Facility Reporting or Community Reporting.

Errors:

20.3.5.2. Logging in (for regular use)

After starting the application, the PIN form is displayed.

- PIN: Enter the four digit number PIN.
- Reinitialize Command: this function will clear all data on mobile and we start from the login screen with username and password.
- Errors: Invalid PIN: If the user has entered an invalid PIN, they will need to enter the correct PIN, or reinitialize the application with the correct username and password.

20.3.5.3. Facility Reporting Module

20.3.5.3.1. Entering data

After selecting an aggregate dataset from the "Select report form" window, the user will need to select an appropriate time period. A list of available time periods is automatically generated.

1. After the user has entered their PIN, they can select from a list of available datasets. Select the appropriate dataset and press "Next".
2. Choosing periods: A list of available periods will be automatically displayed to the user. They can select the appropriate period from the list.
3. Fill in values: After choosing the period, the form can be displayed in two modes, depending on the
 - Form with sections

Each form section is displayed in a single screen with the name of the section in the title window.

To navigate from screen to screen, push "Next".

- Forms without section (Datasets without sections)

All fields are displayed on one screen with the title that is the name of DataSet

The user simply fills in each data element with the appropriate value.

4. Save and Complete:

After finishing data entry, the user can choose to save the data locally on the phone or to upload the data directly to the DHIS2 server.

If the user saves the data form, they can edit the form at a later point in time if they need to. When selecting a period once again, the period will be marked as "Saved" as seen in the next screen shot.

If the user selects "Complete", and the data entry form is not complete, the user will be asked if they are certain they wish to submit the form as incomplete. Once the form has been submitted, a message should be displayed informing the user that the transmission was successful.

20.3.5.3.2. Notes

1. Period list:

Periods marked with an asterisk (*) is the period that is completed or saved, depending on the status of the data entry.

All periods that are not in period list are considered old and will be deleted automatically.

2. Storing values duration

The number of saved forms on mobile are limited only by the effective amount of storage of the mobile device.

Forms are saved for limited period only, depending on the frequency of collection of the particular dataset.

- Daily Forms: 2 months (current and previous month)
- Weekly Forms: 4 weeks (current and 3 previous week)
- Monthly Forms: 2 months (current and previous month)
- Quarterly Forms: 2 quarters (current and previous quarter)
- Yearly Forms: 2 years (current and previous year)

3. Completed forms - Uneditable forms

If the form has been completed, the user can view the form on their phone, but they cannot make any subsequent edits to the form. Each field is greyed out and inactive for editing.

4. Re-Edit completed forms

If the user wishes to edit data which has already been submitted to the server, they can do so by pressing the "Edit" button. They are allowed to do this assuming that the dataset has not been locked for the period in question. If they attempt to upload the data, the user will be informed that the dataset has been locked, and it is not possible to upload the data.

5. Update Forms:

This function is used to synchronize the forms on mobile and on server. The process is automatically triggered after entering PIN number.

Note: Checking and downloading updated forms process run in background. After finished, prompt is displayed to ask user whether refresh form list or stay where they are.

6. Multi-Language Support:

This function help user to choose language of mobile's GUI (graphical user interface) and content's language (Forms).

The forms must be translated on server, otherwise, default language is used.

Default language of first login is English. Change language in Setting menu will affect both interface and content.

Multi-Language Interface: In Setting menu, there are list of supported language (downloaded from server). Language of GUI is only changed after restart application.

Multi-Language Content (forms): Form's language is change after click "Save". In case there are many forms, it take several minutes to save setting.

20.3.5.3.3. Troubleshooting

- Data has been entered on the phone but does not appear on the server

This usually occurs when users enter data on the phone, but cannot send it to the server. This may be because of the configuration of the phone, lack of credit on the phone, or lack of coverage. Usually an error message is displayed as shown below.

Users should be informed that if they see this error, then it means that their data has not been transmitted.

20.3.5.4. Community Reporting

The community based reporting function works in a similar manner as the aggregate reporting function, but patient based data elements.

20.3.5.4.1. Regular Use

1. Activity Main Menu

- Current Activity Plan: Contain all new activities that need to be completed.
- Sent Activity Plan: Contain all the activities that have been completed and sent to server. This list is for review only.

2. Choose Village or Location

From Activity main menu, select "Current Activity Plan". You will be navigated to "Grampanchayat Name" screen where you can select the village. Use the "Up" or "Down" button on your mobile phone to focus on a village. Use "Select" button to select a village.

3. Choose Beneficiary

In a village, beneficiary name will be display in a list. User can use the "Select" button to view the activities of the selected name.

4. Choose Activity

Each Activity is represented by the name of the Beneficiary. Select the name of the beneficiary you want to view. Note that the name start with “*” means that this is a late Activity.

5. Beneficiary Detail

Select the "Detail" command on the left of the activity screen , a Beneficiary Detail screen will be displayed. The detail screen may contain personal information and some additional information of the Beneficiary (depends on the setting from server). Select “OK” to go back to activity screen.

6. Fill in values (Entry screen)

On the top of the screen is the name of the Program Stage. Below is the form, a form include many fields for user to input data. Focus on a field by press the “Up” or “Down” button on your mobile phone. After the field is focused, you can start entering data. Press the “Up” or “Down” button to go to the next field. At the bottom is the menu with "Save", "Complete" and "Back" command.

*Notes:

- For the field with Yes/No value: press the select button on a focused field to open the popup menu then you can select “Yes”, “No” or “Select Option”. Select “Select Option” means that you have no data for that field.
- For the field with pre-suggested values: press the select button to open the popup menu then you can choose one of the options. Select “Select Option” means that you have no data for that field..
- For date-type value:
 - If server Date is available, application will take server Date as default value.
 - If server Date is not available, date filed will be leave blank for user to input manually.

7. Saving/Completing.

After finish step [4], you can choose either “Save” or “Complete” to finish your work.

- **Save:** you may want to use this option if you have not finished your work yet and you want to store the data to continue later.
 - Select “Menu” or “Option” at the bottom of your screen (The name “Menu” or “Option” depend on your mobile phone) and then select “Save”. A success message (“Form Saved”) will be display. Select “Done” or “Dismiss” to go back to Entry Screen.
 - Your data will not be sent to server. It is stored in the Record Store of your mobile phone. To see the data again. Go back to step [2] and select the name of the Beneficiary that you have just entered data. Repeat step [3] and [4]. If you feel that you are ready to send data to server. Select “Complete”.
- **Complete:** you may use this option when you fill the entire field on the form and make sure that your data is correct.
 - Select “Menu” or “Option” at the bottom of your screen (The name “Menu” or “Option” depend on your mobile phone) and then select “Complete”.
 - If you did not fill all the field in the form, a warning message will be display “x fields is not filled. Do you want to complete anyway?” With x is the number of empty field(s). Select “Yes” if you want to send data to server, select “No”, if you do not want to send and go back to Entry screen again.

- After select “Yes”, a security message will appear and inform that the application will connect to server. Select “Yes” to give the permission for the application to do so.
- User will receive a success message: “Activity uploaded successfully”.
- A finished activity (activity that is completed and data is send to server) will be move to "Completed Activity" and it will be display as "Uneditable Form". User can go to "Completed Activity" at "Activity Main Menu" to review.

8. Sent Activities

From "Activity Main Menu" screen, select "Sent Activities" to go to the list of all activities you sent to server. The structure of this screen is exactly the same as "Activity Plan List". Select "Detail" to see the detail of the activity or select "Select" to go to the "Uneditable Screen".

In this screen, user can only review the form they sent to server. No edit or change is allowed. Select "Back" to go back to "Sent Activities" screen.

20.3.5.4.2. Updating Activity Plan and Program Form

After some days, weeks or months, new Activities may automatically generated from server, some Program Stage Data Element may be removed from original form. In order to update these new changes, we have a "Automatic Update Activity Plan and Program" function.

1. This function is completely automatic. After user start the application and enter PIN, a requested to be sent to server to update new data.
2. While this function perform, the "Current Activity Plan" is temporarily blocked and it will be open again as soon as the updating process complete.
3. This function update both "Activity Plan" and "Program Form".

“Update Completed” message will appear on the screen after the update process finish. Select “Dismiss” to close this window and go back to Activity Main Menu. Your Current Activity Plan is now updated.

4. When a data element removed due to the changing of form structure, all data value that related to that data element will be hiding also. You are no longer seeing the value in the form.

20.4. Legacy J2ME client with SMS transport

With the J2ME client with SMS transport solution, the forms filled in on the phone is sent using SMS messages to a central server. The SMS message is decrypted and converted, and then imported into the DHIS2 database.

By default, DHIS2 does not ship with the DHIS SMS Mobile web module. You will need to build in these modules yourself. You also need to modify the client side application with your own data elements.

20.4.1. Build DHIS2 with the dhis-web-mobile module

- Download the latest source code from launchpad, i.e. the DHIS2 trunk source code from <https://code.launchpad.net/~dhis2-devs-core/dhis2/trunk>
- Build DHIS2 as normal, by running `mvn clean install` (to skip tests, use `mvn clean install -Dtest=false -DfailIfNoTests=false`) in the `dhis-2` and `dhis-2\dhis-web` folders.
- Build the mobile modules by running `mvn clean install` in the `dhis-mobile` folder.

- Modify the dhis-web-portal\pom.xml file, adding a dependency to dhis-web-mobile:

```
<dependency>
  <groupId>org.hisp.dhis</groupId>
  <artifactId>dhis-web-mobile</artifactId>
  <version>${version}</version>
  <type>war</type>
</dependency>
```

- Build the portal (mvn clean install in the dhis-web-portal folder)
- Copy the dhis.war file from dhis-web-portal\target to the tomcat\webapps folder. Rename it if you want.

20.4.2. Install the GSM modem

- Driver for the GSM modem

Plug in your modem and install the drivers. You might have to use the manufacturer's provided drivers from a CD or their web page. *You might need administrator privileges to do this. If you still can't do it, try starting Windows in Safe Mode.*

- comm.jar

Copy it to your java\jreX\lib\ext folder. If you've got multiple installations of JRE, you can find the path to the installation used by DHIS 2 by right clicking the Monitor Tomcat icon in the system tray, then Configure -> Java.

- javax.comm.properties

Copy it to your java\jreX\lib folder.

- win32com.dll

Copy it to your java\jreX\bin folder.

Note: You might need administrator privileges to do this. If you still can't do it, try starting Windows in Safe Mode.

- SMSserver.conf

Copy it to your DHIS2_HOME folder (the folder where hibernate.properties is located). The settings in this file can also be modified from the Settings page in the mobile module in DHIS 2.

In this file the manufacturer and the model of the GSM modem are specified. Also, make sure the PIN code for the SIM card in the GSM modem is turned off, and set modem1.pin=0000 in the SMSserver.conf, or use the Settings page in the mobile module in DHIS 2 to set the pin to 0000.

The port of the modem also needs to be specified in this file. After the drivers are successfully installed and the modem is installed in a usb port, you can find the port of the modem by opening Device Manager, locate your modem and right click on it, click on Properties and navigate to the Modem tab. There you'll see which port is assigned to the modem.

Important: Note that if you install the modem into another usb port another time, the port will change, and you will have to update the settings. If you for some reason need to take the modem out of your computer, make sure you'll install it in the same usb port as last time, or else you'll have to update the SMSserver.conf file.

- formIDLayout.csv

Copy it to your DHIS2_HOME\mi folder. If you have not yet deployed your latest build of DHIS2, you'll have to create the mi folder manually.

This file specifies which data elements are to be imported. There's one line for each different mobile application in use. The lines start with a mobile application's id, then followed by comma separated data element ids and their categoryoptioncombo ids. The lines will be on the form

```
1 = <data element id>.<categoryoptioncombo id>,
```

```
<data element id>.<categoryoptioncombo id>, ... ,
<data element id>.<categoryoptioncombo id>
```

E.g.

```
1 = 652.207, 652,208, 20485.271, 20485.272, 683.14
```

Note: If the same mobile application is installed on several phones, the id for each application is the same! The formIDLayout.csv file should thus only have one line, starting with 1 = .

20.4.3. Register users

The phone numbers of the cell phones used for reporting with the mobile application needs to be registered in DHIS 2 in order for the data to be imported and stored in the database. A phone number has to be registered for a user, and the user can *only* be associated with *one organisation unit*!

The phone number must include the regular phone number as well as the country code without + or 00 . E.g. for a Norwegian number, having the country code 47 and phone number 98765432 , the phone number to store is 4798765432 .

20.4.4. Install the mobile application on a phone

If you've got a phone and a computer with Bluetooth, you will in the most cases be able to send the .jar file (the mobile application) via Bluetooth from the computer to the phone. When using a cable, and also in some cases for phones with Bluetooth, you might have to install some software to be able to communicate with the phone. E.g. Nokia PC Suite for Nokia phones.

Once the mobile application is installed on the phone, open it and navigate to the last page in the application. Select settings, and enter the number of the SIM card in the GSM modem. This works both with and without country code.

If there are several GSM modems installed on several computers running DHIS 2 and you want to report to all of these, you can enter the numbers of the SIM cards installed in these GSM modems as well in the remaining fields in your mobile application. When clicking send, the application will now send the registered data to all the registered numbers at the same time.

20.4.5. Using the system

Navigate to the Mobile module via Services -> Mobiles

20.4.5.1. Start the SMS Service

From the start-page DHIS2, go to Maintenance >> Mobile Configuration:

Then choosing the "SMS Service Configuration":

The SMS Service Configuration main-page with descriptions:

(The above screen-shot example with no gateway in the Gateways list)

If having no gateway registered, clicking on the "Reload Configuration" or "Start SMS Service" will have no use and a warning message appeared, see this screen-shot example:

Add or Update Gateway:

Currently, there are 4 gateway types:

Then fill in the information for the gateway (the screen-shot example with BulkSMS Gateway):

(The information for the gateway is from the Gateway providers)

After adding successfully the gateway, the service will automatically started.

20.4.5.2. Sending SMS

From the start-page DHIS2, go to Maintenance >> Mobile Configuration. Then navigate to "Show send SMS form":

At this moment (DHIS version 2.8), this is the one-way sending out the SMS messages from the servers to the recipients (with mobile phone numbers).

See the below example form to send out the messages to the recipients' numbers individuals or mobile number of registered Organisation Unit or by mobile number of the users assigned with Organisation Unit.

Below is an example screen-shot with listing of phone numbers (using ";" between the numbers in the list):

20.4.5.3. Receive Data and Import

To receive and import data, the SMS Service needs to be started.

20.4.5.3.1. Automated import of messages

When SMSs are sent from the phones while the SMS Service is running, the messages will be processed automatically, and the data will automatically be imported and stored in the database.

20.4.5.3.2. Import pending messages

If SMSs are sent from the phones to the SIM card in the GSM modem while the SMS Service is inactive, the messages will be stored as xml files in the folder `DHIS2_HOME\mi\pending` short time after the service is started. On the Receive Data and Import page it will say how many SMSs are pending. These can be imported by pressing the "Import All Pending" button.

Capítulo 21. Data dimensions in DHIS2

21.1. The core building blocks describing the data

A data value in DHIS2 (core module for aggregated data) is at minimum described by three dimensions, 1) data element, 2) organisation unit, and 3) period, which also forms the core building blocks of the data model. E.g. if you want to know how many children that were immunised for measles in Gerehun CHC in December 2009, the three dimensions to that value are the Data Element "Measles doses given", the Organisation Unit "Gerehun CHC", and the Period "Dec-09". All data values have at least these three dimensions describing What, Where and When.

Tabla 21.1.

Organisation Unit	Data Element	Period	Value
Gerehun CHC	Measles doses given	Dec-09	22
Tugbebu CHP	Measles doses given	Dec-09	18

21.2. The data element dimension

21.2.1. Data element categories

The data element above called "Measles doses given", although capturing the core essence of what the data is can be further elaborated and disaggregated into what is called data element categories. The system administrators of DHIS are free to define any data element category dimensions to data elements using the user interface for this in the data element maintenance section, but here are some examples of possible categories to use.

Given the example of Measles vaccination, if you want to know whether these vaccines were given at the facility (fixed) or out in the community as part of the outreach services then you could add a dimension called e.g. "Place of service" with the two possible options "Fixed" and "Outreach". Then all data collected on measles immunisation would have to be disaggregated along these two options. In addition to this you might be interested in knowing how many of these children who were under 1 year or above 1 year of age. If so you can add an Age dimension to the data element with the two possible options "<1 y" and ">1 y". This implies further detail on the data collection process. You can also apply both categories Place of service and Age and combine these into a data element category combination e.g. called "EPI disaggregation" and thereby you would be able to look at 4 different more detailed values instead of only 1 as in the example above for the data element "Measles doses given": 1) Fixed and <1 y, 2) Fixed and >1 y, 3) Outreach and <1 y, and 4) Outreach and >1 y. This adds complexity to how data is collected by the health facilities, but at the same time opens up for new possibilities of detailed data analysis of Measles immunisation.

Tabla 21.2. Example of detailed storage of data values when using data element categories "Place of Service" and "Age" (simplified for readability compared to the actual database table)

Organisation Unit	Data Element	Place of service	Age	Period	Value
Gerehun CHC	Measles doses given	Fixed	<1 y	Dec-09	12
Gerehun CHC	Measles doses given	Outreach	<1 y	Dec-09	4
Gerehun CHC	Measles doses given	Fixed	>1 y	Dec-09	4
Gerehun CHC	Measles doses given	Outreach	>1 y	Dec-09	2

Organisation Unit	Data Element	Place of service	Age	Period	Value
Tugbebu CHP	Measles doses given	Fixed	<1 y	Dec-09	10
Tugbebu CHP	Measles doses given	Outreach	<1 y	Dec-09	4
Tugbebu CHP	Measles doses given	Fixed	>1 y	Dec-09	3
Tugbebu CHP	Measles doses given	Outreach	>1 y	Dec-09	1

21.2.2. Data element group sets

While the data element categories and their options described above dictated the level of detail (disaggregation) at the point of data collection and how data values get stored in the database, the data element group sets and groups can be used to add more information to data elements after data collection. E.g. if looking at a lot of data elements at the same time in a report you would want to group these based on some criteria, e.g. if looking at all the data captured in a form for immunisation and nutrition you might want to separate or group data elements along a programme dimension (called group set) where "Immunisation" (or EPI) and "Nutrition" would be the two groups. Expanding the report to include data from other programs or larger themes of health data would mean more groups to such a group set dimension, like "Malaria", "Reproductive Health", "Stocks". For this example you would create a data element group set called "Programme" (or whatever name you find appropriate), and to represent the different programmes in this dimension you would define data elements groups called "EPI", "Nutrition", "Malaria", "Reproductive health" and so on, and add all these groups to the "Programme" group set. To link or tag the data element "Measles doses given" to such a dimension you must (in our example) add it to the "EPI" group. Which groups you add "Measles doses given" to does not affect how health facilities collect the data, but adds more possibilities to your data analysis. So for the group set dimensions there are three levels; the group set (e.g. "Programme"), the group (e.g. "EPI"), and the data element (e.g. "Measles doses given").

