



Mission Report

THE PROVISION OF TECHNICAL ASSISTANCE GDDS MODULE ON HEALTH: REPORT ON SECOND EXPERT VISIT TO LESOTHO

Prepared by:

Gareth Daniell

Prepared for:

**The Lesotho Department of Health Planning and Statistics,
Lesotho Bureau of Statistics and the World Bank, General
Data Dissemination System, Socio-Demographic Statistics
Project for Anglophone Africa**

November 2008

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1. INTRODUCTION

The Lesotho Bureau of Statistics and the Department of Health Planning and Statistics are under constant pressure to produce relevant up to date Health Statistics. They have identified a fully functional and operational Health Data warehouse as a requirement in order to capture, store and retrieve relevant Health data necessary for data analysis and dissemination.

To this end the Department of Health Planning and Statistics requested Technical Assistance for the creation of a data warehouse. An assessment mission was completed by Mr. E de Fortier whereby the required actions for the creation of a datawarehouse were stipulated. This mission is therefore the first of a series of missions in order to deliver on the specified activities.

The specific objectives and deliverables for this mission were detailed in the Terms of Reference (refer to Annexure 2: Terms of Reference) & Technical Proposal (Annexure 3: Technical Proposal).

The basic objectives and deliverables for this mission are however stated below.

Specific issues to be covered during the consultancy were the following:

Objectives / activities of mission

- To confirm the analysis completed on the current situation and requirements regarding the data warehouse
- To produce a functional specification required for the design of a data warehouse
- Strategic framework. The strategic framework is being handled by another consultant from another company. The latest draft of the strategic framework was also not available.

Based on this assessment future actions can be agreed during the visit to:

- Implement a data warehouse that will contain data from all data sources to facilitate data sharing and easy retrieval of data by users from all corners
- To agree on future in-depth discussions with relevant institutions if needed.
- To advise and assist in the design and the implementation of a district data warehouse

Specific outputs for the consultancy were the following

- Report in detail on all relevant conditions identified.
- Report on feasibility of data warehousing for health in Lesotho.
- Function Specification

This mission is meant to prepare for the future deliverables, like:

- Implement the data warehouse, including a list of next steps, together with time scales and work needed to be done
- A situational analysis report and fine-tuning of objectives
- Report on any training requirements needed for statistical staff in the Health Statistics system
- Draft a mission report for the file of the country on the discussions held in the appropriate format.
- Draft a mission report for the World Bank according to the format provided

2. IMPLEMENTATION OF THE CONSULTANCY

The mission was implemented by Mr. Gareth Daniell from **GeoSpace International**. Thirteen work days were allocated for the assessment mission, and ran from the 6th November 2008 to 24th November 2008.

3. ACKNOWLEDGEMENTS

The consultant would like to thank the Lesotho GDDS Coordinator, 'M'e Malehloa Molato and the head of the IT Department, Mr Mokoena Lesenyeho for their time and support during the consultancy.

Special thanks to Ms. Mahlape Ramoseme and Mr. Teboho Koma for their enthusiasm, assistance and positive attitude during the consultancy as well as arranging the meetings and all necessary documentation.

The consultant would also like to thank the General Data Dissemination Project of the World Bank for sponsoring the consultancy.

4. PROGRAM CONTEXT

With financial support from the Department for International Development (DFID) of the United Kingdom, the World Bank is implementing a project to assist 21 Anglophone Africa countries to participate in the General Data Dissemination System (GDDS). Participating countries are being assisted to participate in the GDDS through two separate, but linked projects both financed by DFID. The IMF is providing project management and technical support in the area of economic and financial statistics. The World Bank is providing technical support in the area of socio-demographic statistics.

Technical assistance is being provided through the World Bank to help countries implement plans for improvement in population, health, agriculture, labor market, justice and security, management of statistical systems, GIS and small area statistics. The GDDS framework developed by the IMF provides the framework for the detailed elaboration of long-term statistical development strategies. Participating countries have already expressed their requests for technical assistance and both the IMF and the World Bank have developed their assistance strategies.

Lesotho was one of the countries which asked for technical assistance in the field of Health Statistics.

5. LESOTHO DEPARTMENT OF HEALTH PLANNING AND STATISTICS (HPSD) DATA WAREHOUSE NEEDS

Information Technology is currently playing a crucial role in the creation of Statistical Health data in Lesotho. Information technology is used as a data capturing and analysis tool. The use of Information Technology as a data capturing and data creation tool mean that a vast amount of data is created over a very short space of time. The Department of Health and Statistics has been utilizing the current data capturing tools for more than a year and a lot of relevant data has therefore been created on daily, weekly and monthly basis. The data is stored and analyzed in separate database files. A fully functional data warehouse is therefore a necessity for the Lesotho HPSD to successfully store and retrieve the data.

6. CHALLENGES FACING THE LESOTHO DEPARTMENT OF HEALTH PLANNING AND STATISTICS (HPSD)

The Lesotho department faces the following challenges regarding Health Statistics.

- The design and creation of an integrated and properly designed data warehouse and database
- Creation of pre-determined data Analysis structure
- Creation of data communication protocol
- Insufficient IT staff quota

The department is aware of these challenges and the request for technical assistance was the first step in addressing them.

7. OVERVIEW OF MEETINGS AND DISCUSSIONS

Please refer to Annexure 1: Overview of Meetings Held for the meetings and discussions that took place.

8. ASSESSMENT OF CURRENT SITUATION

A successful operational data warehouse consists of the following components:

- Data
- IT Infrastructure
 - Hardware
 - Software
 - Communication
- People
- Method

During the first mission an assessment was done based on the above mentioned components. During this mission the earlier findings were confirmed and elaborated upon where applicable, and will be discussed separately.

Data

Relevant Statistical Health data is captured on a daily, weekly and monthly basis. Data is collected at different levels on paper based data capturing sheets.

The following data is collected:

Inpatient.mdb

- Inpatient data
- Outpatient data
- Mental patient data

Dental.mdb

- Dental patient data

MaternalRegister.mdb

- Maternity patient data
- Antenatal Care patient data

TBQuarterly.mdb

- Tuberculosis patient data

HIVSummary.mdb

- HIV patient data

The data is captured at facility and hospital level on a daily basis on a tally-sheet by Nurses or doctors. A monthly summary sheet is then amalgamated from the daily tally-sheets by a clerk or Nurse and submitted to the Office of the Health information officers (Statisticians) for the

10 different Districts. The District Health Information Officers use Microsoft Access to capture the data. A front end application was developed by the Lesotho HPSD to facilitate the capturing process. Different front end applications are used to capture the various data sets. The data is sent to the Statistics Unit at central level in Maseru on a monthly basis. Analysis is done at District level as well as at Headquarters. At the moment the different datasets is only merged for Analysis purposes.

IT Infrastructure

Adequate hardware and software is in place for the data capturing process at District Level as well as head office. All the District Officers do have a workable computer, Microsoft Access 2003 with different front –end applications is used to capture the data. Most of the District Officers do **not** have access to Email and Internet at the moment and the data is transferred to head-office through manual means.

The Department of Communications is in the process of rolling-out a Government Network called GOVNET that will connect all Government Departments in Maseru as well as the Districts. Internet Access will also be provided.

The department does not have any immediate plans in place to upgrade to the latest version of Microsoft Access and Excel. The data warehouse will be implemented using either Microsoft SQL Express or MySQL.

People

An assessment of the current staff component could only be made at the head-office. The District Health Officers that capture the data on Microsoft Access has been trained by Head Office and are constantly given additional training and updates on their performance when they deliver the data to Head office. The capturing of new data, maintenance of the data as well as the analysis of the data does not seem to be a problem at District Level or at Head Office. The current IT specialists do have an abundance of skills. The existing front end applications were developed and are currently being updated and maintained by them. The biggest problem regarding IT support is a shortage of staff. Only three IT personnel is currently employed, one of which is at management level and are therefore not able to commit his time to day to day IT support.

