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Thailand

Health Care Reform: Financial Management

Report 7B

A Common Health Care Financing Model (II) for the main health purchasing agencies
- **Universal Coverage Scheme**
- **Social Security Scheme**
- **Civil Servants' Medical Benefits Scheme,**

and Projection module for the National Health Accounts

DOCUMENTATION OF WORK & PROGRESS

May 2010

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Foreword

This collection of reports provides complete background information and supporting material relating to the development of the Health Care Financing Model (HCFM) by the International Labour Office (ILO) for the health care system of Thailand. As such it supplements the User Manual and practical guide (Report 7A) which presents the technical features and handling instructions of the model developed for Thailand's three main health care systems: the Universal Coverage Scheme, the Civil Servants Medical Benefits' Scheme and the Sickness Branch of the Social Security Scheme. The primary purpose of developing a HCFM was to establish a conceptually clear and transparent basis for modeling and projecting the health care budgets of the three schemes.

The model was developed by the International Labour Office within the framework of the EU project on 'Health Care Reform in Thailand'. A preliminary phase of data specification and collection took place in 2007, which is documented in the first four reports and adjoining annexes (Initial Phase). Work on model development followed during the first semester of 2008, and is documented in the subsequent reports (Second Phase). Also documented are the activities undertaken with respect to the hand-over of the model to the Thai counterparts: a common training session was organized with all three institutions in July 2008 followed by hands-on practical training sessions with the technical officers in charge of modeling at the respective institutions.

As noted, this collection of background reports supplements the model's technical guide and User Manual (Report 7A). Both Reports 7 should be read in conjunction with

> ILO/Thailand Report 6: *A Common Health Care Financing Model (I) for CSMBS, IHPP, NHSO and SSO and a Proposal for a Financial Management Structure. Terms of Reference, Review and Supervision.*

which documents the terms of reference that formed the basis to the software / model development, and comments on the supervision of the relevant work and activities; and which includes a proposal for the implementation of an Integrated Financial Management System (INFIMO). Also pertinent is

> ILO/Thailand Report 8: A *Common Health Care Financing Model (III) for CSMBS, IHPP, NHSO and SSO and a Proposal for a Financial Management Structure. Note on implementation.*

As has already been noted elsewhere, the model in question is not meant to be a final product. The model(s) should be considered on the contrary as a working tool subject to further development and improvement following its full appropriation by the three schemes. It is hoped that the three versions of the Health Care Financing Model developed with the three institutions will serve its intended purpose and become useful tools for the institutional budgeting process of the three schemes. It is hoped further that the platform for the technical cooperation and exchange between stakeholders as established during the model development process will live on, notably for the purpose of updating common model components and assumptions on demographic and macro-economic parameters.

October 2009 Wolfgang Scholz

Jean-Claude Hennicot

Acknowledgements

The author would like to acknowledge the good cooperation extended by the Thai counterparts, in particular the technical staff of the respective institutions. Acknowledgements are due to Ms Rangsima , SSO, Mr Kulsek Limpiyakorn, CSMBS, Ms Taweesri Greetong and Ms Kongkran, NHSO, for their continued assistance with data collection and their continuous feedback, notably on the draft model design. Special thanks are due to Mr. Hiroshi Yamabana, ILO Social Security Specialist, for his insightful comments, to Mr. Wolfgang Scholz, ILO Senior Economist, for his technical comments and the fruitful debates during his missions, and finally to Dr. Thaworn Sakunphanit, EU National Project Manager, for his technical inputs, coordination, and overall guidance.

THAILAND

Development of a Health Care Financing Model

Initial Phase

START-UP ASSESSMENT REPORT

July 2007

Jean-Claude Hennicot
Consulting Actuary
ILO

CONTENTS

1. Background

This report has been drafted within the framework of the consultancy agreement entered into by the consultant with the International Labour Office (External Collaboration Contract no. 40029956/0 signed on 1 July 2007). It presents the first assessment of the consultant required at the commencement of his assignment according to the terms of the contract (see Product 1 – Initial assessment report).

The assignment of the consultant is taking place within the context of the contribution agreement between the International Labour Office (ILO) and the European Commission (EC) signed on 9 February 2006 with regard to the EC project on Heath Care Reform in Thailand (THA/AID/CO/2002/0411, 2004 – 2009), with the purpose to ensure a contribution by ILO towards the implementation of the project component 'Financial Management of the Thai Health System'.

It is noted that the present report is based on the information available to the consultant at the onset of his assignment, i.e., before his consultations with national counterparts (NHSO, SSO, IHPP, CSMBS, etc.).

2. Institutional context

Thailand has currently three national health care schemes, which are the Social Security Scheme (SSO), the Civil Servants' Medical Benefits Scheme (CSMBS), and the Universal Coverage scheme administered by the National Health Security Office (NHSO). The three schemes are the main purchasers of health services from public and private health care service providers (hospitals) in the country.

The Social Security Office provides social health insurance to all workers employed in the private sector and to temporary public sector workers. Participation in the scheme is mandatory and health insurance coverage currently extends to about 9.6 million workers. The scheme is financed by contributions from workers, employers, and the government, each party paying an equal share of 1.5 per cent of insurable earnings, or 4.5 per cent in total.[1] The scheme pays hospitals on a capitation basis for both out-patient and in-patient care, with certain exclusions. Treatments not included in the capitation fee include dental care, medical care provided in case of emergency/accident, and certain treatments classified as high-cost. All treatments, which are not financed through capitation, are paid for on a fee-for-service basis at fixed rates. The capitation fee is calculated and proposed annually by SSO; it includes a basic amount and two separate increments reflecting service utilization and provider risk respectively, the latter referring to the prevalence of chronic diseases with the population registered with each provider.

The CSMBS provides health care services to all Thai civil servants, permanent employees in the public sector, and to public sector pensioners. It also covers their dependent spouses and children if not older than 19, this up to three per family. Dependent parents of civil servants and permanent employees are also insured. Total

[1] Insurable earnings are subject to a ceiling of 15,000 Thai baht per month.

scheme coverage currently amounts to about 7 million persons. The CSMBS scheme is financed solely by the government, with payments of hospitals done so far on a fee-for-service basis. However, the fee-for-service method is currently in the process of being replaced by a DRG-system (details to be clarified later).

The NHSO is administering the Thai universal coverage (UC) scheme, providing free health care to all Thai citizens who are not covered under the SSO or CSMBS.[2] NHSO is the largest national scheme covering about 46.5 million persons. NHSO operates a hospital payment mechanism based on capitation in a similar manner than SSO, with certain treatments paid on a fee-for-service basis.

The International Health Policy Programme (IHPP) is a semi-autonomous body under the Ministry of Public Health (MOPH) and has the mandate to conduct research aiming at improving health systems and policy in Thailand. IHPP is undertaking research on health financing at the national level, notably through the development of a national health financing model, with the purpose to analyze and forecast health care expenditure and resource requirements on a national level.

3. Objectives and work to be accomplished

The main overall objectives of the ILO intervention are to support the Thai Government in developing an integrated health financial management and monitoring system and to improve the capacity on health financing of a core group of health professionals in the respective institutions.

The assignment of the consultant is meant to support the project activity aiming at developing a common model framework for the calculation and projection of health care costs in Thailand, this in order to devise, for each scheme and in aggregate, a sound and transparent mechanism for determining the adequate level of fees (capitation and fee-for-service or DRG-specific respectively) to be paid for health care services purchased from service providers and/or for sound budgeting (and/or simulation) of health care costs in the future.

The work to be accomplished by the consultant during this assignment relates to the first phase of the planned modeling process (‘Initial Phase’) and is stipulated in detail in the terms of reference (see Annex). It consists in summary of the following activities:

a. To develop and describe in detail the structure of the health finance projection and simulation models proposed for NHSO, SSO, and CSMBS, and IHPP. A generic formula has been proposed as the common basis for all models:

$$Exp_t = Pop_t \cdot g_t \cdot f_t \cdot c_t$$

Where: Exp_t is the total health expenditure of the respective scheme

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[2] The scheme initially charged beneficiaries a co-payment of 30 baht per hospital visit/admission but the co-payment abolished at the end of 2006 by the government.

Pop_t is the population covered (i.e. eligible to benefits) in the respective scheme

g_t is the probability that an eligible person of the scheme seeks treatment at least once during the years t (given by the ratio of all eligible scheme members seeking treatment at least once during the year t to the number of scheme members eligible in the year t).

f_t is the frequency of patient contacts in the year t for scheme members seeking treatment (at least once) during the year t.

c_t is the average cost per treatment incurring for the scheme.

It is noted that the formula given above shall be used to determine health care expenditure for each single age cohort and sex, and for each type of treatment (in-patient and out-patient). Furthermore, average unit cost (c_t) shall be determined for each type of hospital (categories to be determined) and total expenditure for each cohorts disaggregated accordingly by type of hiospital with the above formula.

b. To establish a consistent database for the year 2006 containing historical data (i.e., actual values for the year 2006) of all variables contained in the models. It is relevant here to ensure that the data base for 2006 be calibrated in order to ensure that the model results for 2006 (ex-post) match with the actual expenditure reported in the relevant financial statements and/or fiscal reports.

c. To develop a sound projection model for the population covered by CSMBS.

d. To devise a sound method to allocate total expenditure of CSMBS to the different subgroups of the population covered by CSMBS (male and female workers, dependents, pensioners, etc.).

e. To develop a detailed table of contents for the data dictionary to be compiled at a later stage during the project.

f. To establish a sound demographic, labour market, and economic frame to be used by the four models as a common input for demographic variables (e.g., employment by type, scheme coverage, etc.) and economic variables (e.g. wage and price levels, labour productivity, etc.).

g. To develop, based on the outcome of the work carried out under the points above a concrete model proposal for the institutional modeling of revenue and expenditure of NHSO, SSO, CSMBS, and IHPP.