Indicators can be grouped into indicator groups and further into indicator group sets (dimensions) in exactly the same way as data elements.

Tabla 21.3.

Organisation Unit	Data Element	Programme	Period	Value
Gerehun CHC	Measles doses given	EPI	Dec-09	22
Gerehun CHC	Vitamin A given	Nutrition	Dec-09	16
Tugbebu CHP	Measles doses given	EPI	Dec-09	18
Tugbebu CHP	Vitamin A given	Nutrition	Dec-09	12
Gerehun CHC	Malaria new cases	Malaria	Dec-09	32
Tugbebu CHP	Malaria new cases	Malaria	Dec-09	23

21.3. The organisation unit dimension

Organisation units in DHIS2 can be either any type of health facility like Community Health Centres or referral hospitals, or an administrative unit like "MoHS Sierra Leone", "Bo District" or "Baoma Chiefdom". Orgunits are represented in a default hierarchy following the health system at large, and are therefore assigned an organisational level. E.g. Sierra Leone has 4 levels; National, District, Chiefdom, and PHU, and all orgunits are linked to one of these levels. An orgunit hierarchy in DHIS can have any number of levels. Normally data is collected at the lowest level, at the PHUs, and then data values are linked to individual PHUs. When designing reports at higher levels with data aggregated by chiefdom or district, the DHIS will use the hierarchy structure to sum up all the health facilities' data for any given unit at any level. The orgunit level capturing the data always represents the lowest level of detail

that is possible to use in data analysis, and the organisational levels define the available levels of aggregation along a geographical dimension.

21.3.1. Organisation unit group sets and groups

While PHU is the lowest geographical level for disaggregation in DHIS2 there are ways to flexibly group organisation units into any number of dimensions by using the group sets and groups functionality. E.g. if all PHUs are given an official type like CHC, CHP, MCHP etc. it is possible to create an orgunit group set called "Orgunit type" and add groups with the names of the types mentioned above. Then you can link your orgunits to their corresponding groups (orgunit types). Other common orgunit dimensions are Rural/Urban (Rural, Urban, Peri-urban), and Ownership (Public, Private, NGO etc.). When analysing data from the PHU level it then becomes possible to aggregate data by these dimensions, e.g. look at Measles immunisation in BO district by the type of PHU instead of the PHUs themselves.

21.3.1.1. Alternative orgunit hierarchies - advanced use of group sets and groups

A more advanced use of orgunit group sets and groups is to create alternative hierarchies e.g. use administrative borders from other ministries. In Sierra Leone that could mean an alternative hierarchy of 1:MoHS, 2:Districts, and 3: Local councils, instead of the 4 level hierarchy with chiefdoms and PHUs. E.g. if all PHUs were linked to a specific local council it would be possible to look at data aggregated by local council instead of chiefdom. Then you would first need to create a group set called "Local council" and then create one orgunit group for every local council, and finally link all PHUs to their corresponding local council group.

Table 21.4.

District	OrgUnit Type	Data Element	Period	Value
Bo	CHC	Measles doses given	Dec-09	121
Bo	CHP	Measles doses given	Dec-09	98
Bo	MCHP	Measles doses given	Dec-09	87
Bombali	CHC	Measles doses given	Dec-09	110
Bombali	CHP	Measles doses given	Dec-09	67
Bombali	MCHP	Measles doses given	Dec-09	59

21.3.2. Best practice on the use of group sets and groups

Groups that are not members of group sets are more or less useless for analysis (should we allow this at all?). With all the groups you get by e.g. including all different diagnoses as groups the full list of groups does not make sense in any pivot table, and you easily get duplicates in your pivot tables since data elements or indicators are members of multiple groups. This can be controlled by the use of group sets. So the recommendation is to assign all your groups to a group set, and then you pull the group sets you need into your reports and analysis.

It is also recommended to have one group set that is used for the major organising of all data in e.g. a pivot table, e.g. use health programs or other larger themes for data elements or indicators that together cover all the data. That will provide a nicely organised overview of all your raw data or indicator data.

The resource table gives all groupsets as columns with groups as rows, and 1 DE per row. This means that all groupsets are joined in when e.g. creating a view to a pivot table. Resource tables have to be generated from the Maintenance->Data Administration->Resource Table window, and more information on this is available in a later chapter called Data Administration in DHIS2 or from the inline help text in that window.

21.4. The time (period) dimension

The period dimension becomes an important factor when analysing data over time e.g. when looking at cumulative data, when creating quarterly or annual aggregated reports, or when doing analysis that combines data with different characteristics like monthly routine data, annual census/population data or six-monthly staff data.

21.4.1. Period Types

In DHIS2 the periods are organised according to a set of fixed period types: 1) Daily, 2) Weekly, 3) Monthly, 4) Quarterly, 5) Six-monthly, 6) Yearly, 7) Two-yearly, and 8) a special period type called Relative.

As a rule of thumb all organisation units should collect the same data using the same frequency or periodicity, so first of all the periods play an important role in standardising data collection across the country. A data entry form therefore needs to know its period type to make sure data is always collected according to the correct and same periodicity across the country.

It is possible however to collect the same data elements using different period types by assigning the same data elements to multiple data sets with different period types, however then it becomes crucial to make sure no orgunit is collecting data using both data sets/period types as that would create overlap and duplication of data values. If set up correctly the aggregation service in DHIS2 (through datamart and report tables) will aggregate the data together, e.g. the monthly data from one part of the country with quarterly data from another part of the country into a national quarterly report. For simplicity and to avoid data duplication we strongly advise to use the same period type for all orgunits for the same data elements when possible.

21.4.2. Relative periods

When creating reports within the DHIS (report tables, standard reports, charts) it is possible to make use of the relative periods functionality. The simplest scenario is when you want to design a monthly report that can be reused every month without having to make changes to the report template to accommodate for the changes in period. The relative period called `reporting_month` allows for this, and the user can at the time of report generation through a report parameter select the month to use in the report.

A slightly more advanced use case is when you want to make a monthly summary report for immunisation and want to look at the data from the current (reporting) month together with a cumulative value for the year so far. The relative period called "So far this year" provides such a cumulative value relative to the reporting month selecting when running the report. Other relative periods are the last 3, 6, 9 or 12 months periods which are cumulative values calculated back from the selected reporting month. If you want to create a report with data aggregated by quarters (the ones that have passed so far in the year) you can select "Individual quarters this year". Other relative periods are described under the reporting table section of the manual. Common for all the relative periods is that they are relative to a selected reporting month. Even quarterly or annual reports need to know their reporting month to derive the year, the quarter and so on. The reporting month then becomes one of the report parameters the users have to select when running a report based on relative periods.

Table 21.5.

Organisation Unit	Data Element	Reporting month	So far this year	Reporting month name
Gerehun CHC	Measles doses given	15	167	Oct-09
Tugbebu CHP	Measles doses given	17	155	Oct-09

21.4.3. Aggregation of periods

While data needs to be collected on a given frequency to standardise data collection and management, this does not put limitations on the period types that can be used in data analysis and reports. Just like data gets aggregated up the organisational hierarchy, data is also aggregated according to a period hierarchy, so you can create quarterly and annual reports based on data that is being collected on a Monthly basis. The defined period type for a data entry form (data set) defines the lowest level of period detail possible in a report.

21.4.3.1. Sum and average aggregation along the period dimension

When aggregating data on the period dimension there are two options for how the calculation is done; 1) sum and 2) average, which is specified per data element in the DHIS2 through the use of the 'aggregation operator' attribute in the Add/Edit Data Elements window.

Most of the data collected on a routinely basis should be aggregated by summing up the months or weeks, e.g. you create a quarterly report on Measles immunisation by summing up the three monthly values for "Measles doses given".

Other types of data that are more permanently valid over time like "Number of staff in the PHU" or an annual population estimate of "Population under 1 year" need to be aggregated differently. These values are static for all months as long as there are valid data. E.g. the estimated population under 1 calculated from the census data is the same for all months in a year, or the number of nurses working in a PHU is the same for every month in the 6 months period the number is reported for.

This difference e.g. becomes important when calculating an annual value for the indicator morbidity service burden for a PHU. The monthly headcounts are summed up for the 12 months to get the annual headcount while the number of staff for the PHU is calculated as the average of the two 6-monthly values reported through the 6-monthly staff report. So in this example the data element "OPD headcount" would have the aggregation operator "sum" and the data element "Number of staff" would have it set to "average".

Another important feature of average data elements is the validity period concept. Average data values are standing values for any period type within the borders of the period they are registered for. E.g. an annual population estimate following the calendar year will have the same value for any period that falls within that year no matter what the period type. E.g. if the population under 1 for a Tugbebu CHP is 250 for the year of 2009 that means that the value will be 250 for Jan-09, for Q3-09, for Week 12 of 2009 and for any period within 2009. This has implications for how e.g. coverage indicators are calculated as the full annual population will be used as denominator value even when doing monthly reports. If you want to look at an estimated annual coverage value for a given month then you will have the option of setting the indicator to "Annualised" which means that a monthly coverage value will be multiplied by 12, a quarterly value by 4 etc. The annualised indicator feature can therefore be used to mimic the use of monthly population estimates.

21.5. Data collection vs. data analysis

21.5.1. Data collection and storage

The datasets determine what raw data that is available in the system as they describe how data is collected. Through the data sets we define the building blocks of the data to be captured and stored in the DHIS. For each data dimension we decide what level of detail the data should be collected on; 1) the data element (e.g. diagnosis, vaccine, or any event taking place) and its categories (e.g. age and gender), 2) the period/frequency dimension, and 3) the orgunit dimension. For any report or data analysis you can never retrieve more detailed data than what is defined in the datasets so the design of the datasets and their corresponding data entry forms (the data collection tools) dictate what kind of data analysis that will be possible.

21.5.2. Input != Output

It is important to understand that the data entry forms or datasets themselves are not linked to the data (values) and that the meaning of data (the What) is only described by the data element (and its categories). This makes it perfectly safe to modify datasets and forms without altering the data (as long as the data elements stay the same). This loose coupling between forms and data makes DHIS flexible when it comes to designing and changing new forms and in providing exactly the form the users want.

Another benefit of only linking data to data elements and not to forms is the flexibility of creating indicators and validation rules based on data elements, and also in providing any kind of output report (in pivot tables, charts, maps etc) that can combine data individually or across forms, e.g. to correlate data from different health programs. Due to this flexibility of enabling integration of data from various programs (forms) and sources (routine and semi permanent (population, staff, equipment)) a DHIS database is used as an integrated data repository for many or all parts of the aggregated data in a larger HIS. The figure below illustrates this flexibility.

21.6. Some more examples

The table below combines data element the two group sets Diagnosis (all the diseases) and Morbidity/Mortality (New cases, Follow-ups, Referrals, Deaths) with the data element category PHU/Community. Deaths are captured in a separate form with other dimensions (e.g. the PHU/Community) than morbidity.

This output table combines the two data element categories HIV_Age and Gender with the data element group set ART Group. The group enables subtotals for staging and entry points summing up the data elements in that group. Subtotals for either age groups and gender would be other possible columns to easily include here.

21.7. How this works in pivot tables

When doing data analysis in Excel pivot tables or any other OLAP based tool the dimensions become extremely powerful in providing many different views into the data. Each data element category or group set become a pivot field, and the options or groups become values within each of these fields. In fact categories and groupsets are treated exactly the same way in pivot tables, and so are orgunits, periods, and data elements. All these become dimensions to the data value that can be used to rearrange, pivot, filter, and to drill down into the data. Here we will show some examples of how the data dimensions are used in pivot tables.

Using the example of morbidity and mortality data, a pivot table can show how the dimensions can be used to view data for different aggregation levels.

The completely aggregated number is viewed when none of the pivot fields are arranged in the table area, as column or row fields, but are listed above the table itself as page field (filter).

Here we have selected to look at the Morbidity total. The various data elements on morbidity have been ordered into the main_de_groups Morbidity (we will get back to Mortality later). The fields above the table itself are all set to "All", meaning that the totals in the table will contain data from all Countries, Districts, Chiefdom, ou_type, year, months, the various categories as listed in the red fields, and all data elements in the Morbidity group.

As we have seen, this is not a very useful representation, as Morbidity is organized into new cases, follow-ups, referrals, and then again in age groups. Also, we do not see the various diagnoses. The first step is to include the diagnoses field (which is a group set), which is done by dragging the "diagnosis" field down to be a row field, as shown in the figure below, and to add the group set called "morbiditymortality" in the column field to display new cases, follow-up, and referrals.

Contrast this figure above to the one below.

They both show the same data (some of the rows have been cut in the screenshot due to image size), albeit in a different way.

- The "dataelement" field, used in the bottom figure, displays each diagnosis as three elements; one follow-up, one new, and one referrals. This is the way the data elements have been defined in DHIS, as this makes sense for aggregation. You would not like to aggregate follow-ups and new, thus these have not been made as categories, the whole point of is to ease aggregation and disaggregation.
- The "diagnosis" group set has instead been made to lump these three (follow-up, new, referrals) together, which can then be split with another group set, namely the one called "morbiditymortality". This allows us to organize the data as in the first of the two figures, where we have the single diagnosis per row, and the groups new, follow-up, referrals as rows.

The idea of using group sets is that you can combine, in any set, different data elements. Thus, if we add the mortality data (by checking it from the drop-down menu of the `main_de_groups` field, and moving this field out of the table) we can see also the deaths, since the mortality data elements have been included as a "death" group in the "morbiditymortality" group set. The result is shown below.

The result is a much more user-friendly pivot table. Now, another figure shows the relationship between the group sets and elements (these are fake data values).

This small detail of the pivot table show how the actual data elements link to the group sets:

- The four data elements, as defined in DHIS, are Measles death, Measles follow-up, Measles new, and Measles referrals
- They all belong to the group set "diagnosis", where they have been lumped together in the group Measles
- The group set "morbiditymortality" contains the groups New cases, Follow-up, Referrals, and Deaths.
- Only the data element Measles deaths has data related to the group Deaths, thus this is where the data value (20) is shown, at the upper right corner. The same for Measles new; the value (224) is shown at the intersection of the data element Measles new and the group New cases (in the group set morbiditymortality)
- All the intersections where the data element does not link with the groups in morbiditymortality are left blank. Thus in this case we would get a nice table if we excluded the dataelement from the table, and just had diagnosis and the group set morbiditymortality, as in the figure shown earlier

Now lets see how the data element categories can be used. In the data entry form for Morbidity the new cases and follow-ups use one age category, the referral data another,, and the mortality data a third age breakup, so these are available as three individual age group fields in the pivot tables called `morbidity_age`, `referrals_age` and `mortality_age`. It doesn't make sense to use these while looking at these data together (as in the examples above), but e.g. if we only want to look at the only the new cases we can put the `MorbidityMortalityGroups` field back up as a page field and there select the New cases group as a filter. Then we can drag the `Morbidity_age` field down to the column area and we get the following view:

The following table illustrates the benefits of reusing data element categories across datasets and catecombinations. The VCCT, ART and PMTCT data are collected in three different datasets, the first two with both gender and age breakdown, and the PMTCT only age (gender is given). All three share the same age groups and therefore it is possible to view data elements from all these three datasets in the same table and use the age dimension. In the previous example with morbidity and mortality data this was not possible since new cases, referrals and deaths all have different age groups.

In the table below PMTCT data has been removed from the table and the gender category added to the column area so that you can analyse the data for VCCT and ART by age and gender. An optional subtotal for gender has also been added, as well as a grand total for all age and gender.

21.8. From paper form to multidimensional datasets - lessons learned

Typically the design of a DHIS 2 dataset is based on some requirements from a paper form that is already in use. The logic of paper forms are not the same as the data element and data set model of DHIS, e.g. often a field in a tabular paper form is described both by column headings and text on each row, and sometimes also with some introductory table heading that provides more context. In the database this is captured in one atomic data element with no reference to a position in a visual table format, so it is important to make sure the data element with the optional data element categories capture the full meaning of each individual field in the paper form.

Another important thing to have in mind while designing datasets is that the dataset and the corresponding data entry form (which is a dataset with layout) is a data collection tool and not a report or analysis tool. There are other far more sophisticated tools for data output and reporting in DHIS than the data entry forms. Paper forms are often designed with both data collection and reporting in mind and therefore you might see things such as cumulative values (in addition to the monthly values), repetition of annual data (the same population data reported every month) or even indicator values such as coverage rates in the same form as the monthly raw data. When you store the raw data in DHIS every month and have all the processing power you need within the computerised tool there is no need (in fact it would be stupid and most likely cause inconsistency) to register manually calculated values such as the ones mentioned above. You only want to capture the raw data in your datasets/forms and leave the calculations to the computer, and presentation of such values to the reporting tools in DHIS.

21.8.1. From tables to category combinations - designing multidimensional data sets

As we have seen in the examples above the data element categories and their options are helpful in representing tabular data, when adding dimensions to a field in a paper form. We have also seen how the data element is the central dimension and that the data element categories are used to provide further details or disaggregation to the data element. As we will see in the example below there are often more than one way to represent a paper form in DHIS, and it can be difficult to know which dimension to represent with a data element name and which to represent as categories, or even as groups as we have seen above. Here are some general lessons learned from working with data element and category combinations:

- Design your dimensions with data use in mind, not data collection. This means that disaggregation of data values at collection time should be easily aggregated up along the various dimensions, as in adding up to a meaningful total.
- Reuse dimensions as much as possible as it increased the ability to compare disaggregated data (e.g. age groups, fixed/outreach, gender). Not necessary to share all dimensions, it helps to share only one as well (much better than none).
- Disaggregation dimensions should add up to a total
- Different levels of dimensions; 1) disaggregation and 2) grouping. Disaggregation dimensions dictate how you collect and how detailed you store your data, so plan these carefully. The group dimension is more flexible and can be changed and added to even after data collection (think of it as tagging).
- Think integrated data repository and not forms or programs when designing the metadata model and revising forms. Use the same disaggregation for the same or similar data across forms. Reuse definitions so that the database can integrate even though the forms might be duplicating.

STEP BY STEP APPROACH TO DESIGNING DATASETS

1. Identify the different tables (or sub datasets) in the paper form that share the same dimensions
2. For each table identify the dimensions that describe the data fields
3. Identify the key dimension, the one that makes most sense to look at in isolation (when the others are collapsed, summed up). This is your data element dimension, the starting point and core of your multidimensional model (sub dataset). The data element dimension can be a merger of two or more dimensions if that makes more sense for data analysis. The key is to identify which total that makes most sense to look at alone when the other dimensions are collapsed.
4. For all other/additional dimensions identify their options, and come up with explanatory names for dimensions and their options.
5. Each of these additional dimensions will be a data element category and their options will be category options.
6. Combine all categories for each sub dataset into one category combination and assign this to all the data elements in your table (or sub dataset if you like).
7. When you are done with all the tables (sub datasets), create a new dataset and add all the data elements you have identified (in the whole paper form) to that dataset.
8. Your dataset will then consist of a set of data elements that are linked to one or more category combinations.

