

# INF5750 Oct 1st 2007

HISP  
Health Information Systems Programme

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# Overview of this lecture

- ✓ Introduction to HISP
  - ✓ Health information systems (basics)
  - ✓ The DHIS software
- And please interrupt me, participation is encouraged!

# What is HISP?

- ✓ Health Information Systems Programme
- ✓ Global network of individuals and organisations
  - ✓ Academic institutions
  - ✓ Non-governmental organisations
  - ✓ Governmental organisations
  - ✓ Free-lancers
- ✓ A South-South-North collaboration

# Why HISP?

- ✓ The overall objective of HISP is to improve health information systems (HIS) in developing countries
- ✓ In many developing countries killer diseases (like HIV/AIDS) and poor health services hamper human, social and economic developments
- ✓ Appropriate information and HIS are seen as crucial to strengthen the health systems in developing countries
- ✓ 3 of 8 Millennium Development Goals (MDGs) are related to health
- ✓ Despite huge economical efforts (incl. Norwegian funding) most HIS initiatives tend to fail to sustain over time

# HISP objectives

- ✓ To support local management of health care delivery and information flows
- ✓ Design, implement and sustain HIS following a participatory approach
- ✓ Facilitate the spread of best practices and software within and across developing countries

# How did it all begin?

- ✓ Started as a small pilot project in one district in Western Cape, South Africa in 1994
- ✓ Collaboration between University of Oslo and University of Western Cape, funded by NORAD
- ✓ Just after the fall of Apartheid, political context of change and local empowerment
- ✓ Objective to support a district-level health information system
- ✓ The DHIS software was developed following Scandinavian IS research methodologies

# Why did it take off?

- ✓ Based on the relative success in one district the Eastern Cape province wanted the project and soon other provinces followed
- ✓ The DHIS became the national standard for HIS in SA in 1999
- ✓ Flexible software, a simplistic approach and an academic network facilitated the “transfer” of HISP to Mozambique in 2001 and later to many more countries in Africa and Asia

# HISP anno 2007 is truly global





# HISP components

## ✓ Research and Education

- ✓ Important contribution to the research field of information systems in developing countries
- ✓ PhD school (more than 20 international PhD students)
- ✓ International masters programmes (local masters and in Oslo)

## ✓ Software development

- ✓ Global open source sw development
- ✓ DHIS 1.4 and DHIS 2 used in several countries

## ✓ Project implementation

- ✓ Supporting/responsible for HIS implementation in many countries (South Africa, Nigeria, Botswana, Zanzibar, Zambia, 3-4 states in India, Malawi, Mozambique, Vietnam, Ethiopia)