Method

Method requires that once the people, hardware, software and data is in place, the following must be implemented or should exist for the warehouse to achieve its full potential and provide relevant deliverables:

- In the short term, method will imply the specific data creation, collection and warehousing strategy
- In the long term, method will also include the specific data analysis, data dissemination and data access strategies and protocols

As the purpose of this and following missions is to implement a data warehouse, very little of the method is currently in place.

9. FUNCTIONAL SPECIFICATION

Please refer to *Annexure 4: Functional Specification* for the full specification

10. RECOMMENDATIONS

It is evident from the above assessment that the HPSD are equipped with the necessary tools, data and skills to successfully implement, operate and maintain a data warehouse.

It is therefore recommended that the Lesotho Department of Health continue with the implementation of a data warehouse.

The components necessary for the creation and operation of a data warehouse are either already in place, must be fine tuned or must still be created

The following short term and long term activities are recommended for the completion of a data warehouse.

10.1 Short term activities

The main goal for all the short term activities is the establishment of a data warehouse at the Head office to enable the Department to store, update, query, retrieve and disseminate the data. The establishment of the data warehouse consists of the following activities:

- Project management
- User Analysis or Scoping of requirements
- Functional Specification
- System Design
- Implementation
- Installation
- Testing
- Training

Project Management

As with the roll-out of any project it is important to specify the deliverables, dependencies, milestones and responsibilities from the start. A project plan must be developed in conjunction with the user analysis and functional specification. The project plan must be a living document and updated according to the changing environment and subsequent activities. The project plan for the actual implementation of the data warehouse can only be finalized once the functional specification document has been created.

Estimate Duration: *1 day per week*

User Analysis

Completed

Functional specification

Completed

System Design, Implementation, Installation, Testing and Delivery

Once the Functional Specification has been clearly defined and documented the actual design of the data warehouse and the creation of the tools used to import the data as well as the tools used to export the data for analysis and dissemination can commence. The system design must take into account any future plans specified in the functional specification.

Once the data warehouse and structure has been designed it will be populated with the existing data using the import-tools. The database serves as a repository for all the information. Once all the data has been populated the database can be tested for retrieval, updating, importing of new data and exporting of data for analysis and dissemination purposes. The data warehouse should now be ready for final delivery, testing and training. The Department must ensure that all the phases are completed satisfactory. All amendments to the database during the implementation, installation and testing phases should be well documented. A final document specifying the database design should be delivered as part of the final database.

Estimated Duration: *25 days*

Specific short term recommendations

As mentioned above, Microsoft access and user specific front end applications are used to capture the data at district level. Microsoft Access is not the ideal database software application for a data warehouse when a large amount of data is used and multiple users

need to access the data simultaneously. It is therefore recommended that the existing Microsoft SQL server license is used for a central data warehouse at headquarters. Every district will therefore capture the data in the existing Microsoft Access database with the front end application. The Microsoft Access database will then be send to the head office to be imported into the central level Statistics Unit data warehouse based on Microsoft SQL Server in Maseru.

The Department's available IT staff as well as the relevant Ministry of Health and Social Welfare personnel must be involved with all facets of the data warehouse creation as they will be responsible for the data warehouse maintenance and upkeep as well as the future long term activities.

10.2 Long term activities

Rolling out of data warehouse at District Level

Microsoft SQL Compact Edition and Microsoft SQL Express can be deployed at District Level to import the information captured in Microsoft Access and export the merged data for analysis purposes. Every district will therefore have a separate data warehouse that is updated with the latest Microsoft Access captured data on a monthly basis. The different district Microsoft SQL Compact Edition and Microsoft SQL Express data warehouses will then be send to the head office to be imported into the central level Statistics Unit data warehouse based on Microsoft SQL Server in Maseru.

Estimated Duration for Development: ***5 days per District***

Front end data capturing application

The existing front end application based on Microsoft Access can be changed so that the data is captured directly in the District Microsoft SQL Express data warehouse. The same export functionality already designed can still be used to export the data for Analysis purposes. The design of the front end application design should incorporate future plans like data capturing via intra and internet.

Estimated duration for front end application development: ***10 days.***

Data Analysis

The creation of Central and District Data warehouses will provide the Department Statisticians with extra capability regarding data analysis. The current methodology where the data is exported to Microsoft Excel for data analysis should therefore be revised so that the data can be analyzed or queried using software that is directly linked to the data warehouse. The data will therefore be analyzed and queried "live" and no data export will take place. A simple, easy to use data analysis software package such as Crystal Reports can be used to analyze the data and produce reports. Pre-defined analysis and reports can be setup and saved in order to produce uniform type of reports. The type of analysis and reports that will be required must be well documented.

Estimated duration for Data Analysis development: ***15 days (continuous process).***

Training

Extra training in the new data warehouse, front end data capturing application and data analysis at District level is essential.

The IT Personnel together with the relevant personnel of the Ministry of Health and Social Welfare must ensure that all the District staff is well versed in the use of the new data warehouse, front end data capturing application and data analysis software.

Estimated duration for Training: ***5 days (continuous process)..***

Protocols

As with any data set, pre-determined protocols regarding data access need to be established. This is very important especially when the data warehouse is made available first via the Departments own network and intranet but also later on the internet.

Estimated duration for Protocol Setup: **5 days (continuous process)**.

Govnet

The pending roll-out of the Government network gives the Department numerous new opportunities that should be taken into account during the functional specification, system design and roll-out of the warehouse.

- **Data capture**

The new Govnet network can be used in conjunction with intra/internet functionality to capture the data "live" on the Central Data warehouse at Headquarters. The front end application previously designed should take this into account and should be amended accordingly.

- **Data analysis and Dissemination**

The data warehouse together with network, intranet and internet technology gives the Department the opportunity to access the data remotely and perform ad-hoc data analysis and produce reports for dissemination. The Department will also have the opportunity to disseminate the data to other users using the GOVNET Network. The data can be disseminated to other line Departments like the Bureau of Statistics as well as the general public via the internet. The pre-defined reports should therefore be further developed and explained to ensure that users that are not familiar with Statistical Data Analysis techniques do not interpret the reports incorrectly.

- **Protocols**

The granting of access to the data warehouse and reports should not be done before all data access protocols, data analysis and reporting protocols have been defined and setup. Different levels of data and report access can be granted to different users. The internet and intranet can be a very powerful tool for data dissemination if it is used correctly.

Specific long term recommendations

The new data warehouse functionality and applications must be thoroughly trialed and tested at Central level before it is deployed at the District level. All possible bugs must be fixed and limitations documented. The Roll-out of the data warehouse and applications to District Level must be very well planned in order to limit the number of installation, implementation and training trips to the various Districts. The setup of the Data Analysis Software and protocols can commence immediately after the Central data warehouse have been finalized and is not depended on the roll-out of the District Warehouses. The Data Analysis software setup and protocols can therefore be tested and enhanced before it s duplicated at District Level.

the creation of the data warehouse; however the lack of sufficient IT resources poses a serious risk, not only for the creation of a data warehouse, but also the maintenance and support thereof. The data warehouse creation activities require the services of a dedicated IT specialist for the duration of the project. The IT support shortage during the data warehouse creation can be solved with the use of external assistance, however it is not the ideal solution and the Department should ideally look to solve the problem for the short and long term requirements.

The Department will need to address the problem before the data warehouse creation process can commence. The creation of a data warehouse with the added functionality will put extra strain on the IT department. The maintenance and support of the data warehouses at District Level and at Headquarters is of utmost importance. The central data warehouse as well as the subsequent analysis and reporting depends on the constant updating of the warehouses with new data from the Districts. Maintenance and support is therefore not limited to headquarters only, but must also be provided at District level. The potential lack of IT support poses a serious risk to the creation and roll-out of the data warehouse in the short term but also to the successful upkeep of the warehouse in the long run. The shortage of IT support staff therefore poses a short term as well as a long term risk for the successful creation and maintenance of the data warehouse. The Department is well aware of the IT staff shortage, sustainable plans must now be put in place in order for the risk to be minimized.