In order to better explain the approach and the possibilities we present an example paper form and will walk through it step by step and design data elements, categories, category options and category combinations.

This form has many tables and each of them potentially represent a data element category combination (from now on referred to as a catcombo). As such there is no restriction on a dataset to only have one set of dimensions or catcombo, it can have many. For any and as we see above this is necessary as the dimensions are very different from table to table. We will walk through this table by table and discuss how to represent it in the DHIS.

ANC table. This table in the top left corner is one the simpler ones in this form. It has two dimensions, the first column with the ANC activity or service (1st visit, IPT 2nd dose etc) and the 2nd and 3rd column which represent the place where the service was given with the two options fixed and outreach. Since the ANC service is the key phenomena to analyse here and often there is a need for looking at e.g. total of ANC 1st visits no matter where (fixed+outreach) it makes a lot of sense to use this dimension as the data element dimension. So all items on the first column from 1st ANC visit to 2nd IPT dose given by TBA are represented as individual data elements. The place dimension is represented as a data element category (from now on referred to as category) with the name "fixed/outreach" with the two data element category options (from now on catoptions) "fixed" and "outreach". There is no other dimension here so we add a new catcombo with the name "Fixed/Outreach" with one category "Fixed/Outreach". Strictly speaking there is another dimension in this table, and that is the at PHU or by TBA dimension which is repeated for the two doses of IPT, but since none of the other ANC services listed have this dimension it does not seem like a good idea to separate out two data elements from this table and give them another catcombo with both fixed/outreach and at PHU/by TBA. reusing the same catcombo for all the ANC services makes more sense since it will be easier to look at these together in reports etc. and also the fact that there is not much to lose by repeating the at PHU or by TBA information as part of the data element name when it is only for four data elements in a table of totally 11 data elements.

DELIVERY table. This table is more tricky as it has a lot of information and you can see that not all the rows have the same columns (some columns are merged and a one field is grayed out/disabled.). If we start by looking at the first column "Deliveries assisted by" that seems to be one dimension, but only down to the "Untrained TBA" row, as the remaining three rows are not related to who assisted the delivery at all. Another dimension is the place of delivery, either In PHU or in Community as stated on the top column headings. These deliveries are further split into the outcome of the delivery, whether it is a live or still birth, which seems to be another dimension. So if we disregard the three bottom rows for a moment there seems to be 3 dimensions here, 1) assisted by, 2) place of delivery, and 3) delivery outcome. The key decision to make is what to use as the data element, the main dimension, the total that you will most often use and want easily available in reports and data analysis. We ended up using the outcome dimension as total live births is a very commonly used value in many indicators (maternal mortality ratio, births attended by skilled health personnel etc.). In this case the Assisted By dimension could also have been used without any problem, but the added value of easily getting the total live births information was the decisive point for us. This means that from this table (or subtable of row 1 to 6) there are only two data elements; "Live births" and "Still births". Then there are two more dimensions, the "PHU/Community" with its two options and a "Births attended by" with options ("MCH Aides", "SECHN", "Midwives", "CHO", "Trained TBA", "Untrained TBA"). These two categories make up the catcombo "Births" which is assigned to the two data elements "Live births" and "Still births". Considering the final three rows of the delivery table we can see that "Complicated Deliveries" does not have the assisted by dimension, but has the place and the outcome. "Low birth weight" also does not have the assisted by dimension and not the outcome either. The LLITN given after delivery does not have any additional dimension at all. Since not any of the three rows can share catcombo with any other row we decided to represent these fields as so called flat data elements, meaning data elements with no categories at all, and simply adding the additional information from the column headings to the data element name, and therefore ended up with the following data elements with the default (same as none) catcombo; "Complicated deliveries in PHU live birth", "Complicated deliveries in PHU still births", "Complicated deliveries in community live birth", "Complicated deliveries in community still births", "Low birth weight in PHU", "Low birth weight in community", and "LLITN given after delivery".

POST-NATAL CARE table This table is simple and we used the same approach as for the ANC table. 3 data elements listed in the first column and then link these to the catcombo called "fixed/outreach". Reusing the same category fixed/outreach for these data elements enables analysis on fixed/outreach together with ANC data and other data using the same category.

TT table This is a bit more tricky. We decided to use "TT1", "TT2" ... "TT5" as data elements which makes it easy to get the total of each one of these. There is fixed/outreach dimension here, but there is also the In school place that

is only applied to the Non-Pregnant, or more correctly to any of the two as the school immunisation is done whether the girls are pregnant or not. We consulted the program people behind the form and found out that it would be ok to register all school TT immunisations as non-pregnant, which simplifies the model a bit since we can reuse the "TT1" to "TT5" data elements. So we ended up with a new category called "TT place" with the three options (Fixed, Outreach, In School), and another category called "Pregnant/Non-pregnant" with two options. The new catcombo "TT" is then a combination of these two and applied to the 5 TT data elements. Since we agreed to put all In Schools immunisations under Non-pregnant in means that the combination of options (Pregnant+In School) will never be used in any data entry form, and hence become a passible optioncombo, which is ok. As long as the form is custom designed then you can choose which combinations of options to use or not, and therefore it is not a problem to have such passive or unused catoptions. Having school as one option in the TT place category simplifies the model and therefore we thought it was worth it. The alternative would be to create 5 more data elements for "TT1 in school" ... "TT5 in school", but then it would be a bit confusing to add these together with the "TT1" ... "TT5" plus TT catcombo. Having school as a place in the TT place category makes it a lot easier to get the total of TT1.. TT5 vaccines given, which are the most important numbers and most often used values for data analysis.

Complications of early and late pregnancy and labour tables We treat these two tables as one, and will explain why. These two tables are a bit confusing and not the best design. The major data coming out of these tables are the pregnancy complications and the maternal deaths. These are the major things for data analysis. And then there is further detail on the cause of the complication or death (the first column in both tables), as well as a place of death (in PHU or community), and a outcome of the complication (when its not a death) that can be either Managed at PHU or Referred. We decided to create two data elements for these two tables; "Pregnancy complications", and "Maternal Deaths", and two category combinations, one for each of the data elements. For the Pregnancy Complications data element there are two additional dimensions, the cause of the complication (the combined list of the first column in the two tables) and the outcome (managed at PHU or Referred), so these are the categories and options that make up that category combination. For the "Maternal deaths" data element the same category with the different causes are used and then another category for the place of death (in PHU or In community). This way the two data elements can share one category and it will be easy to derive the total number of pregnancy complications and maternal deaths. While the list of complications on the paper form is divided into two (early and late/labour) you can see that e.g. the malaria in 2nd and 3rd trimester are listed under early, but in fact are for a later phase of the pregnancy. There is no clear divide between early and late complications in the form, and therefore we gave up trying to make this distinction in the database.

Family Planning Services table This table has 2 dimensions, the family planning method (contraceptive) and whether the client is new or continuing. We ended up with one data element only "Family planning clients" and then added two categories "FP method" with all the contraceptives as options, and another category "FP client type" with new or continuing as options. This way it will be easy to get the total number of family planning clients which is the major value to look at in data analysis, and from there you can easily get the details on method or how many new clients there are.

Capítulo 22. DHIS TRACKER

22.1. Introduction

22.1.1. Quick Background

Conventionally, Public Health Systems have been recording and reporting aggregated data of the services provided across various health programmes. Though this is crucial in monitoring "*reach*" and "*availability*" of public health services, but it lacks tracing the persons being provided these services and quality of these ones.

For example, the aggregate report will show that 300 pregnant women registered for ANC and 120 women given IFA tablets or 90 women given TT injection. In an aggregate system, it is not possible to ascertain that if a particular pregnant woman registered for ANC, has also been given IFA and TT, as data only shows aggregate numbers. To understand the quality of services given to each pregnant woman registered for ANC, immunization cycle of each child or treatment of each leprosy person, etc. it is important that treatment information of each person is maintained as an individual case.

The DHIS tracker module (also known as DHIS Community Module) is an integrated module in DHIS2, built to support community health systems and facilitate a smooth integration between the community health data and aggregated data management.

The module supports management of community health programs, such as child immunization, maternal health and e.g. allows tracking of individuals enrolled in various programs and activity planning for community health workers.

The following are the major things:

1. Administrating meta data - includes person attributes, person attribute groups, identifier types; relationship types, health programs, program stages corresponding to the program, validations and formulas for aggregating data value from individual cases.
2. Administrating person registration - registering a new person, setting relationships, enrolling a person into a program and management of person location
3. Data entry for inputting individual data for treatment of each person.
4. Reports for individual cases.
5. Linking data between tracker system and aggregate management system.
6. Provides a list of upcoming visits to better plan for daily/weekly activities at a facility or in an area.
7. Support the work practices around tracking persons within a health program.

Advantages of tracker module -

1. Facilitate the health service provider in person's treatment follow-up by recording all treatment related information in one place and in effective monitoring of different health services and drill down to individual person information.
2. Facilitate the health service provider at a facility or in an area a list of upcoming visits to better plan for daily/weekly activities.
3. Help the person in recording treatment history in one place, which could be used later in case of referral.
4. Facilitate in recording entire treatment information of each person.
5. Help strengthen the quality and fidelity of data.

The data in primary registers at sub-center level is recorded and maintained by individual data or treatment cases, and sent up-wards as aggregate reports.

22.1.2. Getting started with DHIS Tracker

The module supports health providers for registering treatment cases and tracks these cases over time through different forms that are filled for the treatment of each person.

The process starts with the person registration. Then she/he can be enrolled in the program for which registered. The application will guide the health provider the services required for her/him through activity plan and the services from time to time can be updated into his/her profile. The working process is described in steps depicted in picture below -



Nota

For programs without registration (e.g. In-Patient Morbidity and Mortality program), users only need to input treatment case and then export reports.

22.1.2.1. Person registration

The process of creating a new person in the system is through the registration process. The person is first registered in the system (or checked if the person already exists in system). Searching a person can be done through name, identifiers, location or user-defined person's attributes (address, child contact name, e.g.). If the person already exists in the system, the program enrollment process can continue. If the person is not available, new registration takes place.

The system supports for creating identifier type for the registration, such as Passport number, PAN, driving license, health identifier, UID. However, a system unique identifier is created automatically after registration and used to track the person.

For identification a person, the health worker is first identified through any of the identifiers or name of patient in the system and the person is identified through identifiers for receiving a health service. After identification, the individual case history can be viewed or a treatment case can be updated for the new visit that they have received.

22.1.2.2. Program enrollment

When a person is enrolled into any health programme, he/she is provided identifier number (e.g PARA, parish, ...) and declare some attributes which belong to the program. After, the person is provided various services through the treatment are recorded. Based on the services of the program by the time, the system creates an activity plan for person.

22.1.2.3. Treatment case

Each interaction with the person related to the case is considered to be an treatment case and these cases are recorded into the individual case. Individual case is updated with the identification of both the health worker and the person who is receiving the service.

22.1.2.4. Reports

The module provides two functions for viewing the reports to get an overview of the services provided for a program or a program stage.

22.2. User guide

There are two additions in the module in both maintenance and services module -

1. *Persons and Programs maintenance module* - Definition meta data, include person attributes, person attribute groups, identifier types, relationships, program and program-stages, validation for program and formula to generate aggregate data value.

When the '*Persons and Programs*' options is chosen from the main *Maintenance* menu, the following screen appears -

2. *Individual records module* - Support main functions for person registration, tracking information and individual reports.

When the '*Individual Records*' options is chosen from the main *Services* menu, the following screen appears -

22.2.1. Persons and Programs maintenance

The content in this part is for the expert users or administrative users who are capable and responsible for development and change.

Each of the options for the maintenance will be described in the following section. The options for the maintenance will be described in the following section -

- Person Attribute

Create, modify and view Person attributes. An attribute can be used to register extra information for a Person.

- Person Attribute Group

Create, modify and view Person attribute groups. Groups makes it more convenient to add attributes to a Person.

- Person Identifier Type

Create, modify and view Person identifier types. Any type and multiple identifiers can be registered.

- Relationship Type

Create, modify and view relationship types. A relationship is typically wife and husband or mother and child.

- Program

Create, modify and view programs. A program has program stages and defines which actions should be taken at each stage.

- Person Aggregation Query Builder

Define formulas, expressions, rules for aggregation data from tracker to aggregation module

- Validation Criteria

Create, modify and view validation criteria. A criteria is used for validation of Person data.

- Schedule Message

Configure message reminders to be automatically sent to enrolled persons XX days before scheduled appointments and/or XX days after a missed visit.

- Schedule Automated Aggregation

Schedule an automated person aggregation process, e.g. to run all pre-defined aggregation queries every midnight.

22.2.1.1. Person attribute

Create, modify and view person attributes. An attribute can be used to register extra private information for a person or information when that person enrolled into a certain program.

From *Maintenance* menu, go to *Persons and Programs* option and click on it. Select *Person Attribute* option to create a new attribute for persons.

After, click on *Add* button into *Person Attribute Management* window to go to *Add New Person Attribute Management* window.

Basic information

- *Name* - Name of person attribute.
- *Description* - Description of person attribute.
- *Mandatory* - Entering value for this attribute is required or not.
- *Inherit* - When to registry a new person for relationship with an available person, all inherit person attribute values of the person will be pre-filled in the registration form.
- *Value Type* - Data type of value inputed. In addition to supporting basic data such as *Number*, *Text*, *Yes/No*, *Date*, the system support a value type as *Predefined value* for defining attribute values. Users only can select on value in the

defined list for each person registered. E.g code values which record the information on access to HIV prevention services can be pre-defined, include *T, TR, TRR, TRRD, TRRDm, TRRDmDb* as *PMTCT Code* attribute.

22.2.1.2. Person attribute group

To access the person attribute group maintenance module, from *Maintenance* menu, go to *Persons and Programs* option and click on it. Select *Person Attribute Group* option to create a new an attribute group.

To create a new attribute group, click the *Add* button into *Person Attribute Group* window to go to *Add New Person Attribute Group* window , click the *Add new* button. Fill in the *Name* and *Description* fields and then select attributes that should belong to the group from the left panel.

Click the *Move selected items* button to add the selected attributes to the attribute group. Click the *Remove selected items* button to remove attributes from the group that have been selected in the right panel.

Finally, click the *Add* button to save changes, or the *Cancel* button to discard any changes. The created attribute members will be displayed by the attribute groups into person registration form.

To sort order of attribute groups for displaying in person registration form, click *Move up* and *Move down* button next to *Selected attributes* section.

22.2.1.3. Person identifier type

To access the person identifier type maintenance module, from *Maintenance* menu, go to *Persons and Programs* option and click on it. Select *Person Identifier Type* option to create a new identifier type.

To creating a new identifier type, click the *Add* button into *Person Identifier Type Management* window to go to *Add New Person Identifier Type* window.

Basic information -

- *Name* - Name of identifier type.
- *Description* - Description of identifier type.
- *Mandatory* - Entering value for the identifier is required or not.
- *Related* - Representative re-uses the identifier of person.
- *Number of characters* - Maximum number of characters for value inputted.
- *Type* - Data type of value inputted, includes *Text*, *Number* and *Letter Only*.

22.2.1.4. Relationship type

Relationship type section provides a mechanism for defining relationship types and link persons through these relationship types by creating specific relationships.

To access the relationship type maintenance module, from *Maintenance* menu, go to *Persons and Programs* option and click on it. Select *Relationship Type* option to create a new relationship type.

To define a new relationship type, click *Add* button into *Relationship Type Management* window to go to *Add new Relationship Type* window.

22.2.1.5. Program and Program stage

The section provides a mechanism for defining health programmes and action for each stage of the programme.

22.2.1.5.1. Program

To access the program maintenance module, from *Maintenance* menu, go to *Persons and Programs* option and click on it. Select *Program* option.

To define a new program, click the *Add new* button on the main page. Fill all fields with read asterisk, and then click the *Add* button.

Basic information -

- *Name* - The name of the program
- *Description* - Descriptions, meanings, explanation, etc. of/about the program.
- *Type* - There are three types of program: multi events with registration, single event with registration and single event without registration.
- *Events generated by enrollment date* - Check on it for auto-generating due dates of events from program-stages of this program based on the enrollment date. If it is not checked, the due dates are generated based on incident date.
- *Show provided elsewhere* - Set show/hide provided elsewhere column in data entry form.
- *Show incident date* - Set show/hide incident date field when a person enroll in this program.
- *Description of incident date* - The date when the person got the disease or he/she has just been committed to an equivalent program for being followed-up. E.g. In the Immunization program for child under 1yr old, the incident date is the birthday; in the maternal program, the incident date is the date of last menstrual period (LMP).
- *Description of enrollment date* - The date in which a person is registered to the system. For example: the date in which a person enrolls to the system.
- *Identifiers / attributes* section - Select identifier-types and person attributes which belong to the program. Check *Displayed in list* checkboxes of identifier types to display its value in person list instead of person's full-name.

To assign a program for organisation units, click *Assign program to organisation units* icon, the first icon under Operations, corresponding to the program you would like and select organisation units where provide the program.

To create validation rules for programs, click *Program validation rule management* icon, the second icon under Operations, corresponding to the program you would like. There are two types of validation rules -

- *Single validation rule* is used for defining validation for only one condition. E.g Weight must be greater then zero, or the date of admission is before the date of discharge. To define a validation, click *Add single rule* button and enter values for the fields in form.
 1. Enter *description* of program validation rule.
 2. In *Validation* section, select an program stage in list to load data elements belong to the selected stage the field below.
 3. Double-click on a data element in list, a formula text of the selected data element is created and displayed into the condition area.
 4. Click the comparing operations (+, <, <=, >, >=, =, !=, !=NULL) below to set operation for the formula.
 5. Click *Add* button to add the new validation rule.
- *Multiple validation rule* is used for defining validation for two conditions. E.g in PMTCT program, if the blood test result of a pregnant is HIV positive, the pregnant must test WHO Stage/CD4. To define a validation, click *Add multi rule* button. The form is have two part - left side and right side. Fill values for the fields in each part is the same *Single validation rule* function.