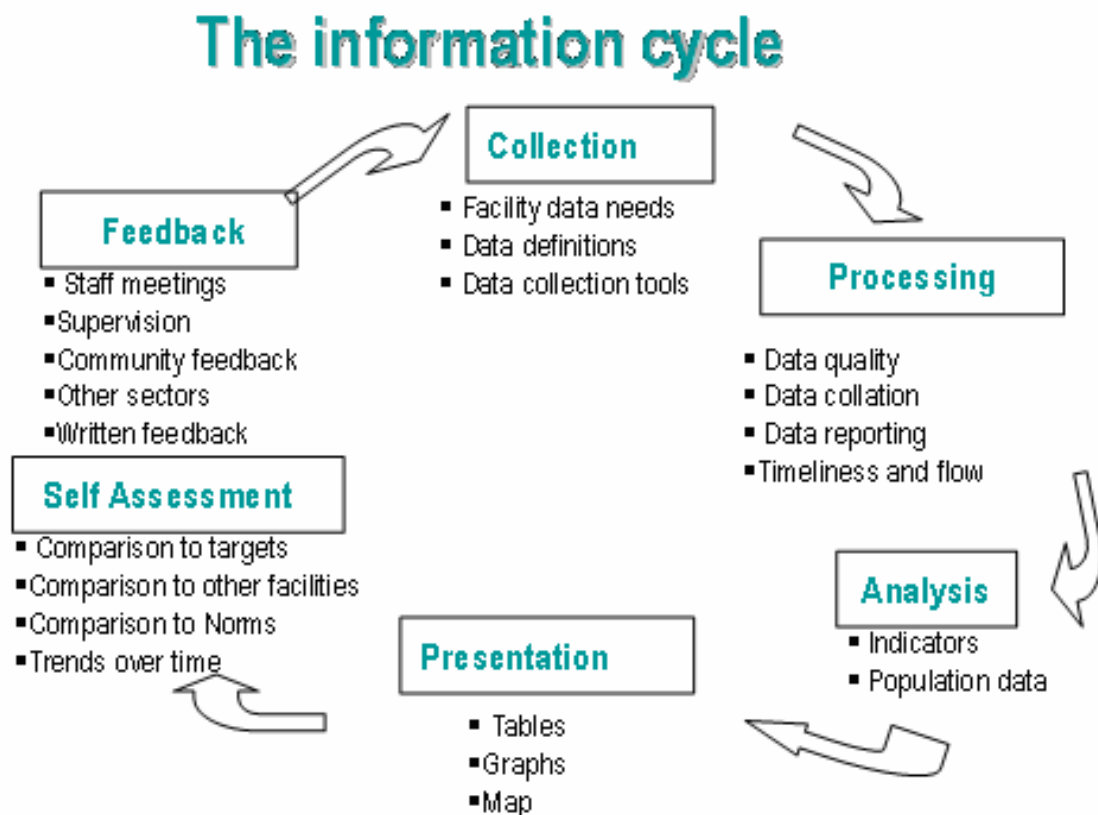
Funded by Norwegian government (NORAD, NFR), EU, UNAIDS, various local governments

# Health Information systems (HIS)

Our main focus: Primary Health Care (PHC) and Routine HIS

- ✓ Primary health care:
  - ✓ first level health care, in the community (*helsestasjon og fastlegetjenesten* in Norway)
  - ✓ focus on mothers and children and killer diseases (HIS/AIDS, Tuberculosis, Malaria)
- ✓ Routine HIS:
  - ✓ Aggregated data (numbers not names)
  - ✓ Typically monthly or quarterly data reporting from clinics to districts to province to ministry
  - ✓ To support local health management

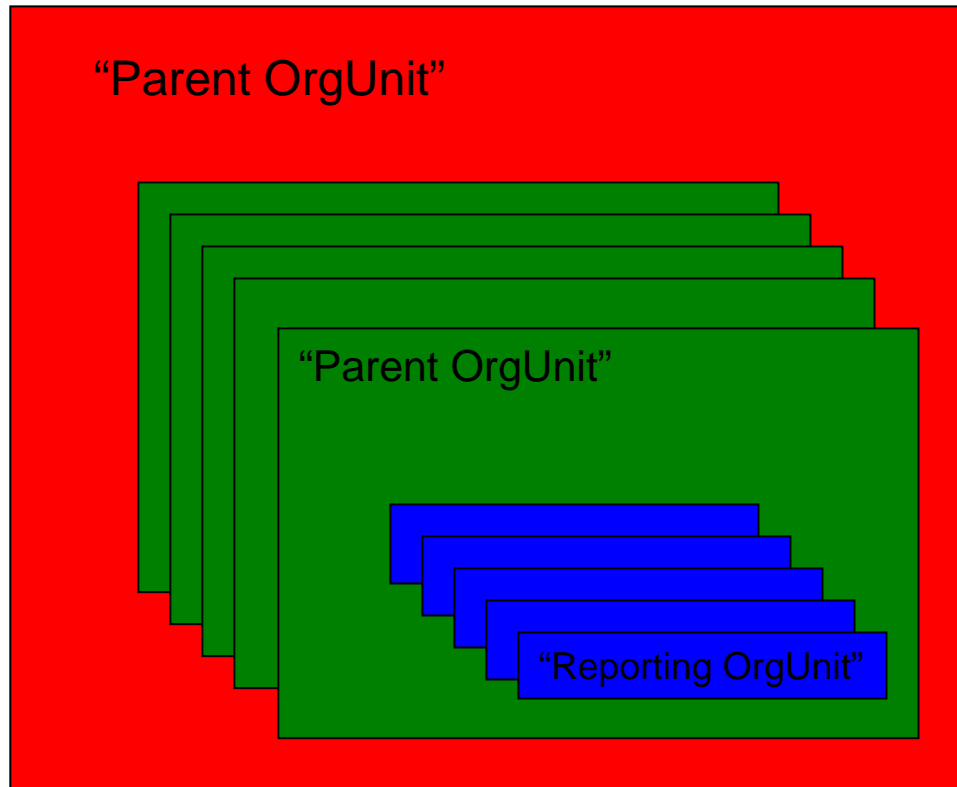
# HIS activities - The Information Cycle