4. Planned approach

It is obvious that the modeling and costing approach to be developed should be agreed upon by both health care service providers (hospitals), purchasers (NHSO, SSO, and CSMBS), and policy experts (IHPP), this in order to achieve their acceptance of and common agreement on the model(s) to be adopted eventually. It is therefore relevant that all national (and international to some extent) stakeholders be duly consulted and involved in the process.

In order to gather swiftly the necessary data and qualitative information on the three schemes, the consultant plans to organize during the first weeks of his assignment regular consultations with each one of the main national stakeholder institutions (NHSO, SSO, CSMBS, and IHPP). It is considered important here to establish a good working relationship, in particular with the technical staff designated as counterparts in each institution. A good and close cooperation with Dr. Thaworn, Manager of the Financial Management Component of HCRP, is considered equally important if not crucial.

Apart from the national counterparts, the consultant also plans to consult on a regular (and hopefully frequent) basis with the ILO experts involved in the project, notably Mr. Wolfgang Scholz, Senior Economist, ILO SOC/SEC Geneva, and Mr. Hiroshi Yamabana, Social Security Specialist, ILO SRO South East Asia, Bangkok. Both of them have a good knowledge of the Thai health care system and their guidance is considered essential and invaluable for the quality and timely delivery of the many outputs to be produced under the assignment.

Apart from the institutions mentioned above, others may be of relevance for this assignment, notably in the context of the development of the demographic and economic framework for the models. These include, amongst others, the Office of The National Economic and Social Development Board (NESDB), the National Statistical Office (NSO), the Budget Bureau, Ministry of Finance, the Trade and Economic Indices Bureau, Ministry of Commerce, and the Bureau of Registration Administration, Ministry of Interior.

Based on a thorough review of the data, qualitative information, and background documents provided by the national counterparts, the consultant will be able to identify data gaps and formulate specific data/information requests accordingly during the course of his assignment.

With regard to model building and development of the database, the consultant plans to undertake these activities concurrently and on an ongoing basis. It is noted here that the progress with these tasks is dependent not only on the availability of data and the consistency of the data provided but also on the timeliness and responsiveness of national counterparts in providing necessary data and qualitative information.

5. Work plan

A detailed work plan proposed for the assignment is shown below, this based on the flow chart of monthly activities attached to the terms of reference. It is noted that the work plan displayed should be considered as tentative since the progress of work and completion of outputs to be developed is dependent not only on the cooperation and availability of national counterparts, but also on the availability and consistency of the data to be provided.

Workplan, July 2007 - September 2007 (tentative*)

Activity (see terms of reference)	***Jul-07***					***Aug-07***				***Sep-07***			
w/c	2	9	16	23	30	6	13	20	27	3	10	17	24
1. Draft-design of model structures													
Consultations and information gathering													
Assessment and modelling													
Reporting (draft and final)													
2. Establishment of consistent data base													
Consultations and data collection													
Compilation and calibration of data base													
Reporting (draft and final)													
3. Modelling of CSMBS population													
Consultations and information/data collection													
Actuarial analysis and design of projection model													
Reporting (draft and final)													
4. Allocation of CSMBS expenditure													
Consultations and data collection													
Analysis of expenditure and disaggregation													
Reporting (draft and final)													
5. Data check and drafting of table of contents for data dictionary													
Data consistency check													
Design of draft table of contents													
Reporting (draft and final)													
6. Development of a common demographic and economic frame													
Consultations and data collection													
Demographic and economic modelling													
Reporting (draft and final)													
7. Development of model proposals and CSMBS demographic model													
Modelling													
Reporting (draft and final)													

** Depending on work progress, data availability and consistency*

ANNEX

Development of a Health Care Financing Model

- Initial Phase -

Terms of Reference

Jean-Claude Hennicot
Consulting Actuary

ATTACHMENT 1

ILO-SECSOC

Geneva, 26 June 2007

Terms of Reference - Initial Phase (TOR-IP)

(1 July to 30 September 2007)

Attachment: Bangkok Mission Report WS dated 26 June 2007, incl. Annexes I to VI

Development of a health care financing model, and staff capacity building, for

The Civil Servants Medical Benefit Scheme (CSMBS), The Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and The International Health Policy Programme (IHPP)

Thailand

These *Terms of Reference for the Initial Phase* (TOR-IP) specify the activities to be undertaken during the initial phase of the overall modelling process, which stretches into 2008.

They are based on, specify and partially replace, the Draft Terms of Reference (Draft03 dated 02/05/2007). The overall contents of Draft03 remains valid and should be understood as reference for the detailing of further TOR that will follow after the activities of these TOR-IP have been finished. The contractor to these TOR-IP is advised to refer to the Draft03 for putting his / her work into perspective.

The contents of Draft03, as far as not replaced by these TOR-IP, is still valid; the time frame defined in Draft03 is however not fully applicable anymore. For the initial phase of modelling, these TOR-IP replace the time frame of Draft03 (see Attachment 1 to these TOR-IP).

(1) Draft-design of model structures; specify and check data (July 2007)

The *health finance projection and simulation models* to be developed for NHSO, SSO, CSMBS and IHPP will be *described*, in writing, in their core structures (modeling approach).

This includes written description of :

- the legislation (as far as relevant for modelling) of the covered populations;
- the statistical representation of the covered populations (numerical data base);
- the approach of moving the covered populations from t to t+1 (demographic modelling approach);
- the revenue and expenditure (= time series tabulation of fiscal accounts, budgets, and National Health Accounts);
- the costs per health benefits / health services *offered* by health providers, including the rules governing their development ("shadow-fee basis"; adequate time series tabulation);
- the costs per benefits / services *covered* (*reimbursed*) by health purchasers, including the rules governing reimbursements ("reimbursement basis");

for each of the three schemes UC, SSO, and CSMBS, separately (where adequate).

For UC, SSO and CSMBS health expenditure, the modelling approach will be based on similar modelling approaches as follows:

$$\mathbf{Exp = Pop * g * f * c,}$$

Where

Exp =: Health expenditure of scheme [UC, SSO, CSMBS respectively]

Pop =: covered population of scheme [UC, SSO, CSMBS respectively]

g =: factor representing the ratio between number of patients of scheme and insured of scheme [UC, SSO, CSMBS respectively]

f =: factor representing frequency of contact of patients with scheme [UC, SSO, CSMBS respectively]

c =: costs per patients' contact with health system [UC, SSO, CSMBS respectively]

In the case of SSO and UC information on **c** will be derived from hospitals' reports on charges ("shadow fees"). Support will be provided by SSO and NHSO staff in order to collect and interpret the data.

All variables / parameters will be calculated by *single ages* (0, 1, ..., 100), by *sex*, by *in-patients* and *out-patients*, and by *hospital type*, i.e. public (non-teaching hospitals, public teaching hospitals, others) and private – details to be determined in cooperation with Thai counterparts.

(2) *Establishment, description and evaluation of a consistent data base (July 2007)*

The data base will be 2006. If incomplete, data of 2005 will be used to estimate, adjust and complete the 2006 statistical data.

It must be made sure that, in 2006, the data base [for UC, SSO, CSMBS respectively] is consistent in the sense that the above equation, i.e.

$$\mathbf{Exp = Pop * g * f * c,}$$

is being fulfilled for all three schemes, i.e. multiplying and adding up over (single-age) vectors **Exp, Pop, g, f** and **c** provides total expenditure as measured statistically (in the fiscal accounts) in the three schemes [UC, SSO, CSMBS] respectively. *This requires calibration of the data base for 2006.*

The data base, year 2006, will form the basis for model design and model projections over time (moving data-vectors from T to T+1). It is this basis that will have to be updated later, once all models are finished and handed over to the Thai counterparts. *A description of the calibration method is to be included in the deliverable under this point 1) of the TOR-IP.*

In SSO and UC, there are health expenditure items that are not, in the data base, covered by the in-patient and out-patient systematic, but recorded (and projected) separately. Some of these expenses are available by single patients, i.e. can be structured by single ages vectors, by sex, by type of hospital etc. With respect to some items, other structured information is available. The contractor will make adequate use of that information in collaboration with the Thai counterparts for structuring the data base 2006.

When shaping the model design and the data base(s) for UC and SSO it has to be kept in mind that important model outputs in both cases (schemes) are the *capitation rates* for either scheme. The capitation rate calculation should be based on transparent methods such that these can be used, after hand-over of the models to the institutions, for calculating the annual budget proposals to the respective committees.

(3) *Modelling approach for the CSMBS covered population (July 2007)*

It is expected that the contractor pays special attention to an ***adequate modelling approach for moving from*** **t** ***to*** **t+1** ***the population covered by the CSMBS***. This special attention is required as there is demographic modelling experience of the ILO with respect to the SSO and the UC, but not with respect to the CSMBS, where the greater part of the covered population is a function of the development of the number and structure of active civil servants, as follows:

Problematique of modelling the CSMBS covered population:

The CSMBS covers

1) Civil servants (most civil servants from 18 (minimum age) to 60 (retirement age; few exemptions);
2) Their parents;
3) Their spouse (if Muslim: their spouses);
4) Maximum of three (3) children per civil servant (idem: couple) until they turn 20 years of age;
5) Permanent employees (incl. their dependents, like for civil servants) from 16 (minimum age) to 60 (retirement age; no exemptions; all receive lump sum at retirement, no pension)

as long as the civil servant maintains his / her status as a civil servant.