Nota

Validation rules for DATE date elements are created for a program automatically. It's used for defining formulas related the DATE data elements of each program stage. To define this validation rule, click *Edit* icon of *Validation for date date elements*. Select a program stage, the DATE data elements will be shown with corresponding conditions as follows -

- Before current date
- After current date
- Before or equals to current date
- After or equals to current date
- Before due-date
- After due-date

- Before or equals to due-date
- After or equals to due-date
- In range due date

22.2.1.5.2. Program stage

To define a program stage, click the *Program Stage Management* icon, the forth icon under Operations, corresponding to the program you would like and then *Add new* button. Fill in the *Name* and *Description* fields and then select the data elements that should belong to the group from the left panel. Click the *Move* selected button to add the selected data elements to the right panel. Click the *Remove* selected button to remove data elements that have been selected in the right panel. Finally, click the *Add* button to save changes, or the *Cancel* button to discard any changes.

Basic information -

- *Name* - Name of the program stage
- *Description* - The description of the program stage
- *Description of report date* - The description for report date which is displayed in case entry form.
- *Auto-generate event* - Un-check this to prevent for creating an event of this program stage automatically when a person enroll into the program.
- *Scheduled days from start* - The minimum number of days to wait for starting the program stage.
- *Repeatable* - specify the program stage as repeatable or not.
- *Standard interval days* - Specify the number of days to repeat the repeatable program stage.
- *Data elements* section - Select person data elements which belong to the program stage
- *Template reminder message* section - Define template reminder messages which are used for sending messages for person automatically. There are two params -

1) *Days before/after due date* - Enter a positive number of days if sending process happens after due-date of events which are generated from this program stage. Enter a negative number of days if sending process happens before due-date of events.

2) *Parameters* - Provide parameters which are used for generating a message for each person. The parameters include person's first name, program's name, program stage's name, due date of event, interval between current date and due date and organisation unit's name.

Double-click on an option to insert it into template message field below.

3) *Message* - Content of template message. E.g Dear {patient-name}, please come to your appointment at {due-date}.



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Click *Add more...* button to add more template reminder messages.

A program stage has three types of data entry form -

1. *Custom data entry form* - Define a data entry form as HTML page. Click *Design data entry form* icon, the fifth icon under *Operations*, corresponding to the program stage you would like to define custom data entry form. The system supports to define a custom entry form with multi stages. So this form can be re-used in other stages of the same program.
2. *Section data entry form* - Group some data elements which belong to the program stage as sections and display data elements by each section. Click *Section management* icon, the forth icon under *Operations*, corresponding to the program stage you would like to define section data entry form.
3. *Default data entry form* - List all data elements which belong to the program stage.

To search program stages by scheduled days, click *Sort by scheduled days* button.

22.2.1.6. Aggregation query builder

This is the core functionality for linking data between tracker module and aggregate management module by defining the linking/aggregating rules. The purpose is to produce aggregated data / statistics based on the low-level case based data. It is based around flexible aggregation query definitions which maps the data elements used for case based data management to data elements used for aggregate data.

This provides two functions -

- *Aggregation query builder management* is a tool for defining formulas, expressions, rules for aggregation data from tracker to aggregation module.
- *Manual person aggregation* is used for generating routine data values from individual data by period and organization unit. Please refer the *Service* module to see this part.

22.2.1.6.1. Person Aggregation Query Builder Management

To access *Aggregation Query Builder* module, from the *Maintenance* menu, go to the *Persons and Programs* option. Select *Aggregation Query Builder* option on left menu to proceed.

To define a formula, click the *Add new* button.

Basic information -

- *Name* - Provide name of query, this name is usually same with the name of aggregate data element. For example Number of mothers got VAT, Number of children got BCG vaccine,...
- *Dataset* - Select dataset contains data elements which will be used to link with individual data.
- *Data element* - Select aggregate data element which will be used to link with individual data.
- *Operator* - Select *Number of persons* if aggregate based on persons, or *Number of visits* if aggregate data based on times that persons received services.
- *Program* - Select program needed for aggregation.
- *Program Stage* - Select program stage from the selected program above.

Next section included 3 tabs: *Data elements*, *Person attributes* and *Program*. Depend on the requirement of data aggregation, data element, person attributes, and number of programs are selected.

Data elements tab: List all available data elements from selected program stage. To create a formula related to each data element, double click on the data element. The formula of the data element is filled on the condition field, like [DE:1.2.3], in with:

- 1 - id of the selected program.
- 2 - id of the selected program stage.
- 3 - id of the selected data element.



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The formula can be created without any program stage, like [DE:1.*.3]

Person attribute tab - List all available fixed attributes, such as gender, DOB type, Age (days), .. and user-defined attributes. Besides, provide a formula for calculating number of persons who registered in system. However, if a program without registration is selected, person attributes aren't displayed.

Program tab - Provide formulas for calculating data value related to the selected program and program stage -

- The number of persons who enrolled the selected program.
- The number of persons / times that (Date of enrollment - Date of incident) is greater then a certain number.
- The number of persons who visited the selected program stage OR the number of visits what are registered in the system.
- The number of persons by age at the report-time.

Condition section - This section contains comparing operations (<, <=, >, >=, =, !=), calculation operation (+), priority operation (()), boolean values (Yes, No), status operations (=NULL, != NULL), relation operations (AND, OR). These operations are used for supporting in setting condition for query.

Description section - Show description for the condition above.

E.g To get number of *girls* who got *Vitamin A dose 6* enrolled *Child Health program* on *January 2012*. Then query is created as in the figure below. Note that January 2012 is period parameter which user will select when generate report. It is not set in the query.

22.2.1.6.2. Sample of person aggregation

E.g. Find the number of the children vaccinated BCG by defining a linking rule between the data elements of aggregate dataset named *Number of children - BCG* and the data element of a program stage named *BCG dose given*.

1. From *Maintenance* menu, go to *Data Element and Indicators* option and click on it. Select *Data Element* option to define two new data elements -
 - 1) Define a new data element named *Number of children - BCG* with *Aggregate* option for Domain Type.
 - 2) Define a new data element named *BCG dose give date* with *Patient* option for Domain Type.
2. From *Maintenance* menu, go to *Datasets* option and click on it. Select *Dataset* option to create a new dataset named *BCG Report* and add *Number of children - BCG* data element into the dataset.
3. From *Maintenance* menu, go to *Persons and Programs* option and click on it. Select *Program* option to create a program named *Child Health Program* with a stage named *Birth Details* and add the *BCG dose given* data element into this stage.
4. Create a new aggregation query builder named *Number of children - BCG Builder* to linking between the data elements.
5. From *Services* menu, go to *Individual Records* option and click on it. Select *Person* option below *Registration* header in the left menu to register three persons named *Micheal*, *Alice* and *Tom* in *Ngelehun CHC* and enroll them into *Child Health Program*.
 - 1) For *Micheal*, open the *Birth Details* stage into *Child Health Program*. Enter value for *BCG dose give date* data element as "2012-01-18".
 - 2) For *Alice*, open the *Birth Details* stage into *Child Health Program*. Enter Enter value for *BCG dose give date* data element as "2012-01-18".
 - 3) For *Tom*, no enter any data value for *Birth Details* stage.



Aviso

Before entering data value for the stage, choose *Report Date* as "2012-01-18".

6. From *Services* menu, go to *Individual Records* option and click on it. Select *Manual person aggregation* option to run *Number of children - BCG Builder* to get data value and save it into database.

22.2.1.7. Validation criteria

Validation criteria section provides a mechanism for defining criteria for persons when enrolling a program.

To access the validation criteria maintenance module, from *Maintenance* menu, go to *Persons and Programs* option and click on it. Select *Validation Criteria* option to create a new program.

To create a new validation criterion, click the *Add new* button. Fill all fields with read asterisk, and click *Add* button.

You can assign facilities to a validation criterion in the *Validation Criteria Management* (list of available validation criteria are shown) by clicking the blue folder icon, the first icon under Operations, corresponding to the validation

criterion you would like to assign. Click the *Move selected* button to add the selected programs to the validation criterion. Click the *Remove selected* button to remove programs from the group that have been selected in the right panel. Finally, click the *Save* button to save changes, or the *Cancel* button to discard any change.

22.2.1.8. Schedule automated message reminder

This function is used for scheduling message reminders to be automatically sent to enrolled persons XX days before scheduled appointments and/or XX days after a missed visit. When the schedule is started, messages for each person are generated based on templates defined in each stage at midnight. On the time, the scheduled messages are sent.

Click *Execute* button to generate and send each message for each person at the time the button clicked.

Message reminders can be automatically scheduled to run on regular intervals. Click *Start* button will enable the scheduled job to run the task. Messages are generated based on templates defined in each stages at mid-night and sent at a pre-determined time or can be run immediately by pressing *Execute* button.

22.2.1.9. Schedule Automated Aggregation

The aggregation query builder jobs can be automatically scheduled to run on regular intervals. Simply select organisation unit group set aggregation level, and strategy to configure how the scheduled job should run. Click *Start* button will enable the scheduled job to run at mid-night or can be run immediately by pressing *Execute* button.

22.2.2. Individual records module

Each of the options for the services will be described in the following section -

- Find/Add Person

Create, modify and search for persons. Any type of data can be registered for a person by including attributes.

- Visit Schedule

Visit Schedule provides for the user at a facility or in an area a list of upcoming visits to better plan for daily/weekly activities.

- Program Tracking

Support the work practices around tracking persons within a health program that have not shown up for a scheduled visit (stage), e.g. that are lost to follow-up.

- Multiple Individual records

Enter data for multiple program stages and persons for a program. The entry screen gives an overview of the stage status.

- Single event with registration

The data to register is defined by a single event with registration program.

- Single event without registration

Register Single events without registration. The data to register is defined by a single event without registration program.

- Program summary

View the summary report to get an overview of the services provided for a program.

- Tabular report

Use an interactive reporting tool for tracker-data using tabular presentation with dynamic filters for each person attribute/data element.

- Person aggregation

Generate routine data values from patient data by month (or other intervals if desired) and organisation unit.

22.2.2.1. Person registration

The first step in the tracking is the registration of person/case in the application. In the registration process, the details - which are related to the personal information, identification, contract and location details & health provider details, are entered in the application. In the registration itself, person is provided with the unique identification number. This number will be unique and will not match with the identification number of any person in the state jurisdiction. The issue of identification number will be the responsibility of facility where person is registered first time.



Aviso

No matter what program persons need to enroll, they must register into the system first. Then health providers will enroll the persons into relevant programs. E.g. every pregnant women and the child need to be registered first as a person, then they will be enrolled in Mother Care program or Child Health program.

Person registration process

For the registration process, the details - which are related to the personal information, identification, contact and location details, and health provider details, are entered.

1. To register a person, go to the *Services* menu, select option *Individual Records*.
2. Click the *Find/Add person* option below *Person* header to go to *Person management* window.
3. Select a facility from the facilities hierarchy displayed on the left side of the screen. Then click the *Add new* button on the right side.
4. Start process of registration by providing name, location details, identification details, contact details and other details like *child contact name* and *child contact type*. Then click the *Add* button to complete the process of registration or click the *Person management* to navigate to previous page.

To check the duplicated person or to avoid double registration, after providing name and demographic details, click the *Check duplicate* button. Checking process bases on full name, gender and birthday of the registering person to look for the available persons with the similar information in the database. The result list will be displayed if the system finds out the same persons. Now health providers can cancel the registration process and update the existing person or continue the process of registration.

To register representative for the registering person, check on the *Has guardian/caretaker* checkbox in *Register new person* form. The sub-function has two tab -

- *Search existing person* tab is used for searching available persons and users can select one person in the result list to set relationship. The criteria to search is based on identifier, attribute and name of persons.
- *Add new person* tab is used for registering a new person for relationship. When adding a person in this form, you need to select one user-defined relationship type in the list. Finally, click *Add* button.

22.2.2.1.1. Person dashboard

The function is intended to provide quick access to individual data of person. Dashboards consist of several sections, some of which provide links to activity programs or relationships of the person. Other sections of the dashboard allow users to enter data values for data entry form, reschedule and set status for each events of activity plan; show messages and report of the program.

The dashboard of the person is opened after register successfully or click the *first icon* under *Operations*, corresponding to the person who you would like.

The *Demographics* section provides links for editing profile and changing other location of the person. Click on *Edit profile* link to update individual information of person. Click on *Change location* link to change other location for the person

The *Active programs* section provides links for activity program and the next visit of person for this program.

Click on *Enroll into program* link to open the Enrollment form.

Click on a program link to open the data entry form for the next visit of the selected program. A form is open below with five tab -

1. *Data entry screen* tab - Where data is manually registered for each person. Click on a event box in tab. Then fill a report date to open data entry form of the selected event.

After entering data values into the data entry form, user should click on *Run validation* button before clicking on *Complete* button to check reality of data. The event is only completed successfully if all validation is valid.

2. *Identifier / Attribute* tab - Load identifier-types and person-attributes which belong to the selected program for users to enter values for this program.
3. *Reschedule and set status* tab - Provides function for re-scheduling, setting status and sending messages/comments or deleting for each events.

After entering a message in the field, click on (+) button in *Message* column to add a comment for the event. For sending a reminder message, click on (>>) button.



Nota

Only allow to edit due dates of events with status as overdue or scheduled in future.

4. *Comments and messages* tab - Displays a comment/message list of the program.
5. *Program report* tab - Summary report for the program.

The *Active programs* section consists of active programs of the person. Click on a program to show detail information below. Besides, there are two link in this tab -

1. To display completed program list of the person, click *Completed programs* link. Select a program to show detail information below.
2. To enroll the person into a program, click *Enroll* link.

The *Relationship* section consists of relationships of the person. Click on a person in list to open his/her dashboard. Besides, there are two link in this tab -

1. To open Relationship management section, click *Management* link.
2. To register new person for relationship, click *Register new person* link.

Besides, the system audits user's information who accessed on the dashboard. Click on the *History* link in the header to display this information.

22.2.2.1.2. Person enrollment

After the registration, the person needs to be enrolled in any available program. To enroll :

1. Click on *Enroll* link from Dashboard of the person to open the Enrollment form.
2. Select a program from the list.
3. After the selection of program, you need to provide two dates:
 - 1) *Date of enrollment (the second field)* - The date when person enrolls into the selected program.
 - 2) *Date of incident (the third field)* - The date when the person got the disease or he/she has just been committed to an equivalent program for being followed-up.



Aviso

If the selected program has any identifier-types and person-attributes, they are displayed below. Users can enter values for them at this time.

The *date of incident* are important to generate the activity plan for each person. Health provider needs to ensure recording and reporting date of incidence with each case of multi events with registration. However, when to define a program, if it can be set *Generated by enrollment date* property as true, the activity plan is generated based on the enrollment date, not incident date.

However, the *date if incident* is ignored with single event programs.

4. Click the *Enroll* button to complete the enrollment process.

The system will automatically calculate due-date for each event of program and will show it in the *Re-schedule and set status* tab. In health programme, a person registered and enrolled, needs to be checked from time to time by health providers. The case update is designed in the same manner so that services which are received by the persons can be updated from time to time when they visit the facility or whenever the health providers need to *track*.

The system will automatically calculate due-date for each the program stage and will show same the below enrollment. In health program, a person registered and enrolled, needs to be checked from time to time by health providers. The case update is designed in the same manner so that services which are received by the persons can be updated from time to time when they visit the facility or whenever the health providers need to track.

22.2.2.1.3. Editing person profile

After enrolling a person to a certain program, you can edit profile for that person.

1. Click the second icon under *Operations*, corresponding to the person you would like to edit. Or click the *Edit profile* link in Dashboard of person.
2. Then a dialog box may appear to require you verify the date of birth if it is not verified. You just simply click *OK* to go to the edit page.
3. Click *Update* button to update data and go to his/her dashboard.

22.2.2.1.4. Adding relationship

Now you can add relationships for person. To do that, you have to click on the *Relationship management* icon under *Operations* or click on the *Management* link on *Relationships* section in Dashboard. Then, the management page appears...

To add relationship for a person, you have to click on *Search available person* link to navigate to *search page*.

To register a new person and create relationship with the selected person, click *Register new person* link.

22.2.2.1.5. Change person location and View person details and history

You can change person location by clicking the *Change person location* icon under *Operations* or click on *Change location* link on *Demographics* section in Dashboard.

In addition, you can view all person details and history by click on *Person details and history* icon under *Operations*.

Furthermore, you can download all person details and history in the format of *XLS* or *PDF* by clicking *Download as Excel* or *Download as PDF* button.

22.2.2.1.6. Search persons

The *Search* function is used for searching persons based on full-name, identifiers and person attributes.

To access *Search* function, from the *Services* menu, go the the *Individual Records* option and click on it. Select *Find/Add Person* option on the left menu to proceed. Then, after selecting organisation unit, click on the *Search* button on the right side.

A search form is appeared after clicking. User has to select criteria and input values into the function.

After selecting search type, entering keyword and clicking on *Search* button, the search result will display on the screen, and then user can interact with these persons.

22.2.2.2. Tracking

This function supports the work practices around tracking persons within a health program that have not shown up for a scheduled visit (stage), e.g. that are lost to follow-up.

22.2.2.2.1. Visit Schedule

This will be used to provide the user at a facility or in an area with a list of upcoming visits to better plan for daily/weekly activities. This can also be used as quick navigation to the data entry screen when using the system as a live/real-time data entry system.

Clicking on an event to open the data entry screen, and plan is updated when closing data entry form. The plan (expected visits for the upcoming period) will typically be a mix of recently overdue stages and stages that are non-completed and scheduled for the coming days/week.

After selecting organisation unit on the left panel, select a program in list. Then status which you would like. Select show events since (if any) and Show events up to (if any). Finally, click Show Event List button to get events which are satisfied with searching criteria.

Click *Export XLS* button to export the result to excel file.

22.2.2.2.2. Program Tracking

This function supports the work practices around tracking persons within a health program that have not shown up for a scheduled visit (stage), e.g. that are lost to follow-up.

After selecting organisation unit on the left panel, select a program in list. And click on List All Person button to load all over-due events of persons.

Click on *person's name* to open his/her dashboard.

Click on an *event box* to re-schedule and set status for the selected event or see all tracking history for this event.

To search events by status and some criteria such as name, identifiers or attributes, click on *Search* button next to *List All Persons*. A advanced search criteria is shown. After to fill search key values, click on *Search* button on this form to display result or click on *Send message* button to send a reminder message for person in result.

22.2.2.3. Data entry

22.2.2.3.1. Multiple individual records

The multiple individual records function is where individual data is manually registered in the DHIS database. A list events for each person who enrolled into the selected program after clicking a multi events with registration.

To access the multiple individual records function, from the *Services* menu, go to the *Individual Records* option and click on it. Select *Multiple individual records* option on left menu to proceed.

To start enter data, the first step is to open a list events of person who enrolled a certain program by selecting a program in the list on the main page. Follow these steps:

1. Locate the organisation unit you want to register data for in the tree menu to the left. Expand and close branches by clicking on the +/- symbols. A quick way to find an organisation unit is to use the search box just above the tree (the green symbol), but you need to write in the full name to get a match.