# Main components of a (paper-based) HIS

- ✓ An organisational hierarchy
  - ✓ service-delivery and administrative units
- ✓ Datasets/forms/reports
  - ✓ Sets of data elements are collected together in specific forms that are used to report up the hierarchy
- ✓ The data flow
  - ✓ The data is aggregated at a given frequency at the health facilities (service-delivery units) and reported up one level
  - ✓ The other levels collate/summarise the data and report a summary report to the level above

# The Organisational Hierarchy



Country

Health district

Facility

Reporting OrgUnits belong to parent OrgUnits, which are either physical health facilities (clinics, hospitals) or administrative OrgUnits arranged in a hierarchical structure. Parent OrgUnits can also be reporting OrgUnits, but the norm is to collect as much data as possible at the lowest level.

# Reporting Forms

- Typically a health programme (HIV/AIDS, RCH, Immunisation etc.) has its own form
- Contain 100-1000 values
- Monthly or quarterly frequencies most common
- Most forms have a tabular design due to the many categories of data (age groups, gender etc.)
- Are often used both as collection tools and reports for monitoring

Look at Immunisation example from Zanzibar

# Strategies for computerisation of HIS

- ✓ The reporting-system approach:
  - ✓ the most common approach
  - ✓ one form is one table with one column per value (data item)

Table: ImmunisationData

| OrgUnit                 | Period | BCG<1 | DPT<1 | Measles<1 |
|-------------------------|--------|-------|-------|-----------|
| Blindern health station | Sep-07 | 10    | 9     | 9         |
| Majorstua health clinic | Sep-07 | 13    | 12    | 13        |
| Sogn health post        | Sep-07 | 15    | 14    | 15        |
| Kringsjø health station | Aug-07 | 8     | 8     | 8         |

- Very fixed format ("hard-coded" forms), little flexibility
- Quick data retrieval for standard reports where data items are known
- Good for a pure reporting system, same data in and out

# Strategies for computerisation cont.

## ✓ The HISP approach:

- ✓ More fine-grained: break up the form into *data elements* with unique definitions
- ✓ A form is a collection of data elements (a data set)

DataValue

| OrgUnitID | DataElementID | PeriodID | Value |
|-----------|---------------|----------|-------|
| 1         | 1             | 2        | 10    |
| 1         | 2             | 2        | 9     |
| 1         | 3             | 2        | 9     |

DataElement

| DataElementID | DataElementName  |
|---------------|------------------|
| 1             | BCG < 1 year     |
| 2             | DPT < 1 year     |
| 3             | Measles < 1 year |

OrgUnit

| OrgUnitID | OrgUnitName             |
|-----------|-------------------------|
| 1         | Blindern health station |
| 2         | Majorstua health clinic |
| 3         | Sogn health post        |

- Snowflake/Star database pattern
- Very flexible
- Data retrieval slower when huge amounts of data