12.3 Training

The recommendation for the creation of a data warehouse and future development at District and headquarter level is based on a phased approach. New technology and method will be deployed at District level. The District Health Information officers are responsible for the capturing, analysis and reporting at District Level. Training of the District Health Information Officer responsible for the data capturing, analysis and reporting is thus very important to ensure that they keep up with the changing data warehouse technology and method. The IT staff also need to be constantly trained on new technology and developments in order to ensure that the data warehouse and the related functionality are updated accordingly. A training programme should be developed as part of the data warehouse roll-out.

13. TRAVEL AND ACCOMMODATION ARRANGEMENTS

There were no problems regarding the travel and accommodation arrangements.

14. FOLLOW-UP MISSIONS

14.1 Requirements before commencing

The source code for the TB and HIV databases is required or a meeting with the system developers is required. This is so that we can confirm the assumptions made during the specification of the data warehouse.

There is a question regarding the validity of the MS SQL Server license. Although not critical to proceeding with the next mission, a decision must be made regarding the choice of database before the implementation phase, and it will be beneficial to know if MS SQL Server can be used before the next mission.

14.2 Objectives & Deliverables of Second Mission

1) Verification of Functional Specification

The HIV and TB databases were still in development at the time the first mission was performed. A number of assumptions were therefore made during the specification of the data warehouse and these assumptions are to be confirmed and verified.

2) System Design

Finalize the functional specification and data warehouse layouts.

Design the import tools and relationships required to import the transactional data into the warehouse data.

Design the reports that are required from the data warehouse.

14.3 Future Missions

3rd: Implementation and Installation

- Implement Data warehouse
- Implement Reports

4th: Testing & Training

- Testing
- Training

A 5th mission is not envisaged at this stage, but a 5th mission may be planned for if additional training is required.

15. FINAL REFLECTIONS

The HPSD made sure that, through all their efforts, the consultancy could be completed as effectively as possible. The professionalism in all aspects of their work is noteworthy and the future of Lesotho Health is in very capable hands. The challenge is to ensure that the short and long term plans for the HPSD data warehouse is set in motion.

16. ANNEXURES

16.1 Annexure 1: Overview of Meetings Held

When	10 th Nov
Attendees	Ms. M. Ramoseme – Head Statistician Mr. J. Nkonyana - M&E Head Dr. D. Rumisha - M&E Consultant
Overview	Introduction and discuss general mission objectives

When	10 th Nov
Attendees	Ms. M. Ramoseme – Head Statistician Mr. T. Koma - IT Specialist Mr. M. Lesenyeho - IT Manager
Overview	Introduction and discuss IT related mission objectives

When	10 th Nov
Attendees	Ms. M. Ramoseme – Head Statistician
Overview	Discuss & finalize the work plan for the mission Obtain Strategic Framework

When	11 th Nov
Attendees	Ms. M. Ramoseme – Head Statistician
Overview	User Analysis – current system

When	11 th Nov
Attendees	
Mr. T. Koma - IT Specialist Mr. T Ramachaea – IT Support Officer	
Overview	
User Analysis – current system, IT specific. Obtained copies of front-end applications and existing databases.	

When	12 th Nov
Attendees	
Mr. T Ramachaea – IT Support Officer	
Overview	
User Analysis – IT infrastructure	

When	12 th Nov
Attendees	
Ms. M. Ramoseme – Head Statistician Mr. T. Koma - IT Specialist Mr. M. Lesenyeho - IT Manager	
Overview	
Discussed the bigger picture. There are other companies that might get involved, and other dept's also have DB needs.	

When	13 th Nov
Attendees	
Ms. M. Ramoseme – Head Statistician Mr. T. Koma - IT Specialist Ms. Itumeleng - District Information Officer	
Overview	
User Analysis – District Level	

When	13 th Nov
Attendees	
Mr. T. Koma - IT Specialist	
Overview	
Current Database Analysis / Overview	

When	14 th – 20 th Nov
Attendees	
Mr. T. Koma - IT Specialist Ms. M. Ramoseme – Head Statistician	
Overview	
Ongoing, mostly informal meetings	

When	18 th Nov
Attendees	
Mr. T. Koma - IT Specialist Mr. T. Thokoane - HIV Research Officer	
Overview	
User Analysis - HIV Obtained copies of front-end applications and existing databases.	

When	18 th Nov
Attendees	
Mr. T. Koma - IT Specialist Mr. T Marata - TB Data Officer	
Overview	
User Analysis - TB Obtained copies of front-end applications and existing databases.	

When	21 st Nov
Attendees	
Mrs. M. Makhakhe - Director Health Planning and Statistics Department Mrs. M. Mohapi - PPP Coordinator Mr. J. Nkonyana - Head M&E Dr. D. Rumisha - M&E Technical Advisor Ms M. Ramoseme - Chief Statistician	
Overview	
Debriefing	

When	21 st Nov
Attendees	
Mr. M. Lesenyeho - IT Manager	
Overview	
Debriefing	

16.2 Annexure 2: Terms of Reference

Refer to "*Lesotho_Health_MissionT2_Edefortier_report.doc*"

16.3 Annexure 3: Technical Proposal

Refer to

"TECHNICAL_PROPOSAL_GDDS2_SECOND_MISSION_LESOTHO_HEALTH_GEOSPACE.doc"

16.4 Annexure 4: Functional Specification

Refer To "*Lesotho_Health_Mission_Nov08_GDaniell_report.doc*"



Functional Specification

Lesotho Health Data Warehouse

Prepared by:

Gareth Daniell

Prepared for:

**The Lesotho Department of Health Planning and Statistics,
Lesotho Bureau of Statistics and the World Bank, General
Data Dissemination System, Socio-Demographic Statistics
Project for Anglophone Africa**

November 2008

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1. INTRODUCTION

1.1 Purpose And Objectives

As part of the drive to create accurate and accessible Statistical Health Data, the Lesotho Department of Health Planning and Statistics requires a central store for all data collected at the district level.

The purpose of this document is therefore to provide, in detail, the layout and definitions of the tables, joins, look-up tables etc. required for the design and implementation of a data warehouse.

1.2 Who should read this document

IT Managers and Software developers responsible for the implementation of the data warehouse and corresponding import tools.

1.3 Related Documents

Terms of Reference:

TOR_Lesotho_Geospace_Health_DWS1.doc

Technical Proposal:

TECHNICAL PROPOSAL_GDDS2_SECOND_MISSION_LESOTHO_HEALTH_GEOSPACE.pdf

1.4 Other

It is important to note that some of the source databases are in a current state of development and maintenance. Changes to these source databases will possibly result in changes to the design of the data warehouse. Therefore instead of a typically rigid "star design" for the data warehouse, a more flexible "snowflake design" was used.

It is also anticipated that Mother Child Health (MCH) data (currently in a FoxPro format) may also be added to the data warehouse at a later date. The data warehouse is therefore designed with a bit of flexibility in mind rather than focusing purely on performance.

If the MS SQL Server license that the department possesses at the moment is not sufficient, IT is recommended that SQL Express be used for the implementation of the data warehouse. This document however does not require a specific database though, and options such as MySQL may be evaluated as well for the implementation.