The system loads multi events with registration which belong to the selected organisation unit.

2. Select a program in the list and click on *List All Person* button. An event list of persons who enrolled into the selected program is shown.
3. Click an event to open data entry form.

After filling and selecting data for a form. You have to click on *Run validation* button to check whether your inputs are valid. Then, click on *Complete* button to finish the entry.

22.2.2.3.2. Single event with registration

The data to register is defined by a single event with registration program. The functionality supports health providers to register person information and input data values for a program into one form.

In order to register an event, from the *Services* option, go to the *Individual Records* option and click it. Then select *Single event with registration* option on left menu to proceed.

To list all persons in the selected facility, click *List All Persons* button.

To add new event, select a program in the combo box. And then click *Add new* button.

To update event of a registered person:

1. Click *Advanced search* button. Then enter criterion for searching available persons. The search result is displayed below. User can read the user guide for *Advanced search* function in *Person registration* section.
2. Click on *Data entry* icon - the first icon under *Operations*, corresponding to the person you would like to edit, to update data values for the event.

22.2.2.3.3. Single event without registration

The data to register is defined by a single event without registration program.

To register an event, from the *Services* option, go to the *Individual Records* option and click it. Then select *Single event without registration* option on left menu to proceed.

To list all events in the selected facility, click *List All Events* button.

To remove empty events of the selected program, click *Remove empty events* button.

To add new event, click *Add new* button.

To update an event -

1. Click *Search* button. Then enter criterion for searching person. The person list are displayed below.
2. Click on *Data entry* icon - the first icon, to update value for the event.

22.2.2.4. Reports

The sub module provides two functions for individual reports -

- *Program summary* - View the summary report to get an overview of the services provided for a program.
- *Tabular report* - An interactive reporting tool for tracker-data using tabular presentation with dynamic filters for each person attribute and data element.

22.2.2.4.1. Program summary

The function provides a tool for generating summary list of individual information with color shown on program stages to identify status of receiving services in each stage.

To access the program summary report, choose *Services -> Individual Records > Program summary*.

Select a *organisation unit* which provides services on the left menu. Then on the main page, select *Program*, *Start date*, *End date* to get period. After, select *Use data from level(s)*. There are three levels *Selected*, *Children Only* and *All*. Finally, click *Generate* button.

The result is get based on the date of enrollment of each person who registered the selected organisation unit and enrolled in the selected program in the interval from start-date and end-date what health provider entered.

Click on an event box to display records for this event.

Click on the person box to display the details and history of the selected person.

The color highlight the status of the stages -

- PURPLE: Data entered and uncompleted stages.
- RED: Stages open but no data entered while the date estimated for closing/completing is over.
- YELLOW: Coming stages.
- GREEN: Compete stages.
- GREY: Skipped stages.

22.2.2.4.2. Tabular report

This is an interactive reporting tool for tracker-data using tabular presentation with dynamic filters for each person attribute/data element.

To access the tabular report function, from the *Services* menu, go to the *Individual Records* option and click on it. Select *Tabular report* option below Reports header on left menu to proceed.

To start, the first step is to select a program in the list. Follow these steps:

1. Select a program from list in the left panel. The system will be load person attributes and identifiers which belongs to the selected program and not belong to any program.
2. Choose start-date and end-date. The event list is loaded with report-date between the two dates.
3. Select one or many *organisation units*.
4. In *Identifiers and Attributes* tab, select options to show it into the result.
5. In *Data element* tab, Select a *program stage*. Double-click data elements which you need to show into the result to move it from *Available* field to the *Selected* field



Nota

If the selected program has only one stage, this field is hidden and data element list of the stage is shown in the *Available* field.

6. In the Options tab, there are two options -

- *Use data from level(s)*: Specify the level which you need to get events -

1) *Children only*: Individual data from the children of the selected organisation unit will be aggregated.

2) *Selected*: Individual data from the selected organisation unit will be aggregated.

3) *All*: Individual data from both selected organisation unit and its children will be aggregated.

- *Show hierarchy from level*: The level of organisation units which you want to show. E.g. If an event belongs to an organisation unit in district level and this option is selected as province level, the result is shown with the name of province.

7. Click *Update* button on toolbar. The result is shown on the main page.

To filter data by person attributes, identifiers or data elements, click on the DOWN button on the column corresponding to field which you want to filter. Click *Filter* button and enter value in the field shown.

To clear filter values, click *Clear filter* button on toolbar.

To save parameters on the left panel, click *Favorites* button on toolbar. The select *Manage favorites* option. A form is shown to enter name for favorite and click *Save* button.

To export the result to excel file, click *Download* button, select XLS option.

22.2.2.5. Manual person aggregation

The *Manual person Aggregation* module is used for aggregating individual data and import into aggregated data element. To open *Manual person aggregation* module, from the *Services* menu, go to the *Individual Records* option. Select *Manual Person Aggregation* option on left menu. *Manual person aggregation form* is opened as below -

In the *Person aggregation form* above

1. Select *dataset* from Dataset List to get aggregate values. Note that only datasets which were assigned to at least one organisation unit will be shown in this list.
2. Select a date range from *From* and *To* fields.
3. Select *organisation unit level* where person data will be select to aggregate. There are 3 options -
 - *All*: Individual data from both selected organisation unit and its children will be aggregated.
 - *Children only*: Individual data from the children of the selected organisation unit will be aggregated.
 - *Selected*: Individual data from the selected organisation unit will be aggregated.
4. Click on the *Aggregate* button to execute aggregate function. The *Person aggregation result* page is shown after running successfully.

In *Manual person aggregation result* page -

- Click *Save all values* button to save all aggregated data values .
- Click *Orange arrow* icon next to period name for showing list of aggregated data values at this period. Select only necessary data values and click *Save selected values* to save them
- Click *Show details* icon to view detail information which aggregated.

Capítulo 23. Web API

The Web API is a component which makes it possible for external systems to access and manipulate data stored in an instance of DHIS 2. More precisely, it provides a programmatic interface to a wide range of exposed data and service methods for applications such as third-party software clients, web portals and internal DHIS 2 modules.

23.1. Introduction

The Web API adheres to many of the principles behind the REST architectural style. To mention some few and important ones:

1. The fundamental building blocks are referred to as *resources*. A resource can be anything exposed to the Web, from a document to a business process - anything a client might want to interact with. The information aspects of a resource can be retrieved or exchanged through resource *representations*. A representation is a view of a resource's state at any given time. For instance, the *reportTable* resource in DHIS represents a tabular report of aggregated data for a certain set of parameters. This resource can be retrieved in a variety of representation formats including HTML, PDF, and MS Excel.
2. All resources can be uniquely identified by a *URI* (also referred to as *URL*). All resources have a default representation. You can indicate that you are interested in a specific representation by supplying an *Accept* HTTP header, a file extension or a *format* query parameter. So in order to retrieve the PDF representation of a report table you can supply a *Accept: application/pdf* header or append *.pdf* or *?format=pdf* to your request URL.
3. Interactions with the API requires correct use of HTTP *methods* or *verbs*. This implies that for a resource you must issue a *GET* request when you want to retrieve it, *POST* request when you want to create one, *PUT* when you want to update it and *DELETE* when you want to remove it. So if you want to retrieve the default representation of a report table you can send a GET request to e.g. */reportTable/iu8j/hYgF6t*, where the last part is the report table identifier.
4. Resource representations are *linkable*, meaning that representations advertise other resources which are relevant to the current one by embedding links into itself. This feature greatly improves the usability and robustness of the API as we will see later. For instance, you can easily navigate to the indicators which are associated with a report table from the *reportTable* resource through the embedded links using your preferred representation format.

While all of this might sound complicated, the Web API is actually very simple to use. We will proceed with a few practical examples in a minute.

23.2. Authentication

In order to interoperate with the Web API you will have to authenticate using *Basic authentication*. Basic authentication is a technique for clients to send login credentials over HTTP to a web server. Technically speaking, the username is appended with a colon and the password, Base64-encoded, prefixed Basic and supplied as the value of the *Authorization* HTTP header. More formally that is `Authorization: Basic base64encode(username:password)` An important note is that this authentication scheme provides no security since the username and password is sent in plain text and can be easily decoded. Using it is recommended only if the server is using SSL/TLS (HTTPS) to encrypt communication between itself and the client. Most DHIS 2 deployments typically use SSL today - consider it a hard requirement to provide secure interactions with the Web API.

23.3. Date and period format

Throughout the Web API we refer to dates and periods. The date format is:

```
yyyy-MM-dd
```

For instance, if you want to express March 20, 2012 you must use *2012-03-20*.

The period format is described in the following table.

Tabla 23.1. Period format

<i>Interval</i>	<i>Format</i>	<i>Example</i>	<i>Description</i>
Day	yyyyMMdd	20040315	March 15 2004
Week	yyyyWn	2004W10	Week 10 2004
Month	yyyyMM	200403	March 2004
Quarter	yyyyQn	2004Q1	January-March 2004
Six-month	yyyySn	2004S1	Janary-June 2004
Year	yyyy	2004	2004
Financial Year April	yyyyApril	2004April	Apr 2004-Mar 2005
Financial Year July	yyyyJuly	2004July	July 2004-June 2005
Financial Year Oct	yyyyOct	2004Oct	Oct 2004-Sep 2005

23.4. Working with the meta-data API

With the release of 2.9, a special entry point for meta-data was added in the API, this can be accessed through **/api/metaData**. This section will give a basic introduction to working with this API, for specific synchronization issues, please see INTEGRATION_CHAPTER.

By default, talking to **/api/metaData** will give you everything, rendered as XML. But just as we can define what we want in the general API, we can also do that with **/api/metaData**.

Tabla 23.2. Available Content-Types

<i>Content-Type</i>	<i>Description</i>
application/xml	Returns the meta-data in XML representation
application/json	Returns the meta-data in JSON representation

Tabla 23.3. Available Query Filters

<i>Param</i>	<i>Type</i>	<i>Required</i>	<i>Options (default first)</i>	<i>Description</i>
assumeTrue	boolean	false	true/false	If you don't want everything that /api/metaData gives you by default, when set to false, this option will not return anything by default. You have to enable the resources you want yourself (see below).
{resources}	boolean	false	true/false (default depends on assumeTrue)	Please see /api for available resources. This option will allow you to override the default (which is taken from assumeTrue) and further refine

<i>Param</i>	<i>Type</i>	<i>Required</i>	<i>Options (default first)</i>	<i>Description</i>
				what meta-data you want.
lastUpdated	date	false	Three date formats are supported: 1. YEAR 2. MONTH/ YEAR 3. DAY/MONTH/ YEAR	Filters the meta-data based on the lastUpdated field, this allows you to synchronize meta-data as a nightly job, without downloading everything from the server.

Example: Get a filtered set of meta-data that was updated since August 1st 2012

As described in the last section, there is a number of options you can apply to `/api/metaData` to give you a filtered view. The use-case we will be looking into here, is the case where you want a nightly job that synchronizes organisation units. We will be using *cURL* as the HTTP client.

```
curl -H "Accept: application/xml" -u user:pass {HOST}/api/metaData?assumeTrue=false&organisationUnits=true&lastUpdated=01/08/2012
```

Example: Get meta-data that was updated since february 2012

This example will just the default *assumeTrue* setting, along with getting the last updates from february 2012. This means that every single type that has been updated will be retrieved.

```
curl -H "Accept: application/xml" -u user:pass {HOST}/api/metaData?lastUpdated=02/2012
```

23.5. Example: Sending data values

A common use-case for system integration is the need to send a set of data values from a third-party system into DHIS. In this example we will use the DHIS 2 demo on <http://apps.dhis2.org/demo> as basis and we recommend that you follow the provided links with a web browser while reading (log in with *admin/district* as username/password). We assume that we have collected case-based data using a simple software client running on mobile phones for the *Mortality <5 years* data set in the community of *Ngelehun CHC* (in *Badjia* chieftom, *Bo* district) for the month of January 2012. We have now aggregated our data into a statistical report and want to send that data to the national DHIS 2 instance.

The entry point for the Web API running on the demo instance is <http://apps.dhis2.org/demo/api>. The entry point provides a convenient HTML page with links to all of the available resources in the Web API. The resource which is most appropriate for our purpose of sending data values is the *dataValueSets* resource. A data value set represents a set of data values which have a logical relationship, usually from being captured off the same data entry form. We follow the link to the HTML representation which will take us to <http://apps.dhis2.org/demo/api/dataValueSets>. The default representation is a HTML page which provides us with useful instructions on how to interact with this resources. It tells us that we can use the POST verb to send values using a XML format defined by the *http://dhis2.org/schema/dxf/2.0* namespace:

```
<dataValueSet xmlns="http://dhis2.org/schema/dxf/2.0" dataSet="dataSetID"
  completeDate="date" period="period" orgUnit="orgUnitID">
  <dataValue dataElement="dataElementID" value="1"/>
  <dataValue dataElement="dataElementID" value="2"/>
  <dataValue dataElement="dataElementID" value="3"/>
</dataValueSet>
```

Note: We have omitted the *categoryOptionCombo* attribute as it is optional and not needed for this example. Please refer to the date and period section above for time formats.

From the example we can see that we need to identify the period, the data set, the org unit (facility) and the data elements for which to report. The *dataValueSets* resource description tells us that the identifier for monthly periods should be on the format *yyyyMM* which means that we will use *201201* for January 2012.

To obtain the identifier for the data set we return to the the entry point at <http://apps.dhis2.org/demo/api> and follow the embedded link pointing at the *dataSets* resource located at <http://apps.dhis2.org/demo/api/dataSets>. From there we find and follow the link to the *Mortality < 5 years* data set which leads us to <http://apps.dhis2.org/demo/api/dataSets/pBOMPrpg1QX>. What we did was effectively to retrieve the HTML representation of our data set of interest, and from it we can easily see the identifier, which is *pBOMPrpg1QX*. The resource representation for the *Mortality < 5 years* data set conveniently advertises links to the data elements which are members of it. From here we can follow these links and obtain the identifiers of the data elements. For brevity we will only report on three data elements: *Measles* with id *f7n9E0hX8qk*, *Dysentery* with id *Ix2HsbDMLea* and *Cholera* with id *eY5ehpbEsB7*.

What remains is to get hold of the identifier of the facility (org unit). Again the *dataSet* representation conveniently provides link to org units which report on it so we search for *Ngelehun CHC* and follow the link to the HTML representation at <http://apps.dhis2.org/demo/api/organisationUnits/DiszpKrYNg8>, which tells us that the identifier of this org unit is *DiszpKrYNg8*.

From our case-based data we assume that we have 12 cases of measles, 14 cases of dysentery and 16 cases of cholera. We have now gathered enough information to be able to put together the XML data value set message:

```
<dataValueSet xmlns="http://dhis2.org/schema/dxf/2.0" dataSet="pBOMPrpg1QX"
  completeDate="2012-02-03" period="201201" orgUnit="DiszpKrYNg8">
  <dataValue dataElement="f7n9E0hX8qk" value="12"/>
  <dataValue dataElement="Ix2HsbDMLea" value="14"/>
  <dataValue dataElement="eY5ehpbEsB7" value="16"/>
</dataValueSet>
```

To perform functional testing we will use the cURL tool (<http://curl.haxx.se>) which provides an easy way of transferring data using HTTP. First we save the data value set XML content in a file called *datavalueset.xml*. From the directory where this file resides we invoke the following from the command line:

```
curl -d @datavalueset.xml "http://apps.dhis2.org/demo/api/dataValueSets" -H "Content-Type:application/xml" -u admin:district -v
```

The command will dispatch a request to the demo Web API, set *application/xml* as the content-type and authenticate using *admin/district* as username/password. If all goes well this will return a *200 OK* HTTP status code. You can verify that the data has been received by opening the data entry module in DHIS 2 and select the org unit, data set and period used in this example.

The API follows normal semantics for error handling and HTTP status codes. If you supply an invalid username or password, *401 Unauthorized* is returned. If you supply a content-type other than *application/xml*, *415 Unsupported Media Type* is returned. If the XML content is invalid according to the DXF namespace, *400 Bad Request* is returned. If you provide an invalid identifier in the XML content, *409 Conflict* is returned together with a descriptive message.

In this example, cURL will authenticate to the server through Basic authentication using our supplied username and password as credentials through the *-u* flag.

In a real-world scenario, looking up identifiers, constructing and dispatching XML messages would be the task of the client software application. This software would probably interact with the more machine-friendly XML and JSON resource representations and not the human-friendly HTML representations like we did in this example. Developing creative and robust consumers of the Web API services begins here.

23.6. Example: Sending data values using SDMX-HD

Posting a *dataValueSet* report formatted using the WHO SDMX-HD standard is very similar to the *dxf2* example above. The same *api/dataValueSets* resource is used, but the client has to specify the Content-Type as *application/sdmx+xml*.

The example below shows an SDMX-HD *dataValueSet*:

```
<?xml version="1.0" encoding="UTF-8"?>
<CrossSectionalData xmlns="http://www.SDMX.org/resources/SDMXML/schemas/v2_0/message"
  xmlns:common="http://www.SDMX.org/resources/SDMXML/schemas/v2_0/common"
  xmlns:ns="urn:sdmx:org.sdmx.infomodel.keyfamily.KeyFamily=DHIS2:KF_DHIS2_SIMPLE:1.0:cross"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.SDMX.org/resources/SDMXML/schemas/v2_0/message SDMXMessage.xsd
  urn:sdmx:org.sdmx.infomodel.keyfamily.KeyFamily=DHIS2:KF_DHIS2_SIMPLE:1.0:cross file:../KF_HOSP...

  <Header>
    <ID>OpenMRS-Export</ID>
    <Test>false</Test>
    <Prepared>2012-03-21</Prepared>
    <Sender id="DDU"/>
  </Header>

  <ns:DataSet FREQ="M" TIME_PERIOD="2012-01" FACILITY="DDU" datasetID="KF_HOSP">
    <ns:Group>
      <ns:Section>
        <ns:OBS_VALUE DATAELEMENT="DE001" value="34" />
        <ns:OBS_VALUE DATAELEMENT="DE002" value="36" />
        <ns:OBS_VALUE DATAELEMENT="DE003" value="34" />
        <ns:OBS_VALUE DATAELEMENT="DE004" value="12" />
        <ns:OBS_VALUE DATAELEMENT="DE005" value="5" />
      </ns:Section>
    </ns:Group>
  </ns:DataSet>
</CrossSectionalData>
```

One thing to note is that the SDMX-HD metadata for dataelements, orgunits and datasets are identified using *codes* rather than *uids*. Assuming these coded datasets are present in the DHIS2 server then this can be posted, for example using the curl command below.

```
curl -d @sdmxdatavalueset.xml "http://{server base url}/api/dataValueSets" -H "Content-Type:application/sdmx+xml" -u admin:district -v
```

23.7. Example: Sending large bulks of data values

The previous example showed us how to send a set of related data values sharing the same period and organisation unit. This example will show us how to send large bulks of data values which don't necessarily are logically related.