By the end of their career, at retirement, *some* opt out – against one time payment of a (high) lump sum – and lose their own CSMBS health coverage and, also, CSMBS health coverage for their dependents.

Permanent employees all loose their status at retirement, i.e. they and their dependents loose CSMBS coverage at retirement of the active.

Unless receiving other health coverage both groups (former actives and their dependents) then refer to UC.

At present, total CSMBS membership is about 5 million persons, of which 1.9 million are active civil servants, 20 thousand permanent employees, and the rest – around 3.1 million persons – dependents.

This totals to a total number of 16 different groups; the information exists by single ages between 0 and 100.

HOWEVER, the CSMBS does not have information about expenditure differentiated by those groups. Accordingly, group-related information does not (yet) exist about allocation of total CSMBS expenditure on in-patients and out-patients.
The only spending information available is TOTAL EXPENDITURE.

Follows preliminary modelling approach for CSMBS-members:

MEMBERS	=	CSm + CSf + CSSPm + CSSPf + CSCHm + CSCHf +
	+	CSPARm + CSPARf +
	+	EMPm + EMPf + EMPSPm + EMPSPf + EMPCHm +
	+	EMPCHf + EMPPARm + EMPPARf

with:

Civil servants

1) CSm	=:	Civil servants, male
2) CSf	=:	Civil servants, female
3) CSSPm	=:	Spouses, male, of civil servants
4) CSSPf	=:	Spouses, female, of civil servants
5) CSCHm	=:	Children, male, of civil servants
6) CSCHf	=:	Children, female, of civil servants
7) CSPARm	=:	Parents, male, of civil servants
8) CSPARf	=:	Parents, female, of civil servants

Permanent employees

9) EMPm	=:	Permanent employees, male
10) EMPf	=:	Permanent employees, female
11) EMPSPm	=:	Spouses, male, of permanent employees
12) EMPSPf	=:	Spouses, female, of permanent employees
13) EMPCHm	=:	Children, male, of permanent employees
14) EMPCHf	=:	Children, female, of permanent employees
15) EMPPARm	=:	Parents, male, of permanent employees
16) EMPPARf	=:	Parents, female, of permanent employees

Modelling problem is mainly to find an algorithm that treats the dependents as a function of the actives. Total actives will have to come from the labour market balance.

See also the file CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

(4) *Calibration of CSMBS expenditure data base by different categories (August 2007)*

A further problem is that TOTAL EXPENDITURE has to be allocated, in the base year, on single ages of the above groups AND on in-patients and on out-patients.

In other words, the contractor will need to establish a hybrid database such that, for the base year, the sum of all sum products equals TOTAL EXPENDITURE. It is only then, that the standard demography-related projection method can be applied.

The CSMBS maintains two detailed lists of prices to be paid for

(1) medical goods and appliances, and

(2) services.

These lists may be tentatively used as indicators for approaching the above problem. Direct coordination with the Thai counterparts is required.

The two lists are agreed upon between CSMBS and health providers; prices are maximum amounts reimbursed. If hospitals charge higher prices the civil servant has to pay the difference out of pocket. The lists only apply to public hospitals. In other words, thus far, if a civil servant [or dependant] goes to a private hospital s/he has to pay the whole bill out of pocket.

Also, CSMBS applies CSMBS-specific DRGs (in-patient classification system) as of July 2007 to Civil Servant cases of treatment of inpatients.
However, for the time being, different RWs are being multiplied with different base amounts, e.g. in

- $\text{Hospital}_1 = \text{RWs} * \text{RW}_{\text{base rate of Hospital}1}$,
- ...,
- $\text{Hospital}_n = \text{RWs} * \text{RW}_{\text{base rate of Hospital}n}$;

it is planned later to group hospitals by categories (e.g. university hospitals, others) and force them within groups to apply identical, hospital-group specific, base rates.

The contractor is expected to explore whether the estimation of an *average general base rate multiplier* $\text{RW}_{\text{base rate}}$ for all hospitals is possible and, if so, whether it is a "reasonable" parameter to be used in CSMBS expenditure modelling.

Specification of data implies: defining (writing down) the complete list of data required for modelling the above schemes.

It was agreed between ILO, CSMBS, and PIU (Dr Thaworn) that data of CSMBS will be provided by CSMBS (Mr Kulasake Limpiyakorn, Financial Analyst: The Comptroller General Department, Min of Finance; sek139@yahoo.com, mobile: (666) 555-3139).
CSMBS population data format is specified in the file
CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

The discussions between the Thai counterparts and the ILO project manager, undertaken in 2006 and spring 2007, have shown that it might be advisable to disaggregate all base year data by different types of hospitals in all three schemes, i.e. in UC, SSO and CSMBS at least by public-teaching, public-non-teaching (sub-district, district, provincial), private, and possible other categories.

It is expected that the contractor establishes the data base (the data bases for the different schemes) in collaboration with the Thai counterparts such that differentiation of the above kind, by type of hospital, is taken into account.

In many respects, the contractor can refer to prior work undertaken by the ILO – especially for the demographic labour market and macro-economic parts (see below: item *(3)*), in other respects new data terrain will have to be covered.

NHSO, CSMBS, SSO and IHPP will collect and provide the specified data.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

(5) ***Data check and first draft table of contents of data dictionary; (August 2007)***

The activity under *(1)*, above, will be supported by a data collection activity through NHSO, CSMBS, SSO and IHPP.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

Data specification and actuarial data check will be used for ***drafting a first table of contents of a data dictionary*** – later to be completed extra these TOR-IP –, containing a statistical description of contents and definitions etc of the data needed for model maintenance.

(6) ***Common demographic, labour market and economic frame for the four models; (September 2007)***

A ***demographic, labour market and economic frame of models*** has to be developed that can be used by CSMBS, NHSO, SSO and IHPP as common input to their respective institutional health models (which are to be developed later, on basis of the work undertaken under these TOR-IP, in detail).

The variables that have to be produced by the above frame-models depend, in detail, on the final design of the institution-specific health models; in other words: the frame-models will be of a preliminary character, and later, extra these TOR-IP, be adjusted, fine-tuned, and finalized.

The contractor, in undertaking his/her work can relate to prior modelling work of the ILO for NHSO and SSO. The ***new approach under these TOR-IP*** is to make sure that the structure of the frame-models is designed such that it equally (simultaneously) satisfies the needs of model-input of *all four institutions' institutional health models*.

The contractor will design the *demographic frame model* such that it calculates the

UC-covered population as a residual of

- total population development,
- SSO-population development,
- CSMBS-population development, and
- "private" population development,

i.e.:

- $Pop_{UC} = Pop - Pop_{SSO} - Pop_{CS} - Pop_{Priv}$

One problem (under this approach) would be to design the model such that "stable", "reasonable" development of Pop_{UC} is guaranteed, allowing for smooth cooperation with all stakeholders of the NHSO, including the Bureau of Budget, over the practice of model application, given the fact that Pop_{Priv} is not explicitly known and a number of statistical inconsistencies between Pop_{UC} and Pop exist and have to be solved.

With respect to Pop the contractor will use the population registration data base of the Ministry of the Interior. (To be provided by the Thai counterparts.)

Labour supply will be designed according to the input needs of the four models for the four institutions.

The labour market balance of the economic sub-module will be designed consistently with labour supply. The ***contractor will explore, and make a respective proposal*** (in writing), to what extent labour supply calculations (by sex and single ages) can be used as input to the demand side of the labour market balance and to which extent, vice versa, labour market demand can function congruently as input for the supply side.

Accordingly, the economic sub-module will have to produce output on costing elements, i.e.

- Price indexes, and
- Average wages
- Productivity,
- Employment of various type,

for each of the four institutions' models.

Consistency between SNA and NHA is to be maintained.

(7) ***Design and data base; specify demographic model for CSMBS; (September 2007)***

The contractor is expected to develop, as a result of his / her work during TOR-IP a decisive view on how the institutional modelling for the revenue and expenditure for NHSO, SSO, CSMBS, IHPP (model design) can best be developed. In other words, the initial draft design must be turned into a concrete proposal for modelling, explaining the structure and, especially, the problems that need to be solved. This is not "the modeling" yet, which follows later in the phase after the work on TOR-IP.

The ***concrete proposal for modelling NHSO, SSO, CSMBS, IHPP should be delivered in writing***; any attachments can be delivered in electronic format (i.e.: Excel and / or Visual Basic program examples).

Further, it is expected that the contractor will have developed, by the end of his / her work, a practical proposal with respect to modelling the population covered under the CSMBS, taking into account the explanations under *(3), above,* section: <u>*Problematique of modelling the CSMBS covered population*</u>. In developing the proposal the contractor will pay special attention to modelling entries and exits into the CSMBS system; this includes exploring possibilities of applying civil service (CSMBS) specific assumptions on fertility and mortality. ***The CSMBS covered population modelling proposal (model) is expected in electronic format; it must be described separately in writing.***

<u>In summary, therefore, the TOR-IP basically stipulate the following:</u>

- Clarification and fine-tuning of modelling designs;
- Depending on the proposed model designs: establishment of the data base, including data calibration, for 2006 (2005); the data base must be complete; Specific care must be taken with respect to the making consistent of *calendar year data* with *fiscal year data*; where data are not available, but necessary for reasonable modelling (example: cost data CSMBS), the contractor provides consistent estimates (to the extent possible: theory based or otherwise "reasonably" constructed, based on established mathematical / statistical estimation procedures or methods of numerical / actuarial mathematics, or on other methods of rational reasoning);
- Development (finalize) of draft modules for the outer framework for the institutional models, i.e. demography, labour supply, labour demand, economy;
- Develop a concrete demographic model, related to the labour market balance of the macro-economic model, for the covered population of CSMBS (incl. computer application);
- And other activities as stipulated in detail above.