2. USER ANALYSIS

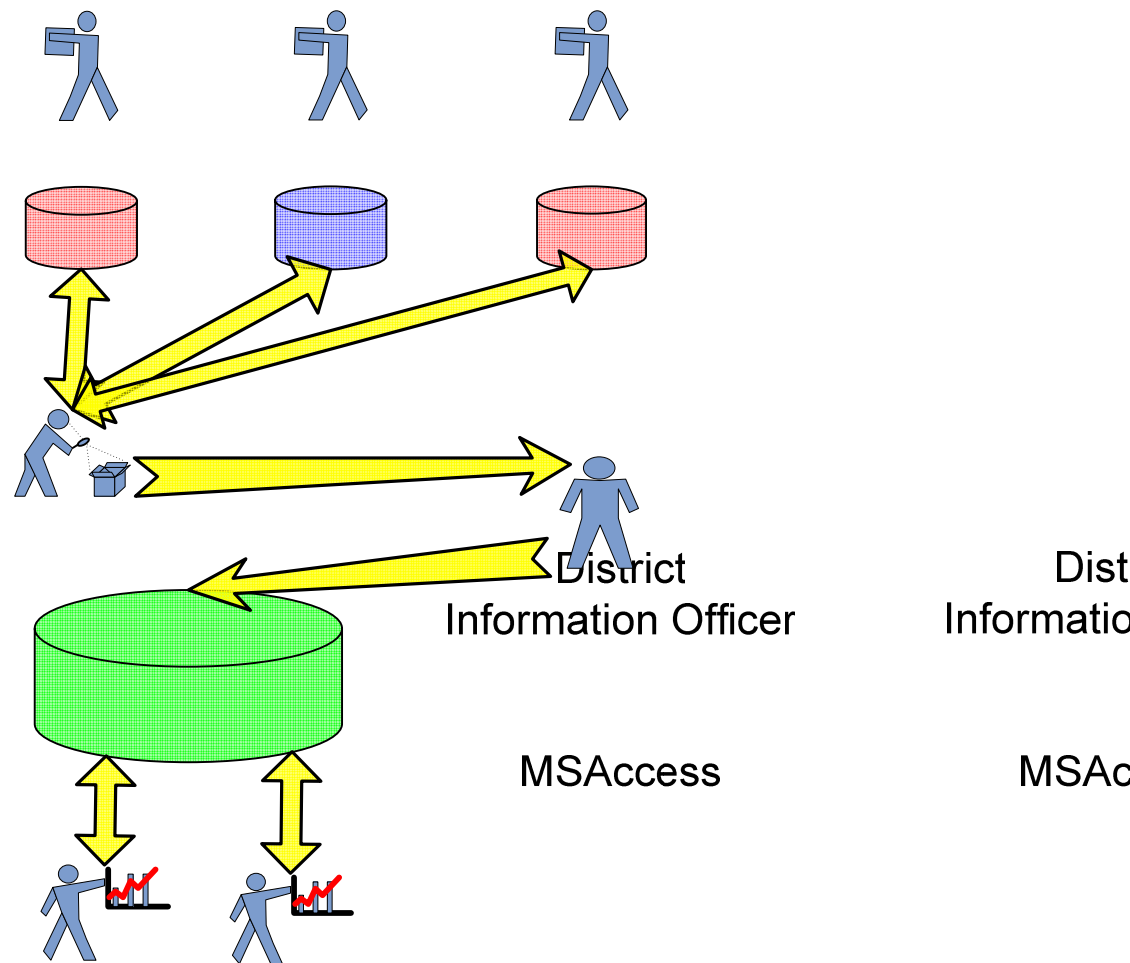


Figure 1 - Data Warehouse User Overview

User / Role Player	Description
District Information Officer	The District Information Officers receive raw data on hand written forms. This data is captured into the relevant MS Access database by means of a front-end application. Once completed the District Information Officer takes the data to the Chief Statistician in at Head Office. Since most districts don't have Internet access yet, the data is transported by motor vehicle on a disk.
Chief Statistician	The statistician responsible for receiving the data analyses the database for correctness, and requests amendments if not satisfied. If satisfied the databases are given to the IT Officer.
IT Officer	The IT Officer uploads the database into the data warehouse by means of an importing tool.
Report Viewer / End User	Anybody with access to the reports, including other role players.

Data Store

3. DATA WAREHOUSE DETAIL

3.1 Table Definitions

3.1.1 Facility

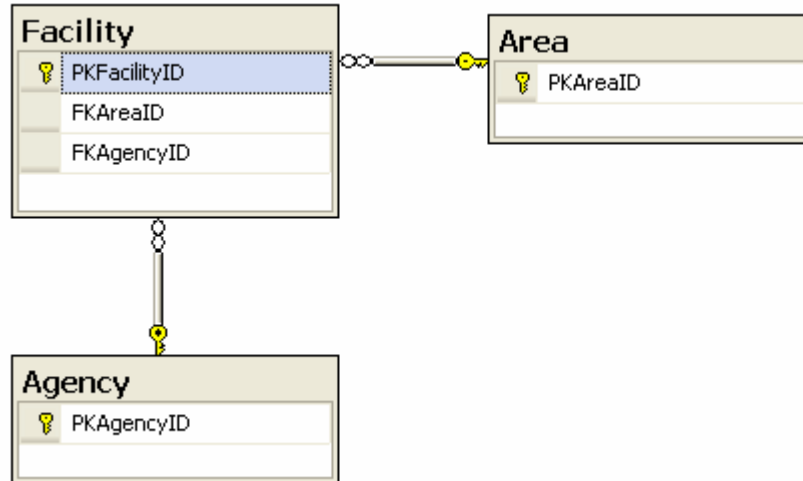


Figure 2 – Facility Data Relationships

3.1.1.1 Agency Table

Columns

Column Name	Data Type	Allow Nulls
PKAgencyID	int	False
Code	varchar(50)	False
Description	varchar(255)	False

Indexes

Name	Clustered	Columns
IX_Agency	False	Code
PK_Agency	True	PKAgencyID

3.1.1.2 Area Table

Columns

Column Name	Data Type	Allow Nulls
PKAreaID	int	False
Code	varchar(50)	False
Description	varchar(255)	False

Indexes

Name	Clustered	Columns
IX_Area	False	Code

PK_Area	True	PKAreaID
---------	------	----------

3.1.1.3 Facility Table

Columns

Column Name	Data Type	Allow Nulls
PKFacilityID	int	False
FKAreaID	int	True
FKAgencyID	int	True
Code	varchar(50)	True
FacilityName	varchar(255)	True
District	varchar(255)	True

Indexes

Name	Clustered	Columns
IX_Facility	False	FKAreaID
IX_Facility_1	False	FKAgencyID
IX_Facility_2	False	Code
IX_Facility_3	False	District
PK_Facility_1	True	PKFacilityID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_Facility_Agency	FKAgencyID	Agency	PKAgencyID
FK_Facility_Area	FKAreaID	Area	PKAreaID

3.1.2 ANC

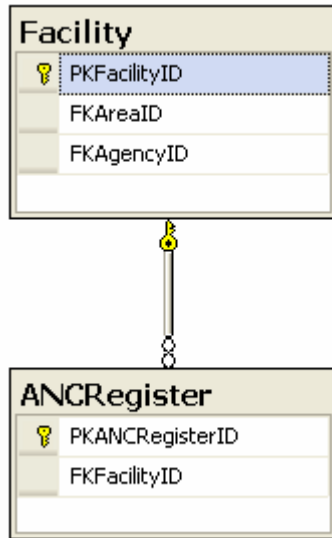


Figure 3 – ANC Data Relationships

See 3.1.1.3 for Facility table definition

3.1.2.1 ANCRRegister Table

Columns

Column Name	Data Type	Allow Nulls
PKANCRRegisterID	int	False
FKFacilityID	int	False
RegisterUser	varchar(255)	True
ReportMonth	smallint	False
ReportYear	smallint	False
field1	int	True
field2	int	True
field3	int	True
field4	int	True
field5	int	True
field6	int	True
field7	int	True
field8	int	True
field9	int	True
field10	int	True
field11	int	True
field12	int	True
field13	int	True
field14	int	True

field15	int	True
field16	int	True
field17	int	True
field18	int	True
field19	int	True
field20	int	True
field21	int	True
field22	int	True
field23	int	True
field24	int	True
field25	int	True
field26	int	True
field27	int	True
field28	int	True
field29	int	True
field30	int	True
field31	int	True
field32	int	True
field33	int	True
field34	int	True
field35	int	True
field36	int	True
field37	int	True
field38	int	True
field39	int	True
field40	int	True
field41	int	True
field42	int	True
field43	int	True
field44	int	True
field45	int	True
field46	int	True
field47	int	True
field48	int	True
field49	int	True

field50	int	True
field51	int	True
field52	int	True
field53	int	True
field54	int	True
field55	int	True
field56	int	True
field57	int	True
field58	int	True
field59	int	True
field60	int	True
field61	int	True
field62	int	True
field63	int	True
field64	int	True