Again we will interact with the with <http://apps.dhis2.org/demo/api/dataValueSets> resource. This time we will not specify the dataSet and completeDate attributes. Also, we will specify the period and orgUnit attributes on the individual data value elements instead of on the outer data value set element. This will enable us to send data values for various periods and org units:

```
<dataValueSet xmlns="http://dhis2.org/schema/dxf/2.0">
  <dataValue dataElement="f7n9E0hX8qk" period="201201" orgUnit="DiszpKrYNg8" value="12"/>
  <dataValue dataElement="f7n9E0hX8qk" period="201201" orgUnit="FNnj3jKGS7i" value="14"/>
  <dataValue dataElement="f7n9E0hX8qk" period="201202" orgUnit="DiszpKrYNg8" value="16"/>
  <dataValue dataElement="f7n9E0hX8qk" period="201202" orgUnit="Jkhdsf8sdf4" value="18"/>
</dataValueSet>
```

We test by using cURL to send the data values:

```
curl -d @datavalueset.xml "http://apps.dhis2.org/demo/api/dataValueSets" -H "Content-Type:application/xml" -u admin:district -v
```

The data value set resource provides an XML response which is useful when you want to verify the impact your request had. The first time we send the data value set request above the server will respond with the following *import summary*:

```
<importSummary>
```

```
<dataValueCount imported="2" updated="1" ignored="1"/>
<dataSetComplete>false</dataSetComplete>
</importSummary>
```

This message tells us that 3 data values were imported, 1 data value was updated while zero data values were ignored. The single update comes as a result of us sending that data value in the previous example. A data value will be ignored if it references a non-existing data element, period, org unit or data set. In our case this single ignored value was caused by the last data value having an invalid reference to org unit. The data set complete element will display the date of which the data value set was completed, or false if no data element attribute was supplied.

The import process can be customized using a set of import parameters:

Tabla 23.4. Import parameters

<i>Parameter</i>	<i>Values (default first)</i>	<i>Description</i>
dataElementIdScheme	uid name code	Which property on the data element object to reference from the XML attribute
orgUnitIdScheme	uid name code	Which property on the org unit object to reference from the XML attribute
dryRun	false true	Whether to save changes on the server or just return the import summary
importStrategy	new_and_updates new updates	Save objects of all, new or update import status on the server

All parameters are optional and can be supplied as query parameters in the request URL like this:

```
http://apps.dhis2.org/demo/api/dataValueSets?dataElementIdScheme=code&
orgUnitIdScheme=name&dryRun=true&importStrategy=new
```

They can also be supplied as XML attributes on the data value set element like below. XML attributes will override query string parameters.

```
<dataValueSet xmlns="http://dhis2.org/schema/dxf/2.0" dataElementIdScheme="code"
  orgUnitIdScheme="name" dryRun="true" importStrategy="new">
  ..
</dataValueSet>
```

Regarding the id schemes, by default the identifiers used in the XML messages refer to the DHIS stable object identifiers. In certain interoperability situations we might experience that the external system decides the identifiers of the objects. In that case we can use the *code* property of the organisation unit and data element objects to set fixed identifiers dictated by the other system. When importing data values we hence need to reference the code property instead of the uid property, and can do so using the dataElementIdScheme and orgUnitIdScheme paramaters.

23.8. Example: Reading data values

This section explains how to retrieve data values from the Web API by interacting with the dataValueSets resource. Data values can currently be retrieved in XML format. Since we want to read data we will use the *GET* HTTP verb. We will also specify that we are interested in the XML resource representation by including an *Accept* HTTP header with our request. The following query parameters are required:

Tabla 23.5. Data value set query parameters

<i>Parameter</i>	<i>Description</i>
dataSet	Data set identifier

<i>Parameter</i>	<i>Description</i>
period	Period identifier in ISO format
orgUnit	Organisation unit identifier

It is assumed that we have posted data values to DHIS according to the previous section called "Sending data values". We can now put together our request and send it using cURL:

```
curl "http://apps.dhis2.org/demo/api/dataValueSets?
dataSet=pBOMPrpg1QX&period=201201&orgUnit=DiszpKrYNg8" -H "Accept:application/xml" -u
admin:district -v
```

The response will look something like this:

```
HTTP/1.1 200 OK
Content-Type: application/xml

<?xml version='1.0' encoding='UTF-8'?>
<dataValueSet xmlns="http://dhis2.org/schema/dxf/2.0" dataSet="pBOMPrpg1QX"
  completeDate="2012-01-02" period="201201" orgUnit="DiszpKrYNg8">
  <dataValue dataElement="eY5ehpbEsB7" period="201201" orgUnit="DiszpKrYNg8"
    categoryOptionCombo="bRowv6yZOF2" value="10003"/>
  <dataValue dataElement="Ix2HsbDMLea" period="201201" orgUnit="DiszpKrYNg8"
    categoryOptionCombo="bRowv6yZOF2" value="10002"/>
  <dataValue dataElement="f7n9E0hX8qk" period="201201" orgUnit="DiszpKrYNg8"
    categoryOptionCombo="bRowv6yZOF2" value="10001"/>
</dataValueSet>
```

The header tells us that the request was processed successfully and that we are receiving a response in XML format. The XML message looks familiar - it is the data values we sent in the previous section.

23.9. Example: Reading aggregated data values

In order to read aggregated data values you can utilize the `reportTables` resource. This resource lets you retrieve data from predefined report tables as well as custom data responses for any number of indicators, data elements, data sets, periods and organisation units.

23.10. Example: Writing and reading messages

DHIS 2 features a mechanism for sending messages for purposes such as user feedback, notifications and general information to users. Messages are delivered to the DHIS 2 message inbox but can also be sent to the user's email addresses and mobile phones as SMS. In this example we will see how we can utilize the Web API to send and read messages. We will pretend to be the *DHIS Administrator* user and send a message to the *Mobile* user. We will then pretend to be the mobile user and read our new message.

The resource we need to interact with when sending and reading messages is the `messageConversations` resource. We start by visiting the Web API entry point at <http://apps.dhis2.org/demo/api> where we find and follow the link to the `messageConversations` resource at <http://apps.dhis2.org/demo/api/messageConversations>. The description tells us that we can use a POST request to create a new message using the following XML format:

```
<message xmlns="http://dhis2.org/schema/dxf/2.0">
  <subject>This is the subject</subject>
  <text>This is the text</text>
  <users>
    <user id="user1ID" />
    <user id="user2ID" />
    <user id="user3ID" />
  </users>
```

```
</message>
```

Since we want to send a message to our friend the mobile user we need to look up her identifier. We do so by going to the Web API entry point and follow the link to the *users* resource at <http://apps.dhis2.org/demo/api/users>. We continue by following link to the mobile user at <http://apps.dhis2.org/demo/api/users/PhzytPW3g2J> where we learn that her identifier is *PhzytPW3g2J*. We are now ready to put our XML message together to form a message where we want to ask the mobile user whether she has reported data for January 2012:

```
<message xmlns="http://dhis2.org/schema/dxf/2.0">
  <subject>Mortality data reporting</subject>
  <text>Have you reported data for the Mortality data set for January 2012?</text>
  <users>
    <user id="PhzytPW3g2J" />
  </users>
</message>
```

To test this we save the XML content into a file called *message.xml*. We use *cURL* to dispatch the message the the DHIS 2 demo instance where we indicate that the content-type is XML and authenticate as the *admin* user:

```
curl -d @message.xml "http://apps.dhis2.org/demo/api/messageConversations" -H "Content-Type:application/xml" -u admin:district -X POST -v
```

If all is well we receive a *201 Created* HTTP status code. Also note that we receive a *Location* HTTP header which value informs us of the URL of the newly created message conversation resource - this can be used by a consumer to perform further action.

We will now pretend to be the mobile user and read the message which was just sent by dispatching a GET request to the *messageConversations* resource. We supply an *Accept* header with *application/xml* as the value to indicate that we are interested in the XML resource representation and we authenticate as the *mobile* user:

```
curl "http://apps.dhis2.org/demo/api/messageConversations" -H "Accept:application/xml" -u mobile:district -X GET -v
```

In response we get the following XML:

```
<messageConversations xmlns="http://dhis2.org/schema/dxf/2.0"
  link="http://apps.dhis2.org/demo/api/messageConversations">
  <messageConversation name="Mortality data reporting" id="ZjHHSjyyeJ2"
    link="http://apps.dhis2.org/demo/api/messageConversations/ZjHHSjyyeJ2"/>
  <messageConversation name="DHIS version 2.7 is deployed" id="GDBqVfkmnp2"
    link="http://apps.dhis2.org/demo/api/messageConversations/GDBqVfkmnp2"/>
</messageConversations>
```

From the response we are able to read the identifier of the newly sent message which is *ZjHHSjyyeJ2*. Note that the link to the specific resource is embedded and can be followed in order to read the full message. From the description at <http://apps.dhis2.org/demo/api/messageConversations> we learned that we can reply directly to an existing message conversation once we know the URL by including the message text as the request payload (body). We are now able to construct a URL for sending our reply:

```
curl -d "Yes the Mortality data set has been reported" "http://apps.dhis2.org/demo/api/messageConversations/ZjHHSjyyeJ2" -H "Content-Type:text/plain" -u mobile:district -X POST -v
```

If all went according to plan you will receive a *200 OK* status code.

23.11. Example: Writing interpretations

For certain analysis-related resources in DHIS, like charts and report tables, one can share a data interpretation. An interpretation is simply a link to the the relevant resource together with a text expressing some insight about the data. Currently an interpretation can be viewed by all users in the system.

We will start by writing an interpretation for the chart with identifier *EbRN2VIbPdV*. To write chart interpretations we will interact with the <http://apps.dhis2.org/demo/api/interpretations/chart/{chartId}> resource. The interpretation will be the request body. Based on this we can put together the following request using cURL:

```
curl -d "This chart shows a significant ANC 1-3 dropout" "http://apps.dhis2.org/demo/api/interpretations/chart/EbRN2VIbPdV" -H "Content-Type:text/plain" -u admin:district -v
```

Second we will write a comment on the interpretation we just wrote. By looking at the interpretation response you will see that a *Location* header is returned. This header tells us the URL of the newly created interpretation and from that we can read its identifier. This identifier is randomly generated so you will have to replace the one in the command below with your own. To write a comment we can interact with the <http://apps.dhis2.org/demo/api/interpretations/{interpretationId}/comment> like this:

```
curl -d "An intervention is needed" "http://apps.dhis2.org/demo/api/interpretations/j8sjHLkK8uY/comment" -H "Content-Type:text/plain" -u admin:district -v
```

You can also write interpretations for report tables in a similar way by interacting with the <http://apps.dhis2.org/demo/api/interpretations/reportTable/{reportTableId}>. For report tables you can also provide an optional *ou* query parameter to supply an organisation unit identifier in the case where the report table has an organisation unit report parameter:

```
curl -d "This table reveals poor data quality" "http://apps.dhis2.org/demo/api/interpretations/reportTable/xIWpSo5jjT1?ou=O6uvpzGd5pu" -H "Content-Type:text/plain" -u admin:district -v
```

23.12. Example: Embedding reports in web pages

In this example we will see how we can build a simple web page where dynamic data such as tabular reports is pulled from the DHIS Web API. A full example on how this can be done is available at <http://apps.dhis2.org/portal>.

The Web API contains several resources which are useful for data analysis: *report*, *reportTable*, *chart*, *map* and *document*. Dispatching GET requests to the mentioned resources will return meta-data information such as name and the date it was last updated. All these resources have an associated *data* resource which produces a data view of related aggregated data - also known as reports, charts and maps. You can follow the links or simply append */data* to the URL to arrive at it. This information can be represented in a variety of formats including HTML, PDF, Excel, PNG and Jasper, as we will see in the next section.

We start as usual at the Web API endpoint at <http://apps.dhis2.org/demo/api>. We look for a relevant report table by following the *reportTables* link to <http://apps.dhis2.org/demo/api/reportTables>. We assume that we are interested in the "District Maternal Health" report and follow the link to <http://apps.dhis2.org/demo/api/reportTables/xIWpSo5jjT1>. This resource provides meta-data information about the report table. From here we can follow the link to the default data view of aggregated data, which leads us to <http://apps.dhis2.org/demo/api/reportTables/xIWpSo5jjT1/data>. As we can see we are provided with a report table in HTML format, which is the default representation format for report tables.

As stated in the introduction there are three ways of indicating which resource representation format you prefer for the response. The most suitable alternative for direct use in web pages is to append a file suffix to the URL. We assume that we are interested in the PDF representation and indicate that by appending *.pdf* to our URL: <http://apps.dhis2.org/demo/api/reportTables/xIWpSo5jjT1/data.pdf>. Go ahead and try out all valid extensions for this resource which are *.html*, *.pdf*, *.xls* and *.csv*.

The report table can be parameterized with an organisation unit and a period by supplying a *ou* and *pe* query parameter accompanied with an organisation unit identifier and period string in the URL. If not provided the Web API will use the top-most organisation unit in the hierarchy and the last period for the report table content. The organisation unit identifier can be looked up by going to the Web API endpoint and follow the link to the *organisationUnits* resource. For our example we will use *Bo* district with identifier *O6uvpzGd5pu* as the organisation unit: <http://apps.dhis2.org/demo/api/reportTables/xIWpSo5jjT1/data?ou=O6uvpzGd5pu>. From the HTML representation we can see that the report now contains data for *Bo* district. These URLs can simply be used in links embedded in the web page like this:

```
<a href="http://apps.dhis2.org/demo/api/reportTables/xIWpSo5jjT1/data.pdf?"
```

```
ou=O6uvpzGd5pu">Maternal Health Bo District 2012</a>
```

There are many ways to authenticate over the Web and each method has its advantages and disadvantages. For this example we will use an approach where we emulate a login from the web-based login form. To help us we will use the *jQuery* JavaScript library. This JavaScript code should be embedded in the *head* section of the Web page:

```
jQuery(document).ready(function() {
    $.post( "http://apps.dhis2.org/demo/dhis-web-commons-security/login.action", {
        j_username: "admin", j_password: "district"
    }
    );
});
```

In this code block we ask jQuery to send a POST request to the standard authentication point with two name-value pairs containing the username and password information. We assume that the user has the necessary authorities to view reports in the DHIS 2 Web API. If authentication was successful the server will send a HTTP cookie in the response with a session identifier. This will make sure that the current user is authorized to view reports for up to 60 minutes.

Caveat: The username and password will be present in the web page in plain text. Make sure you create a dedicated user in DHIS 2 for this purpose provided only with the minimum authorities required. For a more robust way of exposing resources without requiring authentication see the the section on reverse proxy setup in the installation chapter.

For a full example visit <http://apps.dhis2.org/portal> and view the page source in a browser. Note that the example web page is hosted within the same domain (apps.dhis2.org) as the demo DHIS 2 instance. This is done to avoid issues related to the "same origin policy", a concept which prevents scripts hosted on one domain to access resources running on another. While one can circumvent this through techniques such as *CORS*, there are none which have wide browser support at the moment. Therefore we recommend hosting web pages and portals on the same domain. Techniques using reverse proxies described in the "installation" chapter can be useful in this regard. Finally we provide some sample URLs pointing to various data resources for your inspiration:

- <http://apps.dhis2.org/demo/api/maps/JIXSUIcLsmd/data>
- <http://apps.dhis2.org/demo/api/maps/data?in=JIVMtpjVZqJ&ou=O6uvpzGd5pu>
- <http://apps.dhis2.org/demo/api/reports/Cb2BcgxBUPz/data>
- <http://apps.dhis2.org/demo/api/charts/nwqNUFG9Vky/data>
- <http://apps.dhis2.org/demo/api/charts/data?in=JIVMtpjVZqJ&ou=O6uvpzGd5pu>
- <http://apps.dhis2.org/demo/api/charts/data?in=JIVMtpjVZqJ&ou=O6uvpzGd5pu&periods=true>
- <http://apps.dhis2.org/demo/api/documents/MfHNQx51HT9/data>

23.13. Example: Embedding charts with the Visualizer chart plug-in

In this example we will see how we can embed good-looking Ext JS charts (<http://www.sencha.com/products/extjs>) with data served from a DHIS back-end into a Web page. To accomplish this we will use the DHIS Visualizer plug-in. The plug-in is written in Javascript and depends on the Ext JS library only. A complete working example can be found at <http://apps.dhis2.org/portal/chart.html>. Open the page in a web browser and view the source to see how it is set up.

We start by including three required Javascript files in the header section of the HTML document. The first file is the Ext JS Javascript library (we use the Google content delivery network in this case). The third file is the Visualizer plug-in. Make sure the path is pointing to your DHIS server installation.

```
<script type="text/javascript"
    src="http://extjs-public.googlecode.com/svn/tags/extjs-4.0.7/release/ext-all.js">
</script>
<script type="text/javascript"
    src="http://apps.dhis2.org/demo/dhis-web-visualizer/app/plugin/plugin.js">
</script>
```

To authenticate with the DHIS server we use the same approach as in the previous section. In the header of the HTML document we include the following Javascript inside a script element. The *setLinks* method will be implemented later. Make sure the *base* variable is pointing to your DHIS installation.

```
var base = 'http://apps.dhis2.org/demo/';

Ext.onReady( function() {
  Ext.Ajax.request({
    url: base + "dhis-web-commons-security/login.action",
    method: 'POST',
    params: { j_username: "admin", j_password: "district" },
    success: setLinks
  });
});
```

Now let us have a look at the various options for the Visualizer plug-in. If you want to refer to pre-defined charts already made inside DHIS you should use the *uid* parameter. If you want create dynamic charts you should include the *indicators* and/or *dataelements* parameter and omit the *uid* parameter. Asterisk (*) indicates that a parameter is required only when the *uid* parameter is not used.