All work steps and results will be conceptually tested for their robustness and practicability in a framework of cooperation of modelling between NHSO, SSO, CSMBS, and IHPP to be established and implemented latest as of mid-2008. This comprises questions of routines, during a year, of updating the data base(s), especially.

Schedule

The work is expected to be accomplished over the three months July to September 2007.

A *work flow chart* indicatively stipulating which work should reasonably be done when will be made available in electronic format.

Preconditions and caveats

It is assumed that necessary data bases for the models should be developed in collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff.

In case delays are caused in the data collection process, there could be the delay in delivery of the intermediate and final results und these TOR-IP.

THAILAND

Development of a Health Care Financing Model

Initial Phase

DRAFT

MISSIONREPORT 1

(Product 2)

16 October 2007

Jean-Claude Hennicot
Consulting Actuary
ILO

CONTENTS

ANNEXES

1. Background

The present report is prepared in the framework of the consultancy agreement concluded by the consultant and the International Labour Office (ILO) on 1 July 2007 (External Collaboration Contract no. 40029956/0) in the context of the ILO activity on ‘Development of a Health Care Financing Model for Thailand’.

The assignment of the consultant is taking place within the wider context of the contribution agreement signed between the ILO and the European Commission (EC) on 9 February 2006 with regard to the EC project on Heath Care Reform in Thailand (THA/AID/CO/2002/0411, 2004 – 2009). The agreement stipulates the implementation of the EC project component ‘Financial Management of the Thai Health System’ by the ILO.

The present report is part of the reporting requirements stipulated in the consultant’s contract and is referred to as ‘product 2’ in the terms of reference (see Annex A); it includes the findings of the consultant with regard to the following:

- Scheme descriptions (for UC, SSO, and CSMBS) and base year data on coverage, medical benefit provisions, costs of medical services, and scheme expenditure.
- Detailed specification of the proposed models for UC, SSO, and CSMBS
- Demographic modeling for CSMBS
- Expenditure modeling for CSMBS

For ease of readability, the report has been structured as follows:

a) Section 2 presents a general description of the three schemes; including information on the respective legal framework, benefit provisions, current provider payment system or budget allocation method, income and expenditure, and base-year coverage of each scheme.

b) Demographic modeling for the three schemes is presented in section 3. This section also includes a description of the proposed population projection model.

c) Section 4 presents the proposed expenditure models for the three schemes.

d) Section 5 deals with specific issues relating to the modeling of CSMBS expenditure.

e) Section 6 deals with miscellaneous issues such as the cost of health care services to providers etc.

The report does not include information on the IHPP model to be developed under the project. It is noted that the consultant has been advised by the national project component manager that the model to be developed for IHPP was not relevant for the current assignment of the consultant and should be dealt with at a later stage of the project.

It is also noted that the development of model structure and related data framework followed by the data collection exercise took much longer than planned under the terms of reference. It is felt that given the wealth of information and data needed, and the complex nature of the models, the timeframe set out in the terms of reference was a bit unrealistic.

2. Scheme description of CSMBS, SSS, and UC

Thailand has currently three main national health care schemes, which include the Social Security Scheme (SSS), the Civil Servants' Medical Benefits Scheme (CSMBS), and the Universal Coverage (UC) scheme as administered by the National Health Security Office (NHSO). The three schemes are the main purchasers of health care services from public and private medical service providers (hospitals) in the country.

The main features of the three schemes are summarized below:

2.1. The Civil Servants' Medical Benefits Scheme

The CSMBS provides free health care to all Thai civil servants, permanent employees in the public sector, and to dependents spouses, children, and parents.

2.1.1. Legal framework

The legal basis of the CSMBS rests on the 'Royal Decree on the Disbursement of Medical Benefits for Civil Servants, B.E. 2550'. A revised draft of the decree is currently under consideration by the Ministry of Finance; its endorsement by the Cabinet before the general elections to be held in December this year is unlikely however.

2.1.2. Coverage

The CSMBS provides medical care to all civil servants, permanent state employees, and public sector pensioners. It also covers their dependent spouses and children if not older than 19, this up to three children per family. Permanently disabled children are covered for life. Parents of active insured and pensioners are also covered by the scheme if financially dependent.

The exact figure on CSMBS beneficiaries is unknown. Based on the available data and information the total coverage of the scheme for the fiscal year 2006 has been estimated at around 5.4 million persons.[1]

2.1.3. Benefit provisions

According to the Royal Decree quoted above the CSMBS reimburses all cost for medical care incurred by eligible members in case of illness or accident, including the cost for the following:

- All drugs included in the national drug list if prescribed by a medical doctor
- Medical services, diagnostics, laboratory tests, operations, etc.
- Medical devices and artificial organs
- Room and board during hospital admissions
- Annual medical checkup (for actives and pensioners only)

Non-curative goods and services are excluded (unless included explicitly), such as:

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[1] Preliminary estimate of the consultant based on sample data extracted from the database of the CSMBS OP direct payment system.

- Cost related to disease prevention and testing (incl. vaccines, etc.)
- Cost for pregnancy tests
- Plastic surgery, transexual operations, sterilization, etc.

The CSMBS reimburses only the cost of medical care provided by public hospitals, with the exception of in-patient accident and emergency care and a specific list of outpatient treatments (e.g., hemodialysis).

2.1.4. Financing

Financial arrangements

The CSMBS is financed solely through the government budget. Medical providers are reimbursed by the scheme on a fee-for-service basis for treatments provided to its members. Amounts reimbursable by the scheme are subject to ceilings stipulated in the following official documents:

- Circular nr. 0417/77 of the Ministry of Finance (15 Feb 05) on the reimbursement of cost for medical devices and artificial organs
- Circular nr. 0417/177 of the Ministry of Finance (1 Dec 2006) on the reimbursement of cost for medical service fees for outpatient and inpatient care

For the reimbursement of IP care CSMBS introduced the DRG system (version 3.3) in July 2007. However, the CSMBS uses the DRG system in a different way than NHSO since it does not include the reimbursement of cost for room and board, medical devices and appliances, and certain drugs (e.g., for cancer treatments), and for the reimbursement of the cost for IP services provided during the non-acute phase of admissions. Furthermore the CSMBS currently applies a different base rate per unit of DRG relative weight (RW) for each hospital.[2] In order to enhance equity and transparency in their provider payment system, CSMBS plans to introduce uniform base rates for different types of providers in the future although no timetable has yet been adopted for this move.

Expenditure

The expenditure of the CSMBS for the period 2002 – 2006 (fiscal years) is shown in table A.5. It can be observed that total expenditure of the scheme has increased considerably over the past years, from about 20.5 billion THB in the fiscal year 2002 to about 37 billion THB in the fiscal year 2006.

2.2. The Social Security Scheme

The Social Security Fund provides social health insurance to all workers employed in the private sector and to public sector workers with temporary employment contracts.

2.2.1. Legal framework

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[2] Provider specific base rates are currently determined by the CHI based on past IP charges reported by each provider.

The legal basis of the Social Security Fund rests on the Social Security Act (1990), which stipulates the establishment of the Social Security Fund and its administrative body, the Social Security Office. The Social Security Act stipulates the basic principles of the scheme, the list of benefits provided, and the financial arrangements and administrative rules and regulations.

2.2.2. Coverage

According to the Social Security Act, 1990, the Social Security Fund covers all employees working in private sector enterprises. Excluded from mandatory coverage are the following:

- Domestic workers who are not involved in a business;
- Public officials including permanent employees, daily temporary employees and hourly temporary employees of central, provincial, and local administrations, but excluding monthly temporary employees (who fall under mandatory coverage);
- Employees of foreign governments and international organizations;
- Employees of enterprises that have offices in the country but are being stationed abroad;
- Teachers and headmasters of private schools operating under the law on private schools;
- Students, nurse students, undergraduate and interning physicians who are employees of schools, universities, or hospitals;
- Other employees the exclusion of which is stipulated by law;
- Workers under the age of 15 or aged 60 and above.[3]

According to article 39 of the Social Security Act, 1990, workers who cease to be insured due to a change in their employment situation can continue their membership on a voluntary basis provided that they have been subject to compulsory contributions for a period of 12 months at least.

According to article 40 of the Social Security Act, any person who is not covered by the scheme under article 33 (mandatory coverage) or 39 (voluntary coverage following article 33 membership) can apply to become an insured person under the scheme.[4]

According to article 38 of the Social Security Act, employees who cease their employment and loose their membership under article 33 or 39 are entitled to benefits for a further period of six months starting from the date of termination of their employment.

In the year 2006, an average of 9.1 million members were entitled to medical benefits under the Social Security Fund, including about 7.92 million covered under article 33,

[3] According to the Social Security Act, 1990, workers older than 60 can be insured if they commenced their membership before they reached the age of 60.

[4] Members insured under article 40 qualify only for the following benefits: health insurance, sickess cash benefits (in case of in-patient care), maternity, and death benefits

about 874,000 workers covered under article 38, and about 285,000 workers covered under article 39. Only two persons were insured under article 40 in 2006.

