Oversikt forelesning:

- HISP prosjektet; helseinformasjonssystemer, open source sw utviklingsland / “Globalt Sør”
- DHIS Open Source Software – prosjekt ved Ifi Distribuert utvikling og applikasjon/
- Integrert Helse-Informasjon Arkitektur “Hvorfor DHIS kan brukes i mange land”
- Eksempler fra Sierra Leone, Kenya og India

Background:
- Started 1994/95 as a “RDP” project in “New” South Africa –funded by NORAD
- 4 pilot districts in Cape Town: Information systems to support post-apartheid decentralised health structures (RDP goals)
- Base: Universities of Western cape & Cape Town & Western Cape Dept. of Health

Status today
- National standard in South Africa
- Being spread to many countries in Africa & Asia

South Africa 1994/95

– Problems & challenges:

Apartheid Legacy:
- **Inequity** in Health status & Health services provision
- **Fragmentation:**
  - Until 1994: 14 Departments of health at central level
    - ‘National’ Department;
    - ‘White’, ‘Coloured’, ‘Indian’ administrations
  - 10 ‘Black homelands’ & self-governed states
  - + 4 ‘independent’ provinces & 400 local authorities
  - Neighbouring clinics / health centres / hospital reporting to different authorities - no co-ordination

South Africa 1994/95

– Problems & challenges (2):

- **Inequity** between blacks & whites, rural & urban, urban & “peri-urban”, former “homelands”, etc.
- **“Equity” main target**
  - But how to know whether targets are achieved?
- **Need standard data from across the country on**
  - Health status & Health services provision
- **Problem:** No coordinated data system – no standards
- HISP key actor in developing the new unified Health Information System in South Africa
Developing District-based Health Information System in South Africa

Research and development

- HISP approach: Local use of information; Maximise end-user control; Local empowerment & bottom-up design and system development
- Focus on
  1) standardisation of primary health care data & development of database software to support a ‘flexible’ hierarchy of primary health care data
  2) 1998/99: implemented District database software and ‘processes’ in two provinces - Eastern & Western Cape
- 1999/2000 - onwards: National Standard - being rolled out to all provinces and districts

Information management at district level
- From fragmentation to integration; A process of standardisation

A Hierarchy of (data) standards as implemented in South Africa:
- Balancing national need for standards and innovation & local need for flexibility
- Structure Supported by the HISP software:
  - flexibility, integration between & within levels
  - Allowing for “glocal” (global/local) prototyping because all levels have freedom to define their own standards as long as they adhere to the standards of the level above (core data set)

Apartheid legacy: a fragmented and top down health structure as reflected and ‘reproduced’ every day by the information systems
Information infrastructure - Installed base
DHIS – a flexible “generic” health information software

Integration strategies

Botswana  Sierra Leone  Zanzibar  South Africa

Form A  Form A  Form A  Form B

Form A  Form B

Data warehouse

AX  BZ
AY  C
BX  C
BY  C

Data warehouse

Essential Dataset

Other health data

Less  Integration  More

• And now: DHIS 2 in India – big scale

Changes were the only constant in these days …

Since DHIS could be adapted to the very different circumstances within South Africa and changes over time:

• DHIS could be adapted also to other countries

And DHIS spread to other countries from about 1999/2000:

Mozambique, India, Mongolia, Malawi, Tanzania, Cuba, Ethiopia, Nigeria, Vietnam, Zanzibar, Zambia, Nigeria, Namibia, ….

• And Now: DHIS 2 in India – big scale

The domain:
Health Information systems (HIS)

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

✓ Primary health care & public health sector:
  ✓ first & second level health care, district level health management & hospitals
  ✓ focus on mothers and children and killer diseases (HIV/AIDS, Tuberculosis, Malaria)

✓ Routine reporting HIS:
  ✓ Aggregated statistical data (numbers not patient names)
  ✓ Typically monthly or quarterly data reporting from clinics to districts to province to ministry
  ✓ To support local health administration

✓ Information on important health management issues like:
  ✓ how many of the children in a give areas is receiving vaccines,
  ✓ how many of the pregnant women are coming to check-ups,
  ✓ what are the major diseases in the population,
  ✓ how frequently are the clinics visited by the population
  ✓ how many patients per doctor and nurse per day

Open Source, HIS Development & Capacity Building
- “South – South – North” Network of Action

Health Information Systems
Integration, standards
Use of information for action
Health management, etc.