Indexes

Name	Clustered	Columns
IX_ANCRegister	True	FKFacilityID
IX_ANCRegister_1	False	ReportMonth
IX_ANCRegister_2	False	ReportYear
PK_ANCRegister	False	PKANCRegisterID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_ANCRegister_Facility	FKFacilityID	Facility	PKFacilityID

3.1.3 Dental

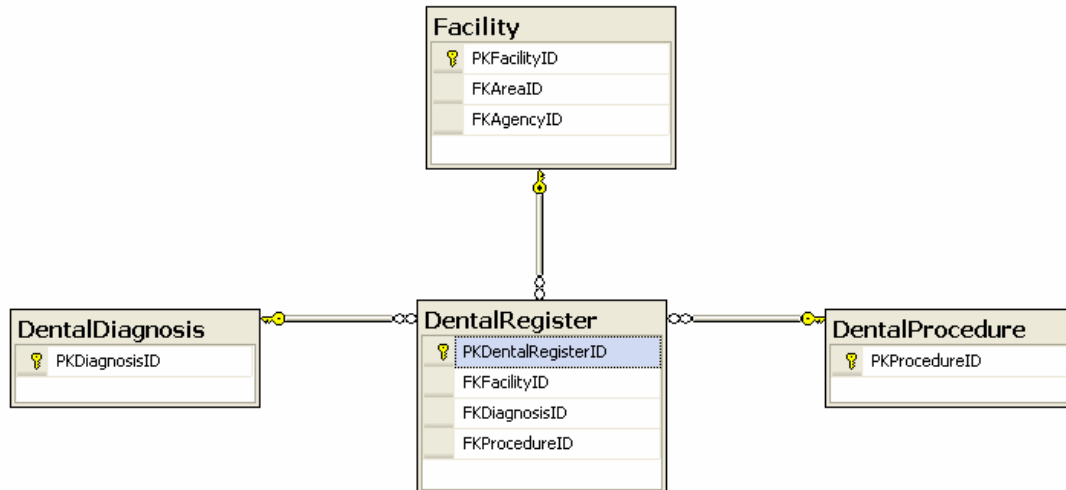


Figure 4 - Dental Data Relationships

See 3.1.1.3 for Facility table definition

3.1.3.1 DentalDiagnosis Table

Columns

Column Name	Data Type	Allow Nulls
PKDiagnosisID	int	False
Description	varchar(255)	True

Indexes

Name	Clustered	Columns
PK_DentalDiagnosis	True	PKDiagnosisID

3.1.3.2 DentalProcedure Table

Columns

Column Name	Data Type	Allow Nulls
PKProcedureID	int	False
Description	varchar(255)	True

Indexes

Name	Clustered	Columns
PK_DentalProcedure	True	PKProcedureID

3.1.3.3 DentalRegister Table

Columns

Column Name	Data	Allow
-------------	------	-------

	Type	Nulls
PKDentalRegisterID	int	False
FKFacilityID	int	False
RegisterUser	varchar(255)	True
FormNumber	int	True
Month	smallint	True
Year	smallint	True
Date	datetime	True
Age	float	True
Sex	char(1)	True
FKDiagnosisID	int	True
FKProcedureID	int	True
Repeat	bit	True

Indexes

Name	Clustered	Columns
IX_DentalRegister	True	FKFacilityID
IX_DentalRegister_1	False	Month
IX_DentalRegister_2	False	Year
IX_DentalRegister_3	False	Date
IX_DentalRegister_4	False	FKDiagnosisID
IX_DentalRegister_5	False	FKProcedureID
PK_DentalRegister	False	PKDentalRegisterID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_DentalRegister_DentalDiagnosis	FKDiagnosisID	DentalDiagnosis	PKDiagnosisID
FK_DentalRegister_DentalProcedure	FKProcedureID	DentalProcedure	PKProcedureID
FK_DentalRegister_Facility	FKFacilityID	Facility	PKFacilityID

3.1.4 Inpatient

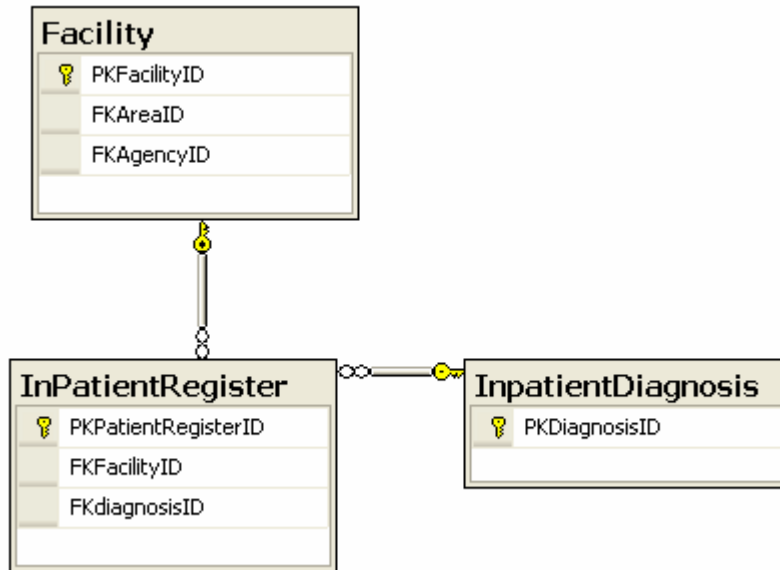


Figure 5 – Inpatient Data Relationships

See 3.1.1.3 for Facility table definition

3.1.4.1 InpatientDiagnosis Table

Columns

Column Name	Data Type	Allow Nulls
PKDiagnosisID	int	False
Code	varchar(50)	True
Description	varchar(255)	True

Indexes

Name	Clustered	Columns
IX_InpatientDiagnosis	False	Code
PK_Diagnosis	True	PKDiagnosisID

3.1.4.2 InpatientRegister Table

Columns

Column Name	Data Type	Allow Nulls
PKPatientRegisterID	int	False
FKFacilityID	int	False
FormNumber	int	False
RegisterUser	varchar(255)	True
Ward	varchar(50)	True
AdmissionDate	datetime	True

DischargeDate	datetime	True
Sex	char(1)	True
Age	float	True
AgeModulo	varchar(50)	True
LSCitizen	bit	True
FKdiagnosisID	int	True
Outcome	smallint	True

Indexes

Name	Clustered	Columns
IX_InPatientRegister	False	AdmissionDate
IX_InPatientRegister_1	False	DischargeDate
IX_InPatientRegister_2	False	FKdiagnosisID
PK_InPatientRegister	True	PKPatientRegisterID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_InPatientRegister_Facility	FKFacilityID	Facility	PKFacilityID
FK_InPatientRegister_InpatientDiagnosis	FKdiagnosisID	InpatientDiagnosis	PKDiagnosisID