2.2.3. *Health care benefit provisions*

According to article 63 of the Social Security Act, health care benefits provided under the Social Security Fund in case of non-occupational injury or disease include the following:

- Medical examination expense
- Medical treatment expense
- Room, board, and treatment expense in hospitals
- Drugs and medical supplies,
- Cost of ambulance and medical transportation services
- Other expenses as necessary

Medical treatments covered by SSO are extensive and include in principle all but those listed on the benefit exclusion list adopted by the Medical Committee. Treatments explicitly excluded from SSO coverage are the following:

- Cosmetic surgery
- Psychosis treatment except for acute attacks
- Specific treatments used against drug addiction
- Long-term hospitalization (exceeding 180 days per year)
- Hemodialysis except for acute renal failure requiring immediate treatment not exceeding 60 days and end-stage treatment for chronic renal failure
- Treatments administered for a purely research-oriented purpose
- Treatment against infertility
- Organ transplant except for bone marrow, kidney, and cornea transplant
- Tissue biopsy for organ transplant with the exception of bone marrow transplant
- Non-medical procedures
- Transsexual operations
- Reproductive surgery
- Non-essential treatments provided during convalescence periods
- Artificial lenses

2.2.4. *Financing*

Financial arrangements

The Social Security Fund is financed by tripartite contributions from workers, employers, and the government. For the sickness, maternity, invalidity, and death benefit branches, each party currently pays an equal share of 1.5 per cent of insurable earnings, or 4.5 per cent in total.[5]

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[5] Insurable earnings are subject to a ceiling of 15,000 Thai baht per month.

Medical providers are paid according to the capitation system for both out-patient and in-patient care, with certain items excluded and reimbursed on a fee-for-service basis up to a fixed ceiling. Not included in the capitation fee are the following benefits/services:

- Accident/emergency care if provided by another provider than the main provider with which the insured person is registered
- Treatments classified as high-cost, which include the following:
  - Hemodialysis
  - Chemotheraphy and radiotheraphy
  - Open heart surgery
  - Brain surgery
  - Medical implants
  - Corronary bypass
  - Percutaneous balloon valvuloplasty
  - Cryptococcal meningitis
  - Coronary dilatation using balloon or PTCA bypass
  - Atrial septal occluder
  - Sterilization (male & female)
- Dental care
- Bone marrow transplant including related drugs
- Hemodialysis, chronic peritoneal dialysis, and renal failure drugs
- HIV/AIDS drugs and diagnostics
- Kidney transplant
- Cornea transplant

The benefits listed above are reimbursed separately up to a ceiling, the amount of which is fixed specifically for each treatment. The ceilings on reimbursements are adjusted occasionally although no timetable has been set for regular adjustments.[6]

The capitation fee is negotiated annually by the SSO Medical Committee; it includes a basic amount and two separate increments reflecting service utilization (for both OP and IP care) and high risk / high cost patients respectively. The risk adjustment partially compensates providers for higher cost caused by high utilization rates, high incidence rates of chronic diseases, and high cost IP treatments (according to DRG relative weights) based on the actual care provided by the provider over a fixed period in the past.

The utilization increment of the capitation fee referred to as 'utilization incentive' is based on a combined annual OP/IP utilization rate index calculated as follows:

$$UI = \sum_{i=1}^{12} \left(\frac{n_i^{(OP)} + (n_i^{(IP)} \cdot d_i^{(IP)} \cdot 4.97)}{pop_i} \right)$$

Where: $n_i^{(OP)}$ is the number of OP visits in month i

[6] The ceiling amounts for certain treatments have never adjusted since the launch of the scheme in 1991.

$n_i^{(IP)}$ is the number of IP admissions in month i

$d_i^{(IP)}$ is the average length of stay in month i

pop_i is the average number of persons registered over month i

The utilization index is calculated for all providers separately and then grouped in percentiles. In 2006 the amount disbursed as utilization incentive was calculated as follows:

THB 30/person/year for providers with UI in the percentiles 1 – 3 (lowest 30% of UI)

THB 40/person/year for the 4th percentile

…

THB 100/person/year for 10th percentile (highest 10% of UI)

The average amount of utilization incentive disbursed in 2006 was 55 THB.

The risk adjustment component of the capitation fee is divided into two parts: an OP portion fixed at 55 per cent of the total amount and an IP portion fixed at 45 per cent of the total amount [of risk adjustment]. The OP portion is paid based on actual treatments provided to chronic disease patients over a fixed period in the past (6 months). It is calculated based on the cumulative risk score index as allocated to treatments provided to chronic disease patients. The OP risk adjustment for provider *i* is thus given by:

$$RA_{i,t}^{(OP)} = \left(cds_{i,t} / \sum_i cds_{i,t} \right) \cdot pop_t \cdot 205 \cdot 0.55$$

Where: $RA_{i,t}^{(OP)}$ is the OP risk adjustment for provider *i* in the period *t*

$cds_{i,t}$ is the cumulative chronic disease score reported by provider *i* over a predetermined period *t* (6 months in general)

pop_t is the average number of persons registered with all providers in the period *t*

The IP portion of the risk adjustment is based on the actual cumulative DRG case-mix index reported by the provider over a fixed period in the past (6 months in general). The IP risk adjustment is calculated as follows:

$$RA_{i,t}^{(IP)} = \left(cw_{i,t} / \sum_i cw_{i,t} \right) \cdot pop_t \cdot 205 \cdot 0.45$$

Where: $RA_{i,t}^{(IP)}$ is the OP risk adjustment paid to provider i for the period t

$cw_{i,t}$ is the cumulative amount of adjusted relative DRG weights reported by provider *i* over a predetermined period t

pop_t is the average number of persons registered with all providers in the period t

The capitation system is currently under review by the SSO Medical Committee.

Revenue and expenditure

The annual medical benefit expenditure and contribution income allocated for medical benefits under the Social Security Fund is shown in table A.6 for the period 2002 - 2006.

It can be observed that the medical benefit expenditure of the Social Security Fund has increased from 9.3 billion Baht in the year 2002 to about 15.8 billion Baht in the year 2006.

2.3. The Universal Coverage Scheme

The Universal Coverage Scheme was established in 2002 aiming to provide health care coverage to all Thai citizens who are not covered by any other statutory health insurance scheme. The scheme initially charged beneficiaries a co-payment of 30 baht per hospital visit/admission, but the co-payment was abolished at the end of 2006 by the new government. The scheme is administered by the National Health Security Office and funded through the National Health Security Fund.

2.3.1. Legal framework

The National Health Security Act, B.E. 2545, adopted in the year 2002 constitutes the legal basis for the Universal Coverage scheme. The Act stipulates the establishment of the National Health Security Office, which is entrusted with the administrative management of the scheme, and of the National Health Security Fund, aiming to ensure adequate financing of the scheme.

2.3.2. Coverage

The National Health Security Act stipulates that every Thai citizen has the right to medical care under the scheme unless he/she is already covered by another statutory scheme, including under the CSMBS and the SSS. Excluded specifically from coverage are the following persons:

- Government officials (civil servants) and employees in the public sector
- Officials and employees working for local governments
- Officials and employees working in state enterprises, in independent government agencies, and those already entitled to medical benefits from the state budget under other arrangements
- Parents, spouses, and children of the aforementioned categories who are entitled to medical care as dependents
- Beneficiaries of the Social Security Fund

The coverage of the UC scheme in the fiscal year 2006 is shown in table A.4. It can be observed that in 2006 about 47 million people were registered under the scheme.

2.3.3. Benefit provisions

According to the National Health Security Act, the benefits provided under UC include curative services, health promotion and disease prevention services, rehabilitation services, and services provided according to Thai traditional or other alternative medical schools. The scheme applies a similar exclusion list than the Social Security Scheme.

In addition to the curative benefits provided in a similar than under the other two schemes, the UC scheme also provides disease prevention and health promotion services targeting the whole Thai population.

2.3.4. Financing

Financial arrangements

Scheme financing is ensured through the National Health Insurance Fund, which is funded from the government budget. Initially the scheme applied a co-payment of 30 Baht but this has been abolished shortly after the current government was instituted.

The provider payment mechanism operated by the NHSO is similar to the SSO, with certain treatments paid on a fee-for-service basis. The scheme however subsidizes providers for salary costs and capital replacement cost and provides special subsidies for providers operating in harsh (i.e., remote) areas of the country.

Expenditure

The expenditure of the UC scheme is shown table A.7 for the fiscal year 2006. It can be observed that the total expenditure including salary cost amounted to about 80.9 billion Baht, of which the main items are about 34.5 per cent for outpatient care, 27.1 per cent for inpatient care, 10.6 per cent for high cost care, and 13.1 per cent for disease prevention and health promotion services.

3. Demographic model proposed

3.1. Overall framework

The demographic framework is a cornerstone for each one of the financial models since the projected coverage directly affects projected annual benefit expenditure of each scheme.

In the context of the given exercise, it was proposed to develop a projection model for the total Thai population in order to devise the population insured under each scheme. It was notably proposed to break up the total population into population groups as registered under the different national schemes, including the UC scheme, the CSMBS, the SSS, and other known statutory schemes (see detailed list below). The total Thai population can thus be written as follows:

$$Pop_t^{tot} = Pop_t^{UC} + Pop_t^{CSMBS} + Pop_t^{SSS} + Pop_t^{OS} + Pop_t^{other} \qquad (1)$$

Where Pop_t^{OS} stands for the population covered by other relevant statutory health insurance schemes, including (for the context of this analysis) the following:

- private school teachers covered by the 'Health Insurance Scheme for private school teachers'.
- state-owned enterprise workers (e.g. Thai Airways), which are covered by various health insurance benefits provided through their respective enterprises.
- local government officials (e.g. provincial and district officials) covered under the health care scheme for local government employees.
- employees of independent state agencies (e.g. Bank of Thailand), which are covered by health insurance benefits provided through their respective agencies

Pop_t^{other} stands for the non-registered population and includes the following:

- the non-registered population entitled to UC benefits: ${}^{NR}Pop_t^{(UC)}$.[7]
- the remaining non-registered population, if any (e.g., those who have lost their entitlement under one scheme but do not yet have acquired entitlement or registered under another scheme): Pop_t^{ε} .[8]

The terms of equation (1) are discussed in detail below, including their estimation for the base year of the model and the suggested method for their projection.