Free & Open Source Software
Distributed DHIS development
– Sharing across the world
knowledge & support

Building Capacity,
Training, Education, Research
Training of health workers
Graduate courses, Masters, PhD
Sharing teaching /courses

DHIS (District Health Information Software)
Main components of a HIS

✓ The organisational hierarchy

✓ service-delivery and administrative organisational units organised in a hierarchy of typically 4-6 levels and following administrative areas (country, province, district/municipality, sub-district)

![Organisational hierarchy diagram]

HISP software – The DHIS

✓ DHIS 1.4
  ✓ MS Access/VB 6
  ✓ Developed in South Africa since 1996
  ✓ Large user base in Sub-Saharan Africa (80%)

✓ DHIS 2
  ✓ Java open source web frameworks
  ✓ Integrates other web-based report and analysis tools for visualisation of data (WHO/OpenHealth, BIRT)
  ✓ Developed in a global community with developers from India, Ethiopia, Tajikistan, Mali, Nigeria, Vietnam and Norway since 2004
  ✓ Large user base in 20 states in India, Sierra Leone, Gambia, Tanzania, Kenya, Vietnam ..
Global distributed participatory development of DHIS 2 – SW end-user application which is used differently in each participating context

Is it possible?

Example: India Use Context:
e.g. Vietnam
Use
Context

India Use Context: 30 states, each a country

Synchronisation

Branching - Example India

Continuous DHIS 2 development; common core, different local applications

Integration, interoperability & standardisation
- Key concepts of integrated Architecture approach

- Integration? Multiple different meanings! Our definition: Integration is about the purpose, vision and goals to achieve better efficiency, better use of information, better systems. A process perspective rather than one end result

- Interoperability? One of the means to achieve integration. Formal definition: an application can apply and use information from another application – and vice versa

- Standardisation? Prerequisite for integration and interoperability!! Without shared “understanding” and meaning, no interoperability or integration, be it within social or technical systems!

For all concepts above; be clear about what level we are dealing with; eg. Technical or organisational integration or interoperability

Example: HMN architecture - National data warehouse
### Different information needs at different levels

<table>
<thead>
<tr>
<th>Level of health system</th>
<th>Quantity of data</th>
<th>Information needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Less data</td>
<td>Summary indicators General, e.g. MDG</td>
</tr>
<tr>
<td>National / State</td>
<td></td>
<td>Summary indicators National needs</td>
</tr>
<tr>
<td>District</td>
<td></td>
<td>Indicators district management</td>
</tr>
<tr>
<td>Facility</td>
<td></td>
<td>Facility management</td>
</tr>
<tr>
<td>Patient</td>
<td>More data</td>
<td>Patient records, tracking &amp; care</td>
</tr>
</tbody>
</table>

### 3 Levels architecture: Horizontal & vertical integration

#### Level 1:
**Organisational / political level of integration of information needs, users & usage**

- **Horizontal integration:** Information from across sectors & health programs available at "one point"
- **Vertical Integration:** "Seamless" flow of information from peripheral to central levels, from patient encounters in clinics to national M&E

#### Level 2:
**Software applications & Information Systems level of integration**

- **Horizontal integration:** Data warehouse, such as DHIS, integrating & managing data from different health programs and sectors
- **Vertical Integration:** Extracting aggregate data from Human Resource system – iHRIS, and load into data warehouse – DHIS – and from patient record systems into data warehouse

#### Level 3:
**Data exchange, interoperability & standardisation level of integration**

- **Horizontal integration:** Shared data & indicator standards prerequisite for sharing data across health programs & sectors, whether from paper or computer sources. SDMX-HD enable transfer of data
- **Vertical Integration:** Shared data standards also prerequisite for aggregating from individual human resource records in iHRIS to data according to standard loaded in DHIS using SDMX-HD.

### Vertical & Horizontal Integration

**Vertical:** Through levels of aggregation & Translations & use From HR / patient records, to national & global reporting on MDG indicators

**Horizontal:** Across health programs, Services & agencies at each level

#### Example Kenya

- **Integrated Analysis, use & dissemination of information - On the web**
  - **Migrating historic data**
  - **New system** Replacing **Old system**
  - **FTP - File transfer**

- **DHS2 project:**
  - FROM Data by district - TO data by facility
  - FROM spreadsheet - TO integrated database
  - FROM FTP - TO WEB
DHIS2 project - Challenges:

- FROM Data by district - TO data by facility
  - From Managing 149 to 7000 reporting units!!!