# The HISP approach cont.

- ✓ Separate input (data collection) and output (analysis)
- ✓ Data Analysis is much more than the standard collection tools (reports)
  - ✓ Use of Indicators to compare and monitor coverage etc.
    - ✓  $BCG \text{ coverage} < 1 \text{ year} = BCG < 1 \text{ year} / \text{Population} < 1 \text{ year}$
  - ✓ Use of groups (compare categories of data and orgunits)
  - ✓ Dynamic view of the data in pivot tables, dashboards, ad-hoc reports etc.
- ✓ Flexibility to meet changes and new areas of interest (key strength of HISP)
  - ✓ example from Tanzania

# Trends in HIS

- ✓ Towards a data warehouse approach
  - ✓ The number of computerised systems available is quickly increasing, towards one for each vertical health programme
  - ✓ Increased need for data integration and monitoring across health programmes
  - ✓ Increased availability of reasonable internet connections in many developing countries opens up for online data presentation
  
- ✓ The DHIS itself can be seen as a data warehouse
  - ✓ Still limitations to how much data that can be integrated in the DHIS
  - ✓ Need to look at other data integration approaches
    - ✓ DHIS data presentation layer on top of a “virtual database” integrating various data sources
    - ✓ example from India

# HISP software – The DHIS

## ✓ DHIS 1.4

- ✓ MS Access/VB 6
- ✓ Developed in South Africa
- ✓ Large user base in Sub-Saharan Africa (80 %)

## ✓ DHIS 2

- ✓ Java open source web frameworks
- ✓ Developed mainly in Norway, but also in India, Ethiopia and Vietnam
- ✓ Large user base in 3-4 states in India, 2 provinces in Vietnam

## ✓ DHIS Data Warehouse

- ✓ Customisation of third-party software
  - ✓ Pentaho, BIRT, KIDS
- ✓ Developed in Norway and Tanzania
- ✓ Compatible with both DHIS 1.4 and DHIS 2
  - ✓ can use database or API as data source
- ✓ Still limited use (very new), but huge potential

**It's all open source**

# DHIS 1

- ✓ First version already in 1996
  - ✓ Developed for one pilot district in Cape Town, SA
  - ✓ Became national standard for HIS in SA in 1999
  
- ✓ Followed the Scandinavian tradition of systems development methods
  - ✓ user participation
  - ✓ evolutionary prototyping
  - ✓ bottom-up
  
- ✓ Developed “in the field”
  
- ✓ Small closed and long-term development team with 1-3 developers
  - ✓ main developer is now expert in health information
  - ✓ short release cycles
  
- ✓ DHIS 1.4 released in May 2006, now version 1.4.0.87

# DHIS 1 pros and cons

## Pros:

- ✓ A very good design-business fit
- ✓ Flexible and relatively simple to use (user base expanded from 1 district to 10 countries)
- ✓ Integrated with Excel pivot tables for dynamic data analysis

## Cons:

- ✓ Not web-enabled
- ✓ Not a modular or layered architecture (“one big block”)
  - ✓ difficult to distribute development
  - ✓ difficult to add local functionality
- ✓ Lack of flexible report tools

# DHIS 2

## ✓ Background

- ✓ process started in 2004
- ✓ need for a web-enabled DHIS
- ✓ need for a modular architecture to distribute sw development in the HISP network
- ✓ need for OS and database independence

## ✓ Technologies and tools

- ✓ Spring, Hibernate, WebWork, Maven, Subversion

# DHIS 2 development

- ✓ First release (2.0-M1) in February 2006
  - ✓ The current release is M7
- ✓ Development so far mainly in Oslo
  - ✓ Master students, 1 employed programmer
- ✓ Participation in other nodes is increasing
  - ✓ India, a dashboard module, local modules for reporting
  - ✓ Ethiopia, special module for ICD-based data (MM module), local reports
  - ✓ Vietnam, local reports, active on the internationalisation module

# DHIS 2 communication platform

- ✓ The confluence wiki for collaborative documentation
- ✓ The Trac issue tracker for bug tracking and project management
- ✓ Subversion for source control management
- ✓ Mailing list for developers and a subversion commit-list (scm)