3.2. Population projection

It is proposed to project the Thai population with the ILO population projection model. For the starting population (i.e., the estimated population in the base year for the models), it was suggested to use the figures on persons registered with the Ministry of Interior.[9] Since the fiscal year 2006 was chosen as the base year, it is proposed to use the mid-year population stock (i.e., the population registered with MOI as at 1 April 2006) as the starting population for the projection. The population registered with MoI as at 1 April 2006 by age, sex, and thai/non-thai is summarized in table A.1 (see Annex A). It can be observed that the total Thai population registered on 1 April 2006 totaled 62.6 million, of which 30.9 million males and 31.7 million females.

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[7] According to Article 8 of the National Health Security Act, all Thai citizens with no health care coverage are entitled to medical care under the UC scheme even if they are not registered. In practice, medical care is provided only to unregistered persons who were never registered with a scheme.

[8] The size of this group is believed to be small since all Thai citizen can register with the UC scheme at most hospitals as soon as their coverage under other schemes is discontinued. This term should thus be considered as a residual error term.

[9] This due mainly to the following reasons: i) the fact that the last population census dates back to the year 2000, i.e., about 7 years, and that the registrations of the UC scheme are based on MoI registration data.

The ILO population projection model allows for the projection, year-by-year, of the population using the projection method by single age cohort. In this model each single age/sex cohort is projected separately by using cohort-specific mortality, fertility, and international migration rates. For the assumptions on mortality and fertility rates, it is proposed to extract the respective rates [for the base year] from data on deaths and births registered with MoI in 2006. However, it remains to be seen whether the rates obtained in this way are reasonable and consistent with other sources.[10]

Data specifications

The data required for the projection of the Thai population include the following:

- Population figures by age and sex cohort (from MoI registration database) as at 1 April 2006
- Data on mortality rates by single age and sex cohort (based on deaths registered with MoI during FY 2006 - to be confirmed)
- Data on newborns by sex and by age of mother (based on figures on newborns registered with MoI – to be confirmed)
- Data on international migration (assumed nil, see below).

Other relevant issues

- One issue that deserves special consideration is the issue of foreigners covered under each one of the three schemes considered in this analysis. For the CSMBS this issue is limited to [foreign] dependents of Thai civil servants, permanent employees and pensioners since the civil service is open to Thai Citizen only. The SSS provides coverage to foreign workers employed with registered enterprises. For the UC scheme, membership is limited in principle to Thai citizen only. However, the scheme has some foreign members registered during its first years of operation. In order to project the future coverage of the UC scheme, it is necessary to distinguish between Thai citizen and foreigners and to project the latter separately. Population figures on foreigners registered with the MoI are available for the base year but this is not the case for the labour force figures, which includes foreign workers. Since SSO membership includes foreigners and its coverage is to be derived from the Labour force (see section 3.2), it is proposed to include registered foreigners in the demographic model.
- International migration is assumed nil in the demographic model since no reliable data is available.

3.3. The Social Security Scheme

3.1.1. Modeling approach

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[10] Another possible source for mortality and fertility rates is the 'Survey on population change', published by NSO in the year 2005.

The coverage of the SSS in the base year is shown in table A.2. Since the coverage of the SSS is dependent on private sector employment, it is proposed to model the coverage of the SSS based on private sector employment, the projection of which is to be derived from the projected macroeconomic framework. In order to project the coverage rate, i.e., the total number of SSS insured expressed as a percentage of total private sector employed, it is considered relevant to analyze the trend observed in past years. It is proposed to project the future coverage rate by extrapolating any trend observed, provided that a marked trend can be observed. The total population insured by SSS in year t thus writes as follows:

$$Pop_t^{SSS} = LF_t \cdot (1-u_t) \cdot priv_t \cdot \text{cov}_t$$

Where: Pop_t^{SSS} is the population insured under the SSS in year t

LF_t is the total labour force in year t

u_t is the unemployment rate in year t

$priv_t$ is the ratio of private (formal) sector employed in total employed in year t

cov_t is the coverage rate in year t, i.e., the ratio of total SSS insured in total private sector employed

3.1.2. Data issues

It is noted that at the time of writing the requested labour force data has not yet been provided by the National Statistical Office (NSO). The modeling of SSS coverage will therefore be dealt with in the following report.

3.4. The Civil Servants' Medical Benefits Scheme

3.4.1. *Modeling approach*

a) Base year data (FY 2006)

For the number of CSMBS beneficiaries in the fiscal year 2006, no reliable information is available. It is proposed to estimate these figures based on the following:

- The end-of-year aggregate figure on civil servants and permanent state employees for the fiscal years 2005 and 2006 (quota figures from the Office of the Civil Service Commission)
- The number of pensions in payment in the fiscal year 2006
- The estimated dependency ratios by type of dependent, age and sex, i.e., the average number of dependents and their age and sex per active member and/or pensioner in

each age/sex cohort (to be extracted from the sample data on CSMBS beneficiaries registered for the direct payment system in the month of August 2007).[11]

The number of CSMBS beneficiaries for the fiscal year 2006, estimated from the above data sources is shown in table A.3.

b) Projection of CSMBS coverage

For projecting the base year population of CSMBS into the future (from year t to t+1), the following step-by-step methodology is proposed:

Step 1. Projection of actives (civil servants and permanent employees) from t to t+1

It is proposed to project the number of actives in the year t + 1 based on:
- The active population in the year t (see point a above for the base year data)
- The assumed annual decrement rates for death (mortality), disability, and exit/retirement (assumptions to be based on the sample statistics provided by CGD and/or the mortality rates assumed in the population projection model)
- The target number of actives in the year t + 1 (official staff plan of the OCSC, i.e. constant number of actives in nominal terms)
- The assumed age and sex distribution of new entrants, i.e., new active civil servants and permanent state employees (assumptions to be based on the statistics provided for the fiscal year 2006).

It is noted that the total annual number of new entrants to be generated should be equal to the total number of annual decrements, this to ensure that the total number of actives remains constant in absolute terms.

Step 2. Projection of dependents of actives (spouses, parents, and children)

It is proposed to project the number of dependents of actives in the year t+1 based on
- The projected number of actives for the year t+1 by age and sex (see step 1 above)
- The assumed dependency ratios by age and sex of active member (assumption to be based on the sample statistics provided by CGD, i.e., the matrices on number of dependents by age and sex and age and sex of active insured / pensioner).

Step 3. Projection of pensioners

It is proposed to project the number of pensioners in the year t+1 based on:
- The population of pensioners in the year t (see above for the base year data)
- The assumed annual mortality rates by age and sex (assumptions to be based on the sample statistics provided by CGD and/or the mortality rates from the population model)
- The projected number of new pensioners in the year t+1, given by the number of actives in the year t multiplied by the assumed age-specific retirement rates for males and

[11] The direct payment system put in place recently for the direct payment of OP-related hospital charges for CSMBS beneficiaries requires that beneficiaries register their personal details (name, age, sex, details of dependents, etc.) in the system's database before they can make use of the system. The registration process is ongoing and so far about 80 per cent of the estimated number of beneficiaries have registered (as at August 2007). The related data on registered beneficiaries by age, sex, and category has been made available by CGD (referred to as the sample data here).

females (assumptions to be based on the sample statistics provided by CGD).

Step 4. Projection of dependents of pensioners

It is proposed to project the number of dependents of pensioners in the year t+1 based on the following:
- The projected number of pensioners by age and sex for the year t+1 (see Step 3)
- The assumed dependency ratios by age and sex of pensioner (assumption to be based on the sample statistics provided by CGD, i.e., the matrices on number of dependents by age and sex and age and sex of active insured/pensioner)

3.4.2. Data issues

The CGD has provided data as requested on dependents by category, age, and sex, and age and sex of the active/pensioner they are dependent on, number of new entrants by age and sex in 2006, and number of persons leaving the scheme due to death, disability, retirement, or for other reasons. All demographic data made available for the FY 2006 is compiled in the electronic file '*CSMBS_demographic_FY06'*.

3.5. The Universal Coverage Scheme

3.5.1. Modeling approach

Since the UC scheme covers all Thai citizens that are not covered by any other scheme, the coverage under the UC scheme is given by the residual obtained after subtraction from the total Thai population of all Thai citizens insured under other statutory health insurance schemes. The population registered under UC is thus given by the following:

$$Pop_t^{UC} = Pop_t^{tot} - Pop_t^{CSMBS} - Pop_t^{SSS} - Pop_t^{OS} - Pop_t^{other}$$

And equally for each cohort of age x and sex s:

$$pop_{x,s,t}^{UC} = pop_{x,s,t}^{tot} - pop_{x,s,t}^{CSMBS} - pop_{x,s,t}^{SSS} - pop_{x,s,t}^{OS} - pop_{x,s,t}^{other}$$

The projection of the first three terms on the right side of the equation has been discussed above. The main problem with the proposed approach is the estimation of the remaining terms, which is discussed below:

Pop_t^{OS} - The population covered under other health care schemes (including here local government officials, school teachers, state-owned enterprise workers, and employees of independent state agencies).

It is suggested to estimate this term for the fiscal year 2006 from the labour force data to be provided by the NSO. The labour force database includes data on employment in the relevant sectors (state-owned enterprises, central and local government, etc.).[12] Data has

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[12] For figures on the coverage of schoolteachers, data has been requested from the respective scheme through the NHSO.

been requested accordingly by age, sex, and occupational group. For the demographic projection, it is proposed to project this group as a constant share of total employment, the latter to be projected within the overall demographic and macroeconomic framework.