3.1.5 Maternity

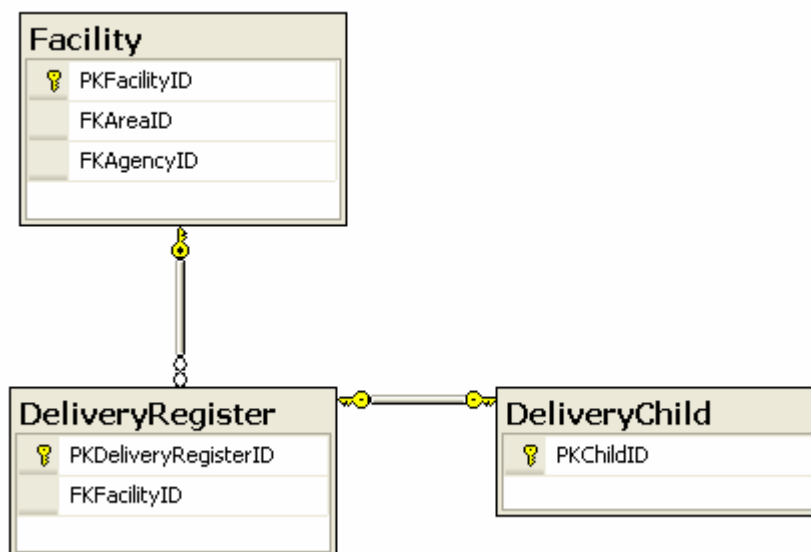


Figure 6 - Maternity Data Relationships

See 3.1.1.3 for Facility table definition

3.1.5.1 DeliveryChild Table

Columns

Column Name	Data Type	Allow Nulls
PKChildID	int	False
FKDeliveryRegisterID	int	False
APGAR1MIN	int	True
APGAR5MIN	int	True
Sex	varchar(50)	True
ChildWeight	float	True
NewbornMaturity	int	True
Malformations	varchar(50)	True
BirthStatus	varchar(50)	True
StillBirth	varchar(50)	True
arvPROPHGIVEN	int	True
arvPROPHDISCHGIVEN	varchar(50)	True
Immunization	int	True
feedingOptBirth	varchar(50)	True
InfantStatusDisch1	varchar(50)	True
InfantStatusDisch2	int	True

Indexes

Name	Clustered	Columns
IX_DeliveryChild	False	FKDeliveryRegisterID
PK_Child	True	PKChildID

3.1.5.2 DeliveryRegister Table

Columns

Column Name	Data Type	Allow Nulls
PKDeliveryRegisterID	int	False
FKFacilityID	int	False
RegisterUser	varchar(255)	True
FormNumber	int	False
FormIndex	int	False
ReportingDate	datetime	False
AdmissionDate	datetime	False

Age	int	False
ANCAttended	bit	False
Parity	int	False
GestationalAge	smallint	False
pmtctTestHIVSTATUS	varchar(50)	True
pmtctTestHAARTSTATUS	varchar(50)	True
pmtctPreTestMaternity	varchar(50)	True
pmtctTESTHIVMATERNITY	varchar(50)	True
pmtctTESTRESULTMART	varchar(50)	True
pmtctARVPROHPREG	int	True
pmtctARVPROPHB4DELIVERY	int	True
pmtctARVLABOR	int	True
pmtctARVPROPHNumHRS	varchar(50)	True
DeliveryDate	datetime	True
DeliveryMode	int	True
DeliveryNumFetus	int	True
MaternCI	varchar(255)	True
MaternDeathOccur	varchar(50)	True
MaternDeathCause	int	True
postPartumMotherStatusDisch	varchar(50)	True
postPartMotherRefferd	int	True
postPartMotherCouns	varchar(50)	True
postPartarvDisch	varchar(50)	True
dischargeDate	datetime	True
postPartDelivBy	varchar(50)	True

Indexes

Name	Clustered	Columns
IX_DeliveryRegister	True	FKFacilityID
IX_DeliveryRegister_1	False	ReportingDate
IX_DeliveryRegister_2	False	AdmissionDate
PK_DeliveryRegister	False	PKDeliveryRegisterID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
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FK_DeliveryRegister_DeliveryChild	PKDeliveryRegisterID	DeliveryChild	PKChildID
FK_DeliveryRegister_Facility	FKFacilityID	Facility	PKFacilityID

3.1.6 Mental

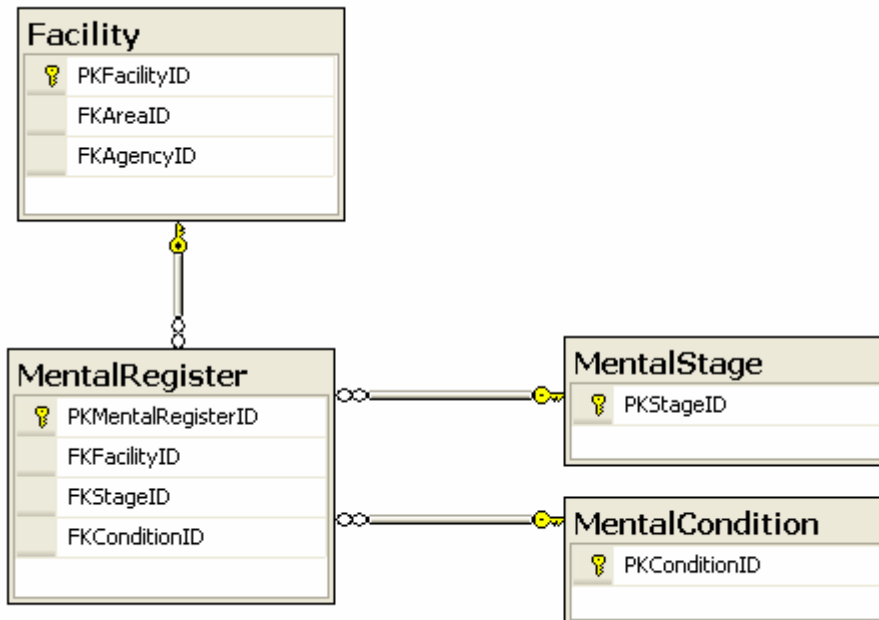


Figure 7 – Mental Data Relationships

See 3.1.1.3 for Facility table definition

3.1.6.1 MentalStage Table

Columns

Column Name	Data Type	Allow Nulls
PKStageID	int	False
Description	varchar(50)	False

Indexes

Name	Clustered	Columns
PK_MentalStage	True	PKStageID

3.1.6.2 MentalCondition Table

Columns

Column Name	Data Type	Allow Nulls
PKConditionID	int	False
Description	varchar(50)	False

Indexes

Name	Clustered	Columns
PK_MentalCondition	True	PKConditionID

3.1.6.3 MentalRegister Table

Columns

Column Name	Data Type	Allow Nulls
PKMentalRegisterID	int	False
FKFacilityID	int	False
RegisterUser	varchar(255)	True
FormNumber	int	False
Date	datetime	True
FKStageID	int	True
FKConditionID	int	True
M_Age_0_9	int	True
M_Age_10_19	int	True
M_Age_20_29	int	True
M_Age_30_39	int	True
M_Age_40_49	int	True
M_Age_50_59	int	True
M_Age_60_64	int	True
M_Age_65	int	True
F_Age_0_9	int	True
F_Age_10_19	int	True
F_Age_20_29	int	True
F_Age_30_39	int	True
F_Age_40_49	int	True
F_Age_50_59	int	True
F_Age_60_64	int	True
F_Age_65	int	True

Indexes

Name	Clustered	Columns
IX_MentalRegister	True	FKFacilityID
IX_MentalRegister_1	False	Date

IX_MentalRegister_2	False	FKStageID
IX_MentalRegister_3	False	FKConditionID
PK_MentalRegister	False	PKMentalRegisterID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_MentalRegister_Facility	FKFacilityID	Facility	PKFacilityID
FK_MentalRegister_MentalCondition	FKConditionID	MentalCondition	PKConditionID
FK_MentalRegister_MentalStage	FKStageID	MentalStage	PKStageID