- FROM spreadsheet - TO integrated database
  - Direct benefit:
    - data quality control & integrated analysis & use

- FROM FTP - TO WEB
  - Both Internet,
    BUT central server & network More critical

**Example Sierra Leone**

- Point of departure:
  - Fragmented information & Poor data quality

- 1st step: Integrate data reporting
  - Use existing data in District /National database repository
  - Demonstrate integration is possible and useful
  - Then – revise data reporting forms & structures

- 2nd Step: “Vertical Integration”
  - Patient record system (OpenMRS) for HIV /AIDS
    - Export aggregate patient data to DHIS
  - (In the making) Human resource management (iHRIS)
    - Export aggregate HR data to DHIS

Point of departure Sierra Leone: Fragmentation of information
Sierra Leone: 1st step integrated architecture
- aggregate data from all programs & services (horizontal integration)

Benefits of HIS Integration

- DHIS: National data repository
  - Integrated data management
  - Other districts reporting to national
  - Information use

- DHIS: District data repository
  - Integrated data entry
  - Integrated data from all programs & services (horizontal integration)

Integrated Human Resource and Health service data
- made possible by systems integration & interoperability

Number of clients per clinical worker per day, by district, 2008 and 2009
Example: DHIS2-OpenHealthMapper in Sierra Leone

Examplp

op enHealthMa

pp in Sierr

Leone

pp p

Indicators by Chiefdom displayed using colours

India: Integrated architecture (design) of interoperable systems

An integrative “umbrella” across programs, sub-systems & infrastructures (paper, computers, Internet, mobile telephones)

Replicated at each

Administrative

Level:

National

State/Province

District

Data from / to Mobile telephones

Data capture from paper reports

Monthly summary reports

Register pregnant women & children for immunization

Import Electronic data

DHS2/HealthMapper

DHS2/NBIT

Export electronic summary data

Export electronic

Summary,

Medical

Records

Species

GIS

Reports

Public, Pivot, graphs, etc.,

Data warehouse

Pregnant women & children

Human Resource records

OpenMRS

iHRIS

Monthly summary reports

Register pregnant women & children for immunization

Comprehensive and scalable approach – “scaling the umbrella”

Architecture enables uniform approach despite uneven infrastructure

1. From paper to computer
2. From “stand alone” to networked computers
3. From paper records to electronic patient records (and other records, e.g. HR)

Levels of the health system

• National/ MoH

• Region/ District:

• Facility

• Patient level Registration

(1) From paper based to computer based

(2) From Stand-alone to networked computers

(3) From paper records to electronic patient records

Four processes of change

Levels of the health system

• State

• District:

• PHC /facility

• Patient level Registration

• Sub-centre & Village health worker

(1) From paper based to computer based

(2) From Stand-alone to networked computers

(3) From paper records to electronic patient records

(4) From paper to mobile telephones: Reporting from sub-centre & village
Interoperability and integration require **standards**

Standardisation & interoperability may be seen as going on at 3 levels of increasing complexity

**3 Levels of (achieving) Interoperability/Standardisation:**

1. **Syntactic/technical**
   - Increasing differences between views
   - Programs / donors/agencies
   - Agree to standardisation
   - Shared / agreed indicators & meta data
   - Unique id. SDMX-HD, etc.

2. **Semantic**
   - Increasing complexity
   - Programs / donors/agencies
   - Agree to standardisation
   - Shared language and Shared understanding?
   - SDMX-HD, etc.

3. **Organisational/Political/pragmatic**
   - Increasing complexity
   - Programs / donors/agencies
   - Agree to standardisation
   - Shared language and Shared understanding?
   - SDMX-HD, etc.

Compared to telephone conversations:

- Shared interests?
  - Interested in talking?
- Shared language and Shared understanding?
  - Interested in talking?
- Compatible telephones & networks?

**Standardisation process: cycling through the levels.** For each level, “solutions” based/running on solutions at level below, and rely on agreement at level above.