Tabla 23.6. Visualizer chart plug-in configuration

<i>Param</i>	<i>Type</i>	<i>Required</i>	<i>Options (default first)</i>	<i>Description</i>
uid	string	No		Identifier of a pre-defined chart in DHIS
type	string	No	column stackedcolumn bar stackedbar line area pie	Chart type
indicators	[string]	Yes*		Identifiers of indicators to include in chart
dataelements	[string]	Yes*		Identifiers of data elements to include in chart
periods	[string]	No	last12Months lastMonth lastQuarter last4Quarters lastSixMonth last2SixMonths thisYear last5Years	Names of relative periods to include in chart
organisationunits	[string]	Yes*		Identifiers of organisation units to include in chart
series	string	No	data period organisationunit	Dimension to use as chart series
category	string	No	data period organisationunit	Dimension to use as chart category
filter	string	No	data period organisationunit	Dimension to use as chart filter
orgUnitIsParent	boolean	No	false true	Whether the chart should display the

<i>Param</i>	<i>Type</i>	<i>Required</i>	<i>Options (default first)</i>	<i>Description</i>
				children of the selected org units
skipAnimation	boolean	No	false true	Whether the initial chart animation should be displayed
showData	boolean	No	false true	Whether to display data on the chart
trendLine	boolean	No	false true	Whether to display trend line(s) on the chart
hideLegend	boolean	No	false true	Whether to hide the chart legend
hideSubtitle	boolean	No	false true	Whether to hide the chart title
userOrganisationUnit	boolean	No	false true	Whether the user of the current user should be included in the chart
userOrganisationUnitChild	boolean	No	false true	Whether the child org units of the current user should be included in the chart
targetLineValue	double	No		Value of target line to display on the chart
targetLineLabel	string	No		Label for target line
baseLineValue	double	No		Value of baseline to display on the chart
baseLineLabel	string	No		Label for baseline
domainAxisLabel	string	No		Label for the domain axis
rangeAxisLabel	string	No		Label for the range axis
el	string	Yes		Identifier of HTML element to render the chart in
url	string	Yes		Base URL of the DHIS server
width	integer	No		Width of chart
height	integer	No		Height of chart
legendPosition	string	No	top right bottom left	Position of chart legend

We continue by including two pre-defined charts and two dynamic charts to our HTML document. You can browse the list of available charts using the Web API here: <http://apps.dhis2.org/demo/api/charts>.

```
function setLinks() {
```

```

DHIS.getChart({ uid: 'R0DVGvXDUNP', el: 'chartA1', url: base });

DHIS.getChart({ uid: 'X0CPnV6uLjR', el: 'chartA2', url: base });

DHIS.getChart({ el: 'chartB1', url: base,
  type: 'bar',
  indicators: ['FnYCr2EAzWS', 'eTDtyyaSA7f', 'tUIlpyeeX9N'],
  periods: 'last12Months',
  organisationunits: ['ImspTQPwCqd']
});

DHIS.getChart({ el: 'chartB2', url: base,
  type: 'column',
  indicators: ['Uvn6LCg7dVU', 'sB79w2hiLp8'],
  periods: 'thisYear',
  organisationunits: ['06uvpzGd5pu', 'fdc6u0vgoji', 'lc3eMKXaEfw', 'jmIPBj66vD6'],
  series: 'data',
  category: 'organisationunit',
  filter: 'period'
});
};

```

Finally we include some *div* elements in the body section of the HTML document with the identifiers referred to in the plug-in Javascript.

```

<div id="chartA1" class="chart"></div>
<div id="chartA2" class="chart"></div>

<div id="chartB1" class="chart"></div>
<div id="chartB2" class="chart"></div>

```

To see a complete working example please visit <http://apps.dhis2.org/portal/chart.html>.

23.14. Example: Creating a chart carousel with the carousel plug-in

The chart plug-in also makes it possible to create a chart carousel which for instance can be used to create an attractive front page on a Web portal. To use the carousel we need to import a few files in the head section of our HTML page:

```

<link rel="stylesheet" type="text/css" href="http://apps.dhis2.org/demo/dhis-web-commons/javascripts/chart.css">
<link rel="stylesheet" type="text/css" href="http://apps.dhis2.org/demo/dhis-web-commons/javascripts/carousel.css">
<script type="text/javascript" src="http://extjs-public.googlecode.com/svn/tags/extjs-4.0.7/require.js"></script>
<script type="text/javascript" src="http://apps.dhis2.org/demo/dhis-web-commons/javascripts/extjs.js"></script>
<script type="text/javascript" src="http://apps.dhis2.org/demo/dhis-web-commons/javascripts/plugin.js"></script>

```

The first file is the CSS stylesheet for the chart plug-in. The second file is the CSS stylesheet for the carousel widget. The third file is the Ext JavaScript framework which this plug-in depends on. The fourth file is the carousel plug-in JavaScript file. The fifth file is the chart plug-in JavaScript file. The paths in this example points at the DHIS 2 demo site, make sure you update them to point to your own DHIS 2 installation.

Please refer to the section about the chart plug-in on how to do authentication.

To create a chart carousel we will first render the charts we want to include in the carousel using the method described in the chart plug-in section. Then we create the chart carousel itself. The charts will be rendered into *div* elements which all have a CSS class called *chart*. In the carousel configuration we can then define a *selector* expression which refers to those div elements like this:

```

DHIS.getChart({ uid: 'R0DVGvXDUNP', el: 'chartA1', url: base });
DHIS.getChart({ uid: 'X0CPnV6uLjR', el: 'chartA2', url: base });
DHIS.getChart({ uid: 'j1gNXBgwKVm', el: 'chartA3', url: base });

```

```

DHIS.getChart({ uid: 'X7PqaXfevnL', el: 'chartA4', url: base });

new Ext.ux.carousel.Carousel( 'chartCarousel', {
    autoPlay: true,
    itemSelector: 'div.chart',
    interval: 5,
    showPlayButton: true
});

```

The first argument in the configuration is the id of the div element in which you want to render the carousel. The *autoPlay* configuration option refers to whether we want the carousel to start when the user loads the Web page. The *interval* option defines how many seconds each chart should be displayed. The *showPlayButton* defines whether we want to render a button for the user to start and stop the carousel. Finally we need to insert the div elements in the body of the HTML document:

```

<div id="chartCarousel">

<div id="chartA1" class="chart"></div>
<div id="chartA2" class="chart"></div>
<div id="chartA3" class="chart"></div>
<div id="chartA4" class="chart"></div>

```

To see a complete working example please visit <http://apps.dhis2.org/portal/carousel.html>.

23.15. Example: Embedding report tables with the table plug-in

In this example we will see how we can embed dynamic data tables in a Web page with data provided from a DHIS back-end server using the table plug-in. The table plug-in resides inside the same file as the chart plug-in so please refer to the section about the chart plug-in above on how to include the required JavaScript and CSS files and how to do authentication. The available table options are listed in the table below.

Tabla 23.7. Table plug-in configuration

<i>Param</i>	<i>Type</i>	<i>Required</i>	<i>Options (default first)</i>	<i>Description</i>
indicators	[string]	Yes*		Identifiers of indicators to include in table
dataelements	[string]	Yes*		Identifiers of data elements to include in table
datasets	[string]	Yes*		Identifiers of data sets to include in table
periods	[string]	No	last12Months lastMonth lastQuarter last4Quarters lastSixMonth last2SixMonths thisYear last5Years	Names of relative periods to include in table
orgunits	[string]	Yes		Identifiers of organisation units to include in table
orgUnitIsParent	boolean	No	false true	Whether the table should display the

<i>Param</i>	<i>Type</i>	<i>Required</i>	<i>Options (default first)</i>	<i>Description</i>
				children of the selected org units
crosstab	string[]	No	data periods orgunit	Which data dimension should be crosstabulated and used as columns
hiddenCols	int[]	No		Zero-based index of the columns in the table which should be hidden
useExtGrid	boolean	No	false true	Whether the table should be rendered as plain HTML or as an Ext JS Grid
el	string	Yes		Identifier of HTML element to render the table in
url	string	Yes		Base URL of the DHIS server

In the following are examples on how the table plug-in can be used.

```

DHIS.getTable({
  indicators: ['Uvn6LCg7dVU'],
  periods: ['last12Months'],
  orgunits: ['ImspTQPwCqd'],
  crosstab: ['periods'],
  orgUnitIsParent: true,
  useExtGrid: false,
  callbackName: 'table1',
  hiddenCols: [0],
  el: 'table1',
  url: base
});

DHIS.getTable({
  dataelements: ['s46m5MS0hXu', 'YtbsuPPo010', 'xc8gmAKf095', 'U0lfIjgN8X6'],
  periods: ['last4Quarters'],
  orgunits: ['ImspTQPwCqd'],
  crosstab: ['data'],
  useExtGrid: false,
  callbackName: 'table2',
  el: 'table2',
  url: base
});

```

Finally we insert in the Web page the div elements which are referred to in the table configuration and used to render the tables.

```

<div id="table1"></div>
<div id="table2"></div>

```

To view a complete working example please visit <http://apps.dhis2.org/portal/table.html>.

You can also choose to provide a link to the report table instead of rendering it directly on the web page. The configuration of the link function is very similar to the table function and shares the *indicators*, *dataelements*, *datasets*,

periods, *orgunits*, *orgUnitIsParent*, *crosstab* and *url* properties. There is only one additional parameter which is listed in the table below.

Tabla 23.8. Link plug-in (additional) configuration

<i>Param</i>	<i>Type</i>	<i>Required</i>	<i>Options (default first)</i>	<i>Description</i>
format	string	No	html xls csv pdf json xml	The representation format of the table, can be HTML, Excel, CSV, PDF, JSON and XML

Below is an example on how to use the link function. The link URL is retrieved from the *getUrl* function and later set as target for a link the HTML document.

```
var url1 = DHIS.getUri({
  indicators: ['Uvn6LCg7dVU'],
  periods: ['last12Months'],
  orgunits: ['ImspTQPwCqd'],
  crosstab: ['periods'],
  orgUnitIsParent: true,
  format: 'xls',
  url: base
});
Ext.get('link1').set({href: url1});
```

The link HTML element can be defined in the body section of the document like below.

```
<a id="link1">Download as Excel</a>
```

To view a complete working example please visit <http://apps.dhis2.org/portal/table.html>.

23.16. Example: Working with SQL views

Executing SQL Views and returning the results of these views has been made possible in version 2.9 of DHIS2. SQL Views are useful for presenting certain data views externally, which may be more easily constructed with SQL than by combining the multiple objects of the Web API. As an example, lets assume we have been asked to provide a view of all organization units with their names, parent names, organization unit level and name, and the coordinates listed in the database. The view might look something like this:

```
SELECT ou.name, par.name as parent, ou.coordinates,
  ous.level,oul.name from organisationunit ou
INNER JOIN _orgunitstructure ous
on ou.organisationunitid = ous.organisationunitid
INNER JOIN organisationunit par on ou.parentid = par.organisationunitid
INNER JOIN orgunitlevel oul on ous.level = oul.level
where ou.coordinates IS NOT NULL
ORDER BY oul.level,par.name,ou.name
```

We will use **curl** to first execute the view on the DHIS2 server. This is essentially a materialization process, and ensures that we have the most recent data available through the SQL View when it is retrieved from the server.

```
curl "http://apps.dhis2.org/dev/
dhis-web-maintenance-dataadmin/
executeSqlViewQuery.action?id=1150154"
-u admin:district -v
```

This **curl** command simply has the internal ID of the view as a single parameter.

The next step in the process is the retrieval of the data. The basic structure of the URL is as follows

```
http(s)://{server}/api/sqlViews/{uid}/data(.csv)
```

The *{server}* parameter should be replaced with your own server. The next part of the URL */api/sqlViews/* should be appended with the specific unique identifier (not the internal ID of the view). Append either *data* for XML data or *data.csv* for comma delimited values. As an example, the following URL would retrieve XML data for the SQL view defined above.

```
curl  
"http://apps.dhis2.org/dev/api/sqlViews/w11jeI9gGAr/data.csv"  
-u admin:district -v
```


Capítulo 24. Integration Engine

DHIS2 has a built in component for managing integration scenarios. The functionality is provided by [Apache Camel](#) which is itself an implementation of the Enterprise Integration Patterns (EIP) described in the book <http://www.eaipatterns.com> by Gregor Hohpe and Bobby Woolf. It complements the web-api by providing the means to consume services from other applications and perform transformations on data. Because integration requirements are always dependent on particular contexts, the integration engine is designed to be configurable on site.

24.1. Introduction

The integration engine is configured by defining *routes*. A route defines a particular message flow from an external system into DHIS2. Routes may consist of timers, http client requests, transformations, message processors, loggers etc. Routes can be defined in XML or in Java. XML routes have the advantage that they can be easily configured and loaded into a running DHIS2 instance. More complex routes might require the greater expressiveness of the Java language. Routes written in Java need to be made available on the classpath of the web application on application startup.

Some sample routes are shown in the sections following. *Disclaimer:* please do not experiment with these routes on a production server. Be sure to test routes thoroughly on a test instance before deploying to production. These routes update metadata and data automatically.

24.2. Synchronising orgunits - an XML route

One use case which motivated the inclusion of the integration engine into DHIS2 is the need to synchronise orgunits. In this example we present a simple XML route which allows one DHIS2 instance to update its orgunits from another DHIS2 instance.

The unavoidable long lines in the route listing may not render well in the DHIS2 user manual. This and other sample routes can be found in the resources section of the DHIS2 source code.

```
<?xml version="1.0" encoding="UTF-8"?>
<route xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://camel.apache.org/schema/spring camel-spring-2.9.1.xsd"
  xmlns="http://camel.apache.org/schema/spring" id="dataUpdater">

  <description>Synch orgunits every 5 minutes</description>
  <!-- trigger every 5 minutes ... -->
  <from uri="quartz://everyHour?cron=0+0/5+*+*+*+%3F"/>
  <!-- filter required elements from metadata export -->
  <setHeader headerName="CamelHttpQuery">
    <constant>assumeTrue=false&amp;organisationUnits=true&amp;organisationUnitGroups=true&amp;org
  </setHeader>
  <!-- send http request -->
  <to
    uri="http://apps.dhis2.org/demo/api/metaData.xml?httpClient.authenticationPreemptive=true&amp;
  <log logName="org.hisp.dhis.camel" loggingLevel="INFO" message="Importing orgunits"/>
  <!-- import to dhis2 component -->
  <inOut uri="dhis2:metadata"/>
  <!-- log the import summary -->
  <log logName="org.hisp.dhis.camel" loggingLevel="INFO" message="${body}"/>
</route>
```

Some notes on the above:

- Note that the route has an id and a description. These are important if you want the route to show up in the Import-Export module.

- Camel components are configured using urls. The trigger expression for the quartz URL should be `cron=0+0+*+*+*+*?` but the "?" character cannot appear unencoded in the XML route, hence the escaped "%3F". Similarly, the "&" is replaced in the query string with "&";
- Additional parameters to the URL such as "authenticationPreemptive" etc are documented for the Camel http component <http://camel.apache.org/http.html>. These are consumed by the camel processor and not sent to the server as part of the request.
- The `dhis2:metadata` endpoint is not part of the camel core. It is a DHIS2 specific component which is available to the author of DHIS2 routes as a destination for importing DXF2 metadata.

24.3. Loading an XML route

Routes like the one in the previous section can be loaded into a running DHIS2 instance through the integration configuration screen found under the Import/Export module. From here routes can be enabled and disabled. The route definition can be updated by adding a new route with the same route id.

DHIS2 also provides a means to automatically load a set of XML routes on application startup. When the application starts it will look for a directory called "routes" under the `DHIS2_HOME` directory. Any XML routes found in that directory will be loaded into the running application.

24.4. Transforming data - a Java route

This route is used internally in the DHIS2 integration module to perform the transformation from SDMX input data to the DHIS2 DXF2 data format. The listing below is a slightly simplified illustration.

```
package org.hisp.dhis.integration.routes;

// imports not shown ....

public class SDMXDataIn
    extends RouteBuilder
{
    @Override
    public void configure() throws Exception
    {
        DescriptionDefinition desc = new DescriptionDefinition();
        desc.setText("Sdmx data input");

        RouteDefinition sdmxDataIn = from("direct:sdmxDataIn").
            convertBodyTo( java.lang.String.class, "UTF-8" ).
            to("xslt:transform/cross2dxf2.xsl").
            convertBodyTo( java.io.InputStream.class).
            inOut("dhis2:data?orgUnitIdScheme=CODE&dataElementIdScheme=CODE&importStrategy=NEW_AND_UPD

        sdmxDataIn.setDescription( desc );
        sdmxDataIn.setId( "internal-sdmx-input" );
    }
}
```

Some notes on the above:

- The DHIS2 integration is configured to automatically scan and load java routes which are in the package `org.hisp.dhis.integration.routes`. So any `RouteBuilder` classes like this, found in the classpath will be automatically loaded.
- This example shows the use of an xslt transform. The url `"xslt:transform/cross2dxf2.xsl"` will search for the xsl file amongst the classpath resources. It is also possible to use an absolute file reference.
- The `dhis2:data` endpoint is a DHIS2 specific component which is available to the author of DHIS2 routes as a destination for importing DXF2 data.

Apéndice A. Guía para la Documentación de DHIS2

A.1. Una panorámica del sistema de documentación de DHIS 2

DHIS2 es un sistema web de gestión de información agregada que está en continuo desarrollo. Dada la naturaleza modular del sistema, su distribución y foco en los usuarios, su naturaleza global de desarrollo, es preciso un sistema de documentación integral. Previamente ya se ha considerado una discusión profunda sobre la necesidad de documentar DHIS2. [Store2007] [DocBook](#) es un sistema exhaustivo basado en XML para crear libros, artículos y otros documentos técnicos bajo el soporte de [OASIS](#).

A.2. Introducción

Una de las principales ventajas de DocBook es que hay una separación total entre el contenido y la presentación. DocBook es un formato puro XML, y está bastante documentado. En realidad con solo un pequeño conjunto de sus funcionalidades se podría lograr mucho mayor calidad de documentación para DHIS. Hay cerca de 400 elementos de marcado distintos que cubren prácticamente todos los niveles de necesidades en la documentación técnica, pero en realidad, con unas pocas docenas de estos elementos se puede lograr una buena calidad de documentación en DHIS2, tanto para formatos impresos como para formatos digitales como HTML o sistemas integrados de ayuda en la propia aplicación. Entonces, hay un amplio margen de posibilidades en términos de qué editor se puede usar para crear ficheros DocBook. [Aquí](#) hay una lista muy completa de posibilidades. Actualmente recomendamos utilizar [Syntext Serna Free](#) para editar los ficheros fuente de DocBook con un editor amigable WYSIWYG. En principio, cualquier programa de edición de texto o XML también es capaz de manejar y crear ficheros para DocBook.



Nota

No recomendamos utilizar el editor XMLmind XML Editor Personal Edition (también conocido como XXE Personal), ya que el editor coloca "imperceptiblemente" espacios en blanco innecesarios y otros adornos en la fuente DocBook que dificultan la edición colaborativa de documentos.

Uno de los conceptos clave a tener en mente al escribir documentación en DocBook, o en otros formatos neutrales de presentación, es que el **contenido** del documento debería ser lo prioritario. La **presentación** del documento se realizará en una fase separada, donde se renderiza a diferentes formatos como HTML o PDF. Por tanto, es importante que el documento esté organizado y estructurado, con las etiquetas apropiadas de DocBook y los elementos estructurales necesarios.