3.1.7 Outpatient

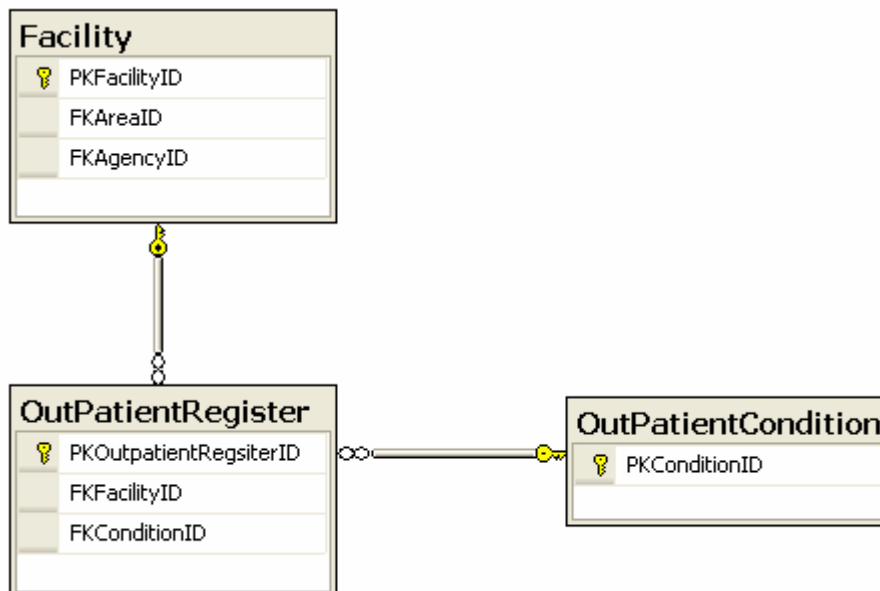


Figure 8 – Outpatient Data Relationships

See 3.1.1.3 for Facility table definition

3.1.7.1 OutpatientCondition Table

Columns

Column Name	Data Type	Allow Nulls
PKConditionID	int	False
Description	int	True

Indexes

Name	Clustered	Columns
PK_OutPatientCondition	True	PKConditionID

3.1.7.2 OutpatientRegister Table

Columns

Column Name	Data Type	Allow Nulls
PKOutpatientRegisterID	int	False
RegisterUser	varchar(255)	True
FKFacilityID	int	False
FormNumber	int	False
FKConditionID	int	True
M_Age_0_9	int	True
M_Age_10_19	int	True
M_Age_20_29	int	True
M_Age_30_39	int	True
M_Age_40_49	int	True
M_Age_50_59	int	True
M_Age_60_64	int	True
M_Age_65	int	True
F_Age_0_9	int	True
F_Age_10_19	int	True
F_Age_20_29	int	True
F_Age_30_39	int	True
F_Age_40_49	int	True
F_Age_50_59	int	True
F_Age_60_64	int	True
F_Age_65	int	True

Indexes

Name	Clustered	Columns
IX_OutPatientRegister	False	FKFacilityID
IX_OutPatientRegister_1	False	FKConditionID
PK_OutPatientRegister	False	PKOutpatientRegisterID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_OutPatientRegister_Facility	FKFacilityID	Facility	PKFacilityID
FK_OutPatientRegister_OutPatientCondition	FKConditionID	OutPatientCondition	PKConditionID

3.1.8 TB Details

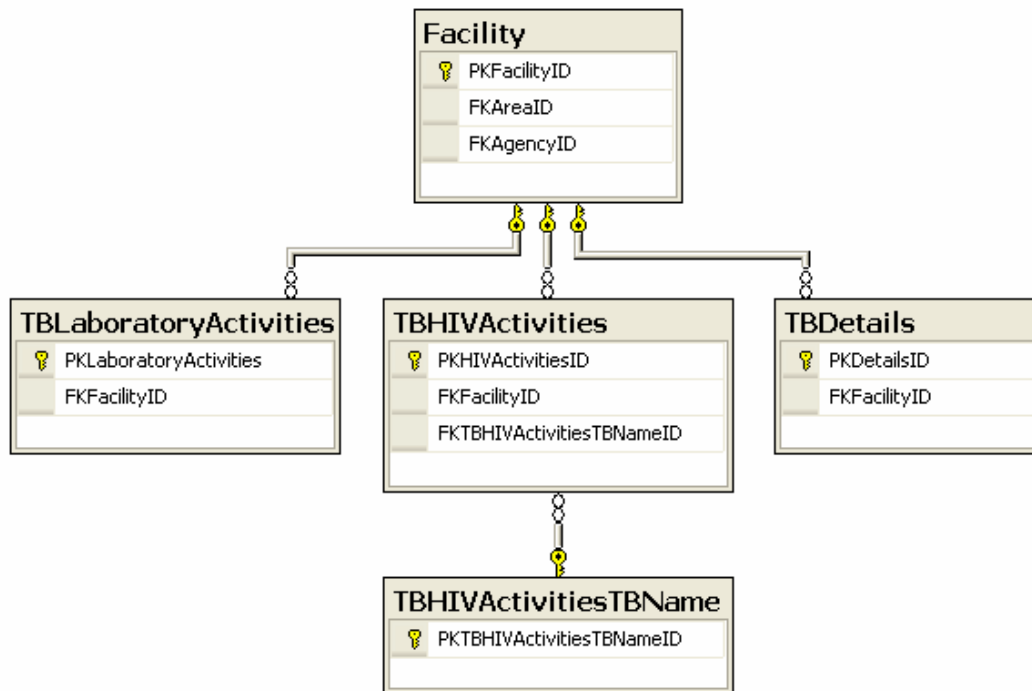


Figure 9 – TB Details Data Relationships

See 3.1.1.3 for Facility table definition

3.1.8.1 TBLaboratoryActivites Table

Columns

Column Name	Data Type	Allow Nulls
PKLaboratoryActivities	int	False
FKFacilityID	int	False
ReportDate	datetime	False
TotalExamined	int	True
SmearPositive	int	True

Indexes

Name	Clustered	Columns
IX_TBLaboratoryActivities	True	FKFacilityID
IX_TBLaboratoryActivities_1	False	ReportDate
PK_TBLaboratoryActivities	False	PKLaboratoryActivities

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_TBLaboratoryActivities_Facility	FKFacilityID	Facility	PKFacilityID

3.1.8.2 TBDetails Table

Columns

Column Name	Data Type	Allow Nulls
PKDetailsID	int	False
FKFacilityID	int	False
ReportDate	datetime	False
TBType	varchar(50)	True
TBName	varchar(50)	True
Sex	char(1)	True
AgeGroup	int	True
Cases	int	True

Indexes

Name	Clustered	Columns
IX_TBDetails	True	FKFacilityID
IX_TBDetails_1	False	ReportDate
IX_TBDetails_2	False	TBName
IX_TBDetails_3	False	TBType
PK_TBDetails	False	PKDetailsID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_TBDetails_Facility	FKFacilityID	Facility	PKFacilityID

3.1.8.3 TBHIVActivitiesTBName Table

Columns

Column Name	Data Type	Allow Nulls
PKTBHIVActivitiesTBNameID	int	False
Description	varchar(50)	True

Indexes

Name	Clustered	Columns
PK_TBHIVActivitiesName	True	PKTBHIVActivitiesTBNameID

3.1.8.4 TBHIVActivities Table

Columns

Column Name	Data Type	Allow Nulls
PKHIVActivitiesID	int	False
FKFacilityID	int	False
ReportDate	datetime	False
FKTBHIVActivitiesTBNameID	int	False
M_Tested_HIV	int	True
M_HIV_Positive	int	True
M_On_CPT	int	True
M_On_ARV	int	True
F_Tested_HIV	int	True
F_HIV_Positive	int	True
F_On_CPT	int	True
F_On_ARV	int	True