A typical infrastructure for larger open source projects



# DHIS 2 pros and cons

## Pros:

- Web-enabled, can be used offline and online
- OS and DBMS independency with java and Hibernate
- Flexible configuration ( modular web portal )
- Architecture and dev. process supports distributed development

## Cons:

- slow GUI
- slow processing of large amounts of data
- complex core module (transaction management, user security, assembly of portal etc.)
- difficult to grasp the frameworks

# DHIS Data Warehouse

- ✓ For web-based presentation and analysis of the DHIS data
- ✓ Compatible with both DHIS 1 and 2
  - ✓ important glue between the two to make the transition more seamless
- ✓ Making use of third-party software
  - ✓ Pentaho Open Source Business Intelligence, [www.pentaho.com](http://www.pentaho.com)
  - ✓ BIRT (Business Intelligence and Reporting Tools), <http://www.eclipse.org/birt>
  - ✓ KIDS (Key Indicators Data Systems), <http://kids.fao.org>
- ✓ Important step for HISP in order to compete in an increasingly tough market

# DHIS Data Warehouse cont.

## Functionality:

- ✓ Online reports
  - ✓ for monitoring and feedback
  - ✓ accessible to stakeholders at different levels
  - ✓ both standard and ad-hoc
- ✓ Dashboards
  - ✓ Quick monitoring of the health status
  - ✓ Interactive charts and tables
  - ✓ Key indicators and customised to user (health programme specific, MDG, staffing etc.)
- ✓ GIS (Geographical Information Systems)
  - ✓ Make the data more visible using thematic maps
  - ✓ Monitor key indicators for different levels, easy to zoom in and out

# Data Warehouses and Data Integration

- ✓ The “everything in DHIS” approach
  - ✓ Use the DHIS as the national repository, define all data elements in DHIS and import data from other systems using XML
  - ✓ The flexibility in DHIS allows for this
  - ✓ The database can get too big and slow (depending on scope (data-wise and geographical-wise))
- ✓ The ETL approach
  - ✓ Use an ETL tool to create a “virtual” DHIS on top of different data sources using the Extract-Transform-Load approach, link data elements and orgunits across systems
  - ✓ Challenge to provide DHIS data processing (indicator calculations, grouping etc.) on top of the “virtual” database
  - ✓ One promising tool is Kettle, part of the Pentaho platform

# Some references

## HISP:

HISP International Wiki – [www.hisp.info](http://www.hisp.info)

HISP SA – [www.hisp.org](http://www.hisp.org)

HISP India – [www.hispindia.org](http://www.hispindia.org)

HISP research papers - <http://www.hisp.info:8080/display/HISP/ResearchPapers>

## HIS:

RHINO (Routine HIS network) - <http://www.rhinonet.org/>

MDGs for health - <http://www.who.int/mdg/en/>

## Global health:

Foreign Affairs roundtable debate - [http://www.foreignaffairs.org/special/global\\_health/](http://www.foreignaffairs.org/special/global_health/)

Norwegian Prime Minister's campaign on MDGs:

<http://www.regjeringen.no/en/dep/smk/Selected-topics/The-Millenium-Development-Goals.html?id=87050>

## DHIS:

DHIS 1 downloads - [http://www.hispkerala.org/latest\\_downloads/](http://www.hispkerala.org/latest_downloads/)

DHIS 2 wiki - <http://www.hisp.info:8080/display/DHIS2/Home>

DHIS 2 issue tracker – [www.hisp.info/dhis2](http://www.hisp.info/dhis2)

DHIS 2 online demo - <http://www.hisp.info:8090>

## Data Warehouse technologies/tools:

Pentaho – [www.pentaho.com](http://www.pentaho.com)

BIRT - <http://www.eclipse.org/birt/phoenix/>

KIDS - <http://kids.fao.org>

Q&A

Questions?

Thank you.