Es bueno practicar dividiendo el documento en varias secciones usando el elemento "section". Los elementos de sección pueden anidarse, como "Sección 1" y "Sección 2". Este concepto es esencialmente el mismo que utilizan Microsoft Word™ u otros programas de procesamiento de textos. DocBook automáticamente anota los números de sección por nosotros al momento de generar el documento. Otros dos elementos importantes son las listas guionizadas ("itemizedlist") y las listas numeradas ("numberedlist"). Otros elementos clave son la captura de pantalla ("screenshot") y las tablas ("table").

A.3. Primeros pasos con Launchpad

Actualmente el sistema de documentación es parte del código fuente alojado en [Launchpad](#). Launchpad es una plataforma colaborativa que permite que muchas personas trabajen en proyectos software de forma colaborativa. Para que esto sea posible es necesario un sistema de control de versiones que maneje todos los cambios realizados por múltiples usuarios. Launchpad utiliza el sistema de control de fuentes llamado *Bazaar*. Aunque se sale del alcance de este documento describir las características de *Bazaar*, los usuarios que deseen crear documentación necesitarán al menos cierta comprensión de cómo funciona el sistema. En la siguiente sección se detalla una guía breve al respecto.

Para comenzar añadiendo o editando la documentación, lo primero es sincronizar el código fuente. Si no disponemos aún de un identificador para loguearnos en Launchpad, necesitaremos obtener uno. Esto podemos hacerlo [aquí](#). Una vez nos hemos registrado en Launchpad, podemos solicitar acceso al archivo de documentadores de DHIS [aquí](#). La solicitud deberá esperar a ser aprobada por el grupo de administradores. Cuando nos hayan concedido acceso al grupo, podemos subir los cambios al archivo de documentación y enviar y recibir emails de la lista de correo del grupo.

A.4. Obtención de la fuente de documentos

Para poder editar la documentación, necesitaremos descargar las páginas fuente de la documentación en nuestra computadora local. Launchpad utiliza un sistema de control de versiones conocido como bazaar, *Bazaar*. Hay diferentes formas de instalar Bazaar en nuestro sistema, dependiendo del sistema operativo que estemos utilizando. Una buena guía por pasos para sistemas operativos Microsoft™ se puede encontrar [aquí](#) y para MacOSX™ [aquí](#). Los usuarios de Linux podrán instalar bazaar en su sistema mediante el gestor de instalación de paquetes, o desde el código fuente.

Cuando tenemos instalado bazaar en el sistema, necesitaremos descargar la fuente de documentación. Simplemente seguiremos este procedimiento:

1. Nos aseguraremos de que Bazaar está instalado.
2. Arrancamos Bazaar haciendo click con el botón derecho del ratón en una carpeta si estamos manejando Windows™ y seleccionamos **Bazaar aquí**. Si usamos Linux, podemos simplemente crear una carpeta para que contenga los fuentes. Podemos colocar los fuentes de documentación en la carpeta que deseemos.
3. Para descargar la última revisión del proyecto de documentación de DHIS2 tipeamos en el terminal de comandos: **bazaar checkout lp:~dhis2-documenters/dhis2/dhis2-docbook-docs** desde Linux o MacOSX, o si usamos Windows™ escribiremos la URL del repositorio de código fuente "lp:~dhis2-documenters/dhis2/dhis2-docbook-docs"
4. El proceso de descarga debería empezar en este momento y se descargarán todos los ficheros fuente de la documentación a la carpeta especificada.

A.5. Editando la documentación

Cuando hayamos descargado los fuentes, deberemos tener un montón de carpetas dentro del directorio dhis2-docbook-docs. Todos los documentos fuente deberían estar ubicados en la carpeta dhis2-docbook-docs/src/docbkx/XX. Notemos aquí que XX representa la pareja de letras de codificación de idioma ISO 639-1. Entonces, para elaborar la documentación en idioma inglés, nos ubicaremos en la carpeta /dhis2-docbook-docs/src/docbkx/en/, mientras que para elaborar la documentación en español trabajaremos siempre en la carpeta /dhis2-docbook-docs/src/docbkx/es/. Ubicaremos los ficheros imagen deseados para enlazarlos en nuestros documentos en la carpeta /dhis2-docbook-docs/src/docbkx/XX/resources/images y los enlazaremos desde el documento DocBook utilizando un enlace relativo al fichero. Cuando la documentación ya se ha generado, en otra fase, las imágenes se copiarán al directorio correspondiente.

A.6. Manejando imágenes

Las capturas de pantalla son imágenes muy útiles para dar instrucciones a los usuarios sobre cómo llevar a cabo acciones concretas. DocBook no tiene mecanismos intrínsecos para saber exactamente cómo se debe renderizar una imagen en el documento final. Por eso es necesario dar ese detalle mediante atributos de elementos. El fragmento de código XML muestra cómo podemos especificar que una imagen ocupe el 80% de la anchura de página. Para capturas de pantalla en formato horizontal, esta cantidad parece apropiada. Tal vez queramos experimentar un poco para obtener el ancho más adecuado para nuestras imágenes. Una alternativa es editar la resolución de la imagen, para obtener un tamaño adecuado al renderizar.

```
<screenshot>
  <screeninfo>DHIS2 Login screen</screeninfo>
  <mediaobject>
    <imageobject>
      <imagedata fileref="dhis2_login_screen.jpg" format="JPG" width="80%"/>
    </imageobject>
  </mediaobject>
</screenshot>
```

```
</mediaobject>
</screenshot>
```

Para otras imágenes pueden precisarse valores distintos dependiendo de su tamaño. Si no tenemos una anchura específica para las imágenes y el tamaño real es mayor que el ancho de pantalla, la imagen puede desbordar algunos tipos de documento con anchura fija, como los PDF.

A.7. Cómo enlazar documentos

DocBook tiene un entorno modular donde es posible enlazar muchos documentos distintos en un mismo documento master. Los fragmentos de esos documentos deberían montarse en forma de artículo o capítulo. Los capítulos son partes esenciales de un libro, de modo que se pueden enlazar de nuevo en un documento mayor con facilidad. Los artículos son generalmente documentos independientes, pero también pueden combinarse en un documento mayor que los contenga.

Si queremos enlazar muchos artículos en un libro, DocBook ofrece un mecanismo para asignar un identificador a cada sección. En el ejemplo siguiente, cada sección tiene asignado un identificador ("id"). Este identificador debe ser único en todo el documento.

```
<section id="mod2_1">
<title>Getting started with DHIS2</title> ....
```

In order to include an article into a book, an Xinclude statement must be used. The following example shows how.

```
<chapter>
<title>Getting started with DHIS2</title>
<xi:include xmlns:xi="http://www.w3.org/2001/XInclude" href="dhis2_user_man_mod2.xml"
  xpointer="mod2_1" encoding="UTF-8"/>
...
```

Notemos que el nombre del fichero y el identificador se asignan en el documento padre, con referencia al fichero actual (href) y a un fragmento concreto del documento hijo que debería referenciarse en el documento padre (xpointer).

Es sencillo incluir capítulos en un libro. Este ejemplo muestra cómo hacerlo:

```
<xi:include xmlns:xi="http://www.w3.org/2001/XInclude" href="dhis2_user_man_
mod1.xml" encoding="UTF-8"/>
```

En este caso no hay necesidad de referenciar explícitamente una parte del documento, a menos que solo queramos incluir una parte del capítulo. Si queremos utilizar una sección del capítulo, podemos asignar un "id" a esa sección, y luego referenciarla mediante un "xpointer".

A.8. Manejando documentación en varios idiomas

La estructura del directorio de documentación ha sido creada para facilitar la generación de documentos en cualquier idioma. Si queremos crear un nuevo conjunto de documentos en un determinado idioma, simplemente crearemos un nuevo directorio en la carpeta `dhis2-docbook-docs/src/docbkx/` y lo llamaremos "XX" reemplazando las x por el código de idioma. Debemos asegurarnos de utilizar un código ISO 639-1 para el idioma en el que escribiremos los documentos. Hay una lista completa de estos códigos [aquí](#). Añadiremos una nueva subcarpeta para las imágenes. Debemos también generar una copia del fichero `pom.xml` en el directorio `dhis2-docbook-docs`, y lo nombraremos `XX-pom.xml` y adaptaremos a nuestro árbol nuevo de directorios (ver los ficheros `pom.xml` y `es-pom.xml` como ejemplo). Si no estás seguro de cómo hacer los cambios necesarios en este fichero, pregunta en la lista de correo primero, ya que estos ficheros `pom` controlan la generación de toda la documentación.

A.9. Cómo generar la documentación

Una de las ventajas cruciales del formato DocBook es que la documentación fuente puede transformarse en gran variedad de formatos como HTML, HTML truncado, XHTML, PDF, y muchos otros. Hay variedad de herramientas

capaces de realizar esta transformación. Básicamente las páginas XML fuente se transforman utilizando las páginas de estilo XSL de DocBook en el formato deseado. No hemos incluido aquí la lista completa de herramientas capaces de transformar DocBook, pero a continuación damos algunos ejemplos.

Las últimas generaciones de documentación están disponibles en [el sitio web de DHIS2](#). La últimas versiones están disponibles mediante el servidor de integración continua ubicado [aquí](#).

A.9.1. Generar la documentación con Apache maven

Para transformar los ficheros de documentación fuente en distintos formatos, como HTML y PDF, necesitaremos instalar el programa de Apache Maven. Podremos obtener una copia [aquí](#) o instalándolo mediante el gestor de paquetes en Linux. En el terminal ejecutaremos el comando **mvn clean package** en Windows, MacOSX o Linux desde el directorio `/dhis2-docbook-docs`. Maven comenzará a descargar los componentes necesarios para convertir los documentos en HTML, PDF y RTF. Cuando el proceso haya terminado (hemos de ser pacientes la primera vez, ya que hay muchos componentes que descargar), podremos generar todo tipo de documentos en el directorio `dhis2-docbook-docs/target/docbkx` y los subdirectorios correspondientes.

A.9.2. Generar la documentación con xmlto

xmlto es una utilidad disponible en plataformas Linux para convertir documentos de DocBook en diversos formatos. Es posible encontrar más información sobre este paquete [aquí](#). Si por alguna razón no queremos utilizar Apache Maven, podremos instalar **xmlto** mediante el gestor de paquetes. Después de instalar **xmlto** bastará con ejecutar **xmlto htmlfile_to_transform** donde el parámetro *file_to_transform* es el nombre del fichero que deseamos convertir. Hay otros formatos disponibles como PDF, PS, Java Help y otros.

A.10. Cómo subir los cambios a Launchpad

Una vez hemos terminado de editar los documentos, deberemos subir los cambios a Launchpad mediante la acción "commit". Abrimos un terminal y navegamos a la carpeta donde tenemos la documentación. Si hemos añadido nuevos ficheros o carpetas en el repositorio local, necesitaremos añadirlos al árbol de fuente con el comando **bzr add** seguido de la ruta al fichero o carpeta añadido. Después de añadir todos los ficheros, deberemos actualizar el repositorio local para asegurarnos de que no hay conflictos utilizando en comando **bzr update**

Si hay conflictos, Bazaar nos notificará esto. Los conflictos se pueden listar usando el comando **bzr conflicts**. Si hay conflictos en un fichero, Bazaar creará tres versiones de ese fichero :

- *filename.BASE*
- *filename.THIS*
- *filename.OTHER*

Estos ficheros corresponden a partes comunes del fichero, a la versión local y a la versión del servidor respectivamente. Los ficheros contendrán marcadores para indicar las áreas en conflicto. Después de resolver los conflictos editando cada fichero y eliminando los marcadores de conflicto, utilizaremos el comando **bzr resolve**. Esto indica a Bazaar que el conflicto ha sido resuelto, y eliminará los ficheros BASE, THIS, OTHER.

Cuando nuestro código fuente está actualizado y se han resuelto los conflictos que hubiese, podemos subir los cambios incluyendo un mensaje informativo acerca de los cambios realizados:

```
bzr commit -m "Created Aymara translation of documentation"
```



Importante

No debemos nunca subir el código utilizando el comando **bzr push**, que sobrescribe todos los cambios en el repositorio, y el historial de revisión se perdería.

Si tienes alguna duda sobre cómo utilizar la documentación, o no consigues saber cómo empezar, envía un email con tus preguntas a [<dhis2-documenters@lists.launchpad.net>](mailto:dhis2-documenters@lists.launchpad.net).

Glosario de DHIS2

A

Agregar En el contexto de DHIS2, agregar se refiere a cómo se reúnen y combinan los elementos de datos en una determinada relación jerárquica. Por ejemplo, todos establecimientos de salud de un determinado distrito contribuyen al valor total de dicho distrito en cuestión. La aplicación DHIS2 permite diferentes tipos de operadores de agregado, tales como SUMA, PROMEDIO y CONTEO.

Agregado de datos En el contexto de DHIS2, se entiende por datos agregados los elementos de datos o los indicadores generados a través de otras fuentes jerárquicas de datos. Por ejemplo, los datos agregados de un establecimiento de salud son el resultado de los totales agregados de todos los pacientes que fueron atendidos en ese establecimiento para un servicio de atención determinado. Los datos agregados de un distrito son el resultado de los totales agregados de todos los establecimientos de salud que pertenecen a ese distrito.

C

Categoría Las categorías se utilizan para desagregar elementos de datos. Como ejemplo, el elemento de datos "Número de casos confirmados de malaria" puede desagregarse en la categoría "Edad", que a su vez alberga las opciones de "Menor de 1 año", "De 1 a 5 años" y "Mayor de 5 años". Las opciones de categoría se utilizan en la entrada de datos para simplificar el número de elementos de datos que es preciso crear. En el análisis de datos, las categorías funcionan básicamente como dimensiones del análisis.

D

Datamart Es un conjunto de las tablas de bases de datos en DHIS2 que contiene valores procesados de elementos de datos e indicadores, generados en base a reglas de agregado, cálculo de elementos de datos y fórmulas de indicadores. Las tablas datamart se utilizan en el análisis de datos y la generación de reportes. Generalmente, los usuarios no trabajan directamente con valores de datos no agregados, sino con valores que son ya el resultado de una exportación de datamart lista para el análisis.

Denominador El divisor de un indicador. Puede estar formado por varios elementos de datos combinados en una fórmula (utilizando a su vez operaciones de suma, sustracción, multiplicación y división).

Diccionario de datos Es un conjunto de elementos de datos e indicadores que pueden intercambiarse con otros sistemas DHIS. Generalmente se utilizan para definir un set de elementos de datos y de indicadores al configurar inicialmente el sistema DHIS.

Dimensión Las dimensiones son los criterios de clasificación de elementos de datos en el análisis. Las dimensiones proporcionan un mecanismo para agrupar y filtrar datos en base a características comunes. Generalmente podremos agregar o filtrar elementos de datos relacionados entre sí durante el análisis utilizando dimensiones. Las dimensiones pueden ser parte también de una jerarquía. Por ejemplo, la dimensión "Periodo" puede a su vez dividirse en "Día->Mes->Trimestre->Año".

DXF Ver Formato de intercambio de datos, por sus siglas en inglés, "Data exchange format".

E

Elemento de datos El elemento de datos es la piedra angular de DHIS2. Es una unidad atómica de datos con un significado propio y bien definido. Básicamente es un valor de datos que se

ha observado o registrado y que se caracteriza por unas dimensiones determinadas. Un ejemplo de elemento de datos sería el "Número de niños inmunizados", que contiene el número de niños y niñas que han recibido este servicio concreto de vacunación. Los elementos de datos están ligados siempre a un periodo y a una unidad organizativa. También pueden estar enlazados a otras dimensiones.

F

Formato de intercambio de datos En el contexto de DHIS2, el "Formato de intercambio de datos" se refiere a un esqueleto XML que permite trasladar datos y metadatos entre instancias desconectadas de DHIS, así como entre diferentes aplicaciones que soportan formatos DXF.

G

Grupo de elementos de datos Los grupos de elementos de datos se utilizan para clasificar los múltiples elementos de datos de acuerdo a un tema común, como por ejemplo "Inmunización" o "TARV". Generalmente, se utilizan para los reportes o análisis con el fin de poder analizar conjuntamente elementos de datos relacionados entre sí.

I

Indicador Un indicador es un valor obtenido de los datos de salud y calculado mediante una fórmula, generalmente un cociente. Los indicadores se utilizan para el análisis de datos, ya que aportan mayor información que los propios datos en bruto.

$$indicator = \frac{numerator}{denominator} \quad (1)$$

N

Nivel de una unidad organizativa Es el nivel de profundidad en una jerarquía organizativa. Normalmente cada país tiene diferentes niveles administrativos, como 1) Nacional 2) Departamental 3) Distrital 4) Establecimientos de salud. En el contexto de DHIS2, los establecimientos de salud son normalmente los niveles más bajos en la jerarquía. Desde aquí, los datos son agregados hacia arriba desde el nivel más bajo hasta el nivel más alto.

Numerador El dividendo de un indicador (recordemos que un indicador es un cociente). Puede estar formado por varios elementos de datos y factores combinados utilizando las fórmulas disponibles para el cálculo de indicadores.

O

Unidad Organizativa Una unidad organizativa es normalmente también una unidad geográfica, que existe en una determinada jerarquía. Por ejemplo, en Colombia, "Cauca" sería considerada una unidad organizativa a nivel de "Departamento". Las unidades organizativas pueden utilizarse también para especificar una unidad administrativa, como puede ser una sección específica en un hospital. La dimensión de una unidad organizativa específica esencialmente "dónde" se encuentra un valor de dato determinado.

P

Periodo	Un periodo es un intervalo de tiempo concreto conformado por una fecha de inicio y una fecha de fin. Por ejemplo, "Enero 2012" sería el periodo comprendido entre el 1 de enero de 2012 y el 31 de enero de 2012.
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S

Set de grupo de elementos de datos	Los grupos de elementos de datos sirven para clasificar múltiples grupos de elementos de datos en torno a un criterio común.
Sistema de Información Geográfica	Es una aplicación de visualización y edición de mapas que permite introducir, almacenar, manipular y analizar información geográficamente referenciada. Por ejemplo, la aplicación DHIS2 incorpora algunas funcionalidades de SIG que permiten la ubicación de unidades organizativas en mapas y la visualización de indicadores por regiones geográfico-administrativas tales como distritos, provincias, etc.
Sistema de Gestión de la Información de Salud	Generalmente es un sistema digital de bases de datos utilizado para registrar datos agregados de provisión de servicios de salud, incidencia de enfermedades, recursos humanos y otra información utilizada para evaluar el funcionamiento de la provisión de servicios de atención de salud. Normalmente un SGIS no contiene datos muy detallados de sistemas de registro de historia clínica electrónica o de datos individuales de paciente. La aplicación DHIS2 es un Sistema de Gestión de Información de Salud con alguna capacidad extra para incorporar datos de paciente.

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