Indexes

Name	Clustered	Columns
IX_TBHIVActivities	False	FKFacilityID
IX_TBHIVActivities_1	False	ReportDate
IX_TBHIVActivities_2	False	FKTBHIVActivitiesTBNameID
PK_TBHIVActivities	False	PKHIVActivitiesID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_TBHIVActivities_Facility1	FKFacilityID	Facility	PKFacilityID
FK_TBHIVActivities_TBHIVActivitiesTBName1	FKTBHIVActivitiesTBNameID	TBHIVActivitiesTBName	PKTBHIVActivitiesTBNameID

3.1.9 TB Outcome

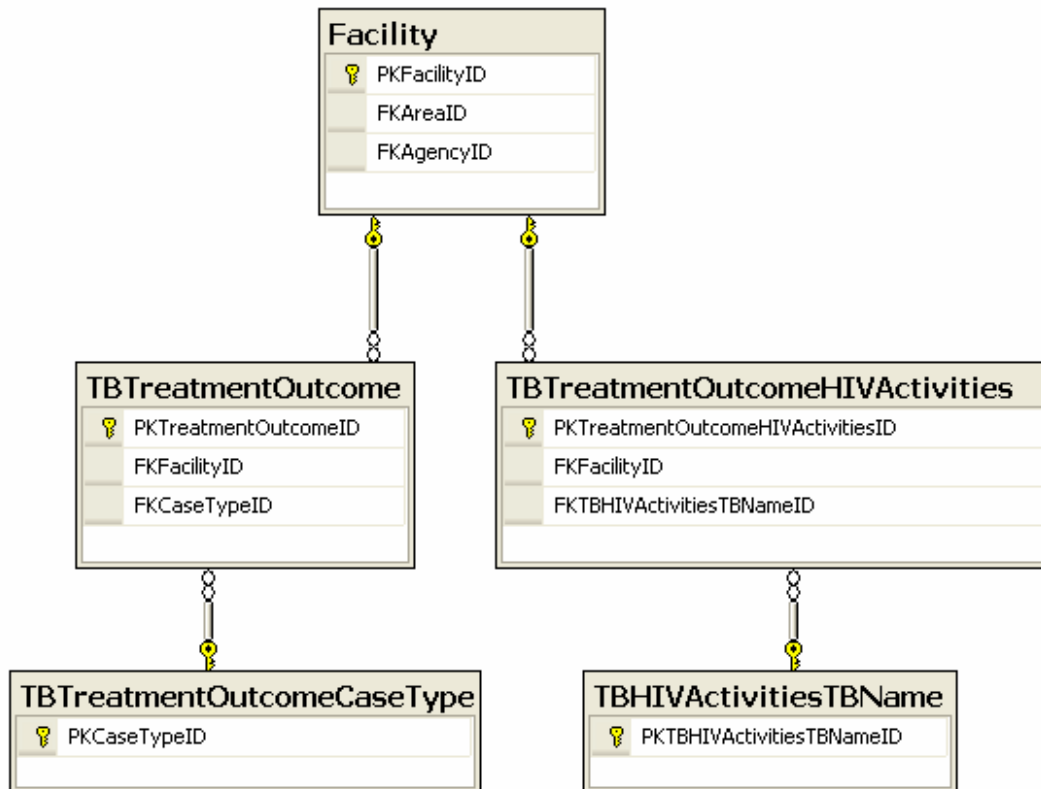


Figure 10 – TB Outcome Data Relationships

See 3.1.1.3 for Facility table definition

See 3.1.8.3 for TBHIVActivitiesTBName table definition

3.1.9.1 TBTreatmentOutcomeCaseType Table

Columns

Column Name	Data Type	Allow Nulls
PKCaseTypeID	int	False
Description	varchar(50)	False

Indexes

Name	Clustered	Columns
PK_TBTreatmentOutcomeCaseType	True	PKCaseTypeID

3.1.9.2 TBTreatmentOutcome Table

Columns

Column Name	Data Type	Allow Nulls
PKTreatmentOutcomeID	int	False
FKFacilityID	int	False

ReportDate	datetime	False
FKCaseTypeID	int	True
bHIVPositive	bit	True
Registered	int	True
Cured	int	True
Completed	int	True
Died	int	True
Failed	int	True
Defaulted	int	True
Transferred	int	True
Evaluated	int	True
NotEvaluated	int	True

Indexes

Name	Clustered	Columns
IX_TBTreatmentOutcome	True	FKFacilityID
IX_TBTreatmentOutcome_1	False	ReportDate
IX_TBTreatmentOutcome_2	False	FKCaseTypeID
PK_TBTreatment	False	PKTreatmentOutcomeID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_TBTreatmentOutcome_Facility	FKFacilityID	Facility	PKFacilityID
FK_TBTreatmentOutcome_TBTreatmentOutcomeCaseType	FKCaseTypeID	TBTreatmentOutcomeCaseType	PKCaseTypeID

3.1.9.3 TBTreatmentOutcomeHIVActivitiesTable

Columns

Column Name	Data Type	Allow Nulls
PKTreatmentOutcomeHIVActivitiesID	int	False
FKFacilityID	int	False
ReportDate	datetime	False
FKTBHIVActivitiesTBNameID	int	False
M_Tested_HIV	int	True
M_HIV_Positive	int	True
M_On_CPT	int	True
M_On_ARV	int	True

F_Test_HIV	int	True
F_HIV_Positive	int	True
F_On_CPT	int	True
F_On_ARV	int	True

Indexes

Name	Clustered	Columns
IX_TBTreatmentOutcomeHIVActivities	False	FKFacilityID
IX_TBTreatmentOutcomeHIVActivities_1	False	ReportDate
IX_TBTreatmentOutcomeHIVActivities_2	False	FKTBHIVActivitiesTBNameID
PK_TBTreatmentOutcomeHIVActivities	False	PKTreatmentOutcomeHIVActivitiesID

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_TBTreatmentOutcomeHIVActivities_Facility	FKFacilityID	Facility	PKFacilityID
FK_TBTreatmentOutcomeHIVActivities_TBHIVActivitiesTBNameID	FKTBHIVActivitiesTBNameID	TBHIVActivitiesTBName	PKTBHIVActivitiesTBNameID

3.1.10 TB Sputum

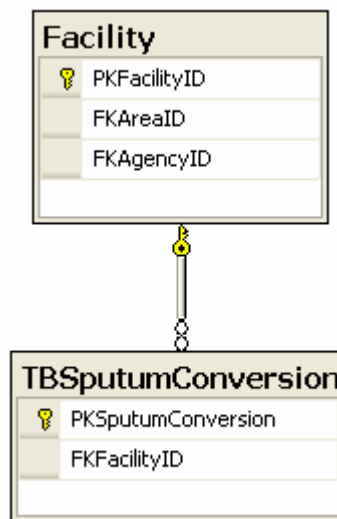


Figure 11 – TB Sputum Data Relationships

See 3.1.1.3 for Facility table definition

3.1.10.1 TBSputumCohnversion Table

Columns

Column Name	Data Type	Allow Nulls
PKSputumConversion	int	False
FKFacilityID	int	False

ReportDate	datetime	False
NewSmearPositiveCases	int	True
SmearNotDoneAt2or3Months	int	True
SputumConversionAt2Months	int	True
SputumConversionAt3Months	int	True
TotalConverted2or3Months	int	True
ConversionRate	float	True

Indexes

Name	Clustered	Columns
IX_TBSpulumConversion	True	FKFacilityID
IX_TBSpulumConversion_1	False	ReportDate
PK_TBSpulumConversion	False	PKSpulumConversion

Foreign Key Constraints

Name	Columns	Referenced Table	Referenced Columns
FK_TBSpulumConversion_Facility	FKFacilityID	Facility	PKFacilityID

4. REPORTING

It is suggested that Crystal Reports or Reporting Services (if using SQL Express) be used for the reporting requirements. The report parameters and requirements will be defined in the design documentation.