Pop_t^{other} - The non-registered population and those uncovered who do not have UC entitlement. This is the main unknown in the above equation. Since for the base year all other terms are known or can be estimated, the value of this variable is given as the residual in the base year equation. It is proposed to project this variable as a constant share of total employment.

For the projection of the UC-covered population, all terms on the right side of the above equation have to be projected first by age and sex cohort. The coverage under the UC scheme will then be determined as the residual obtained, this for each age and sex cohort.

The total population covered by the UC scheme in the base year is shown in table A.3 (see Annex A).

3.5.2. Data issues

Comprehensive data has been provided by the NHSO on UC coverage by age, sex, and main contractor hospital where they are registered (see table A.3.). For the detailed data, see the electronic file '*UC_demographic_FY06.xls'*.

4. Expenditure modeling

4.1. Conceptual issues

For expenditure modeling of the three schemes, a generic formula is proposed in the terms of reference as the general modeling approach to be adopted in the three models:

$$Exp_t = Pop_t \cdot g_t \cdot f_t \cdot c_t$$

Where: Exp_t is the total expenditure of the scheme for a specific benefit

Pop_t is the population covered (i.e. eligible to benefits) under the respective scheme

g_t is the probability that an eligible person of the scheme seeks treatment at least once during the years t (given by the ratio of all eligible scheme members seeking treatment at least once during the year t to the number of scheme members eligible in the year t).

f_t is the frequency of patient contacts in the year t for scheme members seeking treatment (at least once) during the year t.

c_t is the average cost per treatment incurring for the scheme.

Since the composition of expenditure and financing arrangements differ between the three schemes, the models have to be tailored to each scheme. It is notably relevant to take into account the nature of expenditure components, which include not only medical benefits but also other items such as, for the UC scheme, capital replacement cost and cost of compensation in case of medical malpractice. It is also considered relevant to take into consideration the provider payment method of each scheme since this affects the way expenditure is reported under each scheme.

It was unclear at the start of the assignment to what extent the models should reflect the cost accounting methods adopted by each scheme. These differ considerably between the three schemes due to the different budget allocation methods adopted. For the UC scheme in particular it was unclear whether the model should reflect the break-up of OP and IP benefit expenditure (e.g. between General IP, high cost IP, and IP disease management) resulting from the complex budget allocation method used by the NHSO.

For the expenditure models outlined below, it is proposed to disaggregate total expenditure into major components differing either by the nature of the services they represent (e.g., outpatient versus inpatient care), and partly where a different provider payment method has been adopted (e.g., capitation versus fee-for-service).

For the main components of expenditure, it was proposed to disaggregate, where possible and relevant, by age/sex cohort of beneficiary, population group (e.g. registered versus non-registered), and type of provider. Regarding the latter, no consensus has been reached yet between national stakeholders as to the most adequate definition of provider types to be adopted for each scheme. Due to this, the disaggregation of expenditure into provider types has been deferred to a later stage in the modeling process although this feature has been included in the specification of the models presented below.

For the modeling of inpatient care, no agreement has been reached yet on whether expenditure should be represented in the model in terms of DRG-based adjusted relative weights (ARWs) per admission or based on unit cost per admission. It was argued by the consultant that ARWs may be very useful for budget allocation purposes, but that they do not reflect costs accurately but only approximately. Furthermore, the regular updating of the DRG system and the recent exclusion of some IP treatments from the DRG system (e.g., the treatments included under the new 'disease management' category) does not help since any time series of ARWs per admission (or age/sex cohort) becomes meaningless if not referring to the same set of treatments and weighting scale.

However, since ARWs reflect level of treatment or severity together with cost, it was argued that their use could nevertheless be beneficial for modeling, particularly for the modeling and analysis of level of care provided to different age cohorts (e.g., for a trend analysis over time, or for a comparison between different age cohorts). It is also believed that since the three schemes now use the DRG system for reporting IP care provided to their members, ARW values could be useful as an indicator to establish a comparison between the three schemes. Having the same frame of reference, ARWs do have the benefit that they enable a comparison and allow in a sense to circumvent the controversies surrounding the discussion on unit cost differentials between providers.

Since this issue has not been clarified yet, it was suggested to develop two optional expenditure models for IP care until a final decision on model structure has been taken.

The proposed expenditure models for the three schemes are presented below:

4.2. ***Expenditure model proposed for the CSMBS***

Total benefit expenditure for the Civil Servants Medical Benefits' Scheme consists of two main components, which are inpatient and outpatient care. Hence:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} \qquad (1)$$

4.2.1. Outpatient care

It is proposed to disaggregate expenditure for outpatient care by age, sex, and hospital type. Hence:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_h {}_h Exp_t^{(OP)} \\ &= \sum_h \sum_{x,s} {}_h Exp_{x,s,t}^{(OP)} \\ &= \sum_h \sum_{x,s} pop_{x,s,t} \cdot {}_h u_{x,s,t}^{(OP)} \cdot {}_h c_{x,s,t}^{(OP)} \end{aligned} \qquad (2)$$

Where:

${}_h Exp_t^{(OP)}$	is the aggregated OP expenditure for all hospitals of type h, (h = 1,…, 8) in year t
${}_h Exp_{x,s,t}^{(OP)}$	is the OP expenditure relating to the age cohorts of age x and sex s aggregated over all hospitals of type h in year t
$pop_{x,s,t}$	is the number of persons of age x and sex s insured under CSMBS in year t
${}_h u_{x,s,t}^{(OP)}$	is the average OP service utilization rate of the insured population of age x and sex s in year t with all providers of type h, i.e., the average number of OP contacts per person per year with providers of type h in year t
${}_h c_{x,s,t}^{(OP)}$	is the average cost per contact for OP visits of the insured population of age x and sex s with all providers of type h in year t

4.2.2. Inpatient care

It is proposed to disaggregate inpatient expenditure by age, sex, and hospital type. For the expenditure by age/sex cohort for each type of provider, it is yet unclear whether i) to make use of DRG relative weights or ii) to use average cost per admission (see discussion above). Two alternative options are therefore being considered:

<u>Option A</u> (based on unit cost per admission):

$$Exp_t^{(IP)} = \sum_h {}_h Exp_t^{(IP)}$$

$$= \sum_{h} \sum_{x,s} {}_{h}Exp_{x,s,t}^{(IP)}$$

$$= \sum_{h} \sum_{x,s} pop_{x,s,t} \cdot {}_{h}u_{x,s,t}^{(IP)} \cdot {}_{h}c_{x,s,t}^{(IP)} \tag{3a}$$

Where: ${}_{h}Exp_{t}^{(IP)}$ is the aggregated IP expenditure for all hospitals of type h, (h = 1,…, 8) in year t

${}_{h}Exp_{x,s,t}^{(IP)}$ is the IP expenditure relating to the age cohorts of age x and sex s aggregated over all hospitals of type h in year t

$pop_{x,s,t}$ is the number of persons of age x and sex s insured under CSMBS in year t

${}_{h}u_{x,s,t}^{(IP)}$ is the average IP service utilization rate of the insured population of age x and sex s in year t with all providers of type h, i.e., the average number of admission per person per year with providers of type h in year t

${}_{h}c_{x,s,t}^{(IP)}$ is the average cost per admission for the insured population of age x and sex s with all providers of type h in year t

Option B (based on average DRG case-mix index per person per year):

$$Exp_{t}^{(IP)} = \sum_{h} {}_{h}Exp_{t}^{(IP)}$$

$$= \sum_{h} \sum_{x,s} {}_{h}Exp_{x,s,t}^{(IP)}$$

$$= \sum_{h} \sum_{x,s} pop_{x,s,t} \cdot {}_{h}u_{x,s,t}^{(IP)} \cdot {}_{h}cmi_{x,s,t}^{(IP)} \cdot {}_{h}c_{t}^{(DRG)} \tag{3b}$$

Where: ${}_{h}Exp_{t}^{(IP)}$ is the aggregated IP expenditure for all hospitals of type h, (h = 1,…, 8) in year t

${}_{h}Exp_{x,s,t}^{(IP)}$ is the IP expenditure relating to the age cohorts of age x and sex s aggregated over all hospitals of type h in year t

$pop_{x,s,t}$ is the number of persons of age x and sex s insured under CSMBS in year t

${}_{h}u_{x,s,t}^{(IP)}$ is the average IP service utilization rate of the insured population of age x and sex s in year t with all providers of type h, i.e., the average number of admission per person per year with providers of type h in year t

${}_{h}cmi_{x,s,t}^{(IP)}$ is the average DRG case-mix index per admission of the insured population of age x and sex s for providers of type h in year t, i.e., the average number of DRG relative weights per admission for providers of type h in year t for the population of age x and sex s

${}_{h}c_{t}^{(DRG)}$ is the average DRG base rate for all providers of type h in year t

4.2.3. Data specifications

Based on the above model structures, data is required on the following variables for mapping CSMBS expenditure in the base year:

- $pop_{x,s,t}$
- ${}_{h}u_{x,s,t}^{(OP)}$
- ${}_{h}c_{x,s,t}^{(OP)}$
- ${}_{h}u_{x,s,t}^{(IP)}$
- ${}_{h}c_{x,s,t}^{(IP)}$
- ${}_{h}cmi_{x,s,t}^{(IP)}$
- ${}_{h}c_{t}^{(DRG)}$

4.3. Expenditure model proposed for SSS

In the year 2006, the total health care benefit expenditure of the Social Security Scheme consisted of the following items:

- Capitation amount (including risk adjustments) for general OP and IP care
- Expenditure for high cost items (both OP and IP)
- Expenditure for Accident/Emergency care comprising both OP and IP care (and cost for treatments provided to non-registered persons entitled to SSO medical benefits)
- Expenditure for dental care
- Expenditure for HIV drugs and diagnostics
- Expenditure for renal failure treatment including hemodialysis, chronic peritoneal dialysis and renal failure related drugs.
- Expenditure for bone marrow transplant
- Expenditure for kidney transplant

For the modelling of total expenditure it is proposed to group the above expenditure items into the following components:

a) Expenditure for general OP care (GOP)

b) Expenditure for general IP care (GIP)

c) Expenditure for Accident/Emergency care (AE)

d) Expenditure for high cost care including specific items such as bone marrow transplant, kidney transplant, and renal failure treatment (HC)

e) Expenditure for dental care (DC)

f) Expenditure for HIV drugs and diagnostics (HIV)

g) Expenditure for medical care provided to non-registered persons (NR)

Total benefit expenditure thus writes as follows:

$$Exp_t^{(TOT)} = Exp_t^{(GOP)} + Exp_t^{(GIP)} + Exp_t^{(AE)} + Exp_t^{(HC)} + Exp_t^{(DC)} + Exp_t^{(HIV)} + Exp_t^{(NR)} \qquad (4)$$

The disaggregation of the different terms are discussed below:

4.3.1. General outpatient care

It is proposed to disaggregate general outpatient expenditure by age, sex, and hospital type. Hence:

$$\begin{aligned} Exp_t^{(GOP)} &= \sum_h {}_h Exp_t^{(GOP)} \\ &= \sum_h \sum_{x,s} {}_h Exp_{x,s,t}^{(GOP)} \\ &= \sum_h \sum_{x,s} \left({}^{(m)}_{h}pop_{x,s,t} \cdot {}^{(m)}_{h}u_{x,s,t}^{(GOP)} \cdot {}^{(m)}_{h}c_{x,s,t}^{(GOP)} + {}^{(v)}_{h}pop_{x,s,t} \cdot {}^{(v)}_{h}u_{x,s,t}^{(GOP)} \cdot {}^{(v)}_{h}c_{x,s,t}^{(GOP)} \right) \end{aligned} \qquad (5)$$

Where:

${}_h Exp_t^{(GOP)}$ is the aggregated expenditure for general OP care for all hospitals of type h, (h = 1,…, 6) in year t

${}_h Exp_{x,s,t}^{(GOP)}$ is the GOP expenditure relating to the age cohorts of age x and sex aggregated over all hospitals of type h in year t

${}^{(m/v)}_{h}pop_{x,s,t}$ is the number of persons of age x and sex s registered with all providers of type h and insured under SSS on a mandatory/voluntary basis in year t

${}^{(m/v)}_{h}u_{x,s,t}^{(GOP)}$ is the average GOP service utilization rate of the population of age x and sex s registered with all providers of type h and insured on a mandatory/voluntary basis in year t, i.e., the average number of GOP visits per person per year for providers of type h

${}^{(m/v)}_{h}c_{x,s,t}^{(GOP)}$ is the average cost per GOP contact for the population of age x and sex s that is insured on a mandatory/voluntary basis and is registered with all providers of type h in year t

4.3.2. General inpatient care (GIP)

It is proposed to disaggregate inpatient expenditure by age, sex, and hospital type. For the expenditure by age/sex cohort for each type of provider, it is yet unclear whether i) to make use of DRG relative weights or ii) to use average cost per admission. Two alternative options are therefore being considered:

Option A (based on unit cost per admission):

$$
\begin{aligned}
Exp_t^{(GIP)} &= \sum_h {}_hExp_t^{(GIP)} \\
&= \sum_h \sum_{x,s} \left({}_h^{(m)}Exp_{x,s,t}^{(GIP)} + {}_h^{(v)}Exp_{x,s,t}^{(GIP)} \right) \\
&= \sum_h \sum_{x,s} \left({}_h^{(m)}pop_{x,s,t} \cdot {}_h^{(m)}u_{x,s,t}^{(GIP)} \cdot {}_h^{(m)}c_{x,s,t}^{(GIP)} + {}_h^{(v)}pop_{x,s,t} \cdot {}_h^{(v)}u_{x,s,t}^{(GIP)} \cdot {}_h^{(v)}c_{x,s,t}^{(GIP)} \right)
\end{aligned}
\tag{6.a}
$$

Where: ${}_hExp_t^{(GIP)}$ is the aggregated GIP expenditure for all hospitals of type h, (h = 1,…, 6) in year t

${}_h^{(m/v)}Exp_{x,s,t}^{(GIP)}$ is the aggregated GIP expenditure for the age cohort of age x and sex s insured on a mandatory/voluntary basis aggregated over all hospitals of type h

${}_h^{(m/v)}pop_{x,s,t}$ is the number of persons of age x and sex s registered with all providers of type h and insured under SSS on a mandatory/voluntary basis in year t

${}_h^{(m/v)}u_{x,s,t}^{(GIP)}$ is the average GIP service utilization rate of the population of age x and sex s registered with all providers of type h and insured on a mandatory/voluntary basis in year t, i.e., the average number of GIP admissions per person per year for providers of type h

${}_h^{(m/v)}c_{x,s,t}^{(GIP)}$ is the average cost per GIP admission for the population of age x and sex s that is insured on a mandatory/voluntary basis and is registered with all providers of type h in year t

Option B (based on average DRG case-mix index per person per year):

$$
\begin{aligned}
Exp_t^{(GIP)} &= \sum_h {}_hExp_t^{(GIP)} \\
&= \sum_h \sum_{x,s} \left({}_h^{(m)}Exp_{x,s,t}^{(GIP)} + {}_h^{(v)}Exp_{x,s,t}^{(GIP)} \right)
\end{aligned}
$$

$$
= \sum_h \sum_{x,s} \left({}_h^{(m)}pop_{x,s,t} \cdot {}_h^{(m)}cmi_{x,s,t}^{(GIP)} \cdot {}_h^{(m)}u_{x,s,t}^{(GIP)} \cdot {}_hc_t^{(DRG)} + {}_h^{(v)}pop_{x,s,t} \cdot {}_h^{(v)}cmi_{x,s,t}^{(GIP)} \cdot {}_h^{(m)}u_{x,s,t}^{(GIP)} \cdot {}_hc_t^{(DRG)} \right) \tag{6.b}
$$

Where: ${}_hExp_t^{(GIP)}$ is the aggregated IP expenditure for all hospitals of type h, (h = 1,…, 8) in year t

${}^{(m/v)}_{h}Exp^{(GIP)}_{x,s,t}$ is the aggregated GIP expenditure for the age cohort of age x and sex s insured on a madatory/voluntary basis aggregated over all hospitals of type h

${}^{(m/v)}_{h}pop_{x,s,t}$ is the number of persons of age x and sex s registered with all providers of type h and insured under SSS on a mandatory/voluntary basis in year t

${}^{(m/v)}_{h}u^{(GIP)}_{x,s,t}$ is the average GIP service utilization rate of the population of age x and sex s registered with all providers of type h and insured on a mandatory/voluntary basis in year t, i.e., the average number of GIP admissions per person per year for providers of type h

${}^{(m/v)}_{h}cmi^{(GIP)}_{x,s,t}$ is the average DRG case-mix index per admission for the population of age x and sex s insured on a mandatory/voluntary basis and registered with all providers of type h in year t, i.e., the average number of DRG relative weights per admission per year for providers of type h

${}_{h}c^{(DRG)}_{t}$ is the average DRG base rate for GIP care provided under SSS for providers of type h in year t

4.3.3. *Expenditure for accident and emergency care (AE)*

For accident and emergency care, SSO members can seek treatment at any other hospital apart from their main provider, including those not contracted by SSO. It is therefore considered relevant to separate this item from the general OP and IP care. Since the types of hospitals providing AE care do not correspond to the normal types (of main contract hospitals) and the utilisation pattern for AE has a random element, it is proposed not to disaggregate expenditure for AE care by hospital type. As accident and emergency care consists of both IP and OP care, it is proposed to disaggregate AE expenditure as follows:

$$\begin{aligned} Exp_t^{(AE)} &= Exp_t^{(AE/OP)} + Exp_t^{(AE/IP)} \\ &= \sum_{x,s} Exp^{(AE/OP)}_{x,s,t} + \sum_{x,s} Exp^{(AE/IP)}_{x,s,t} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u^{(AE/OP)}_{x,s,t} \cdot c^{(AE/OP)}_{x,s,t} + \sum_{x,s} pop_{x,s,t} \cdot u^{(AE/IP)}_{x,s,t} \cdot c^{(AE/IP)}_{x,s,t} \end{aligned} \tag{7}$$

Where: $Exp_t^{(AE/OP)}$ is the aggregated expenditure for AE outpatient care for all hospitals in year t

$Exp^{(AE/IP)}_{x,s,t}$ is the aggregated expenditure for AE inpatient care for all insured of age x and sex s in year t

$pop_{x,s,t}$ is the number of insured of age x and sex s in year t

$u_{x,s,t}^{(AE/OP)}$ is the average service utilisation rate for AE outpatient care for the insured population of age x and sex s in year t, i.e., the average number of AE/OP visits per person in the year t

$c_{x,s,t}^{(AE/OP)}$ is the average cost per AE/OP visit for all insured of age x and sex s in year t

The further disaggregation between mandatory and voluntary insured may be of relevance if a difference in utilisation rates can be established from historical data for these two distinct groups of insured.

4.3.4. Expenditure for high cost care and other special treatments (HC)

High cost care and other specific treatments are provided mainly at tertiary (e.g., teaching) hospitals.[13] Since this component comprises both OP care (e.g., chemotherapy and hemodialysis) and IP care (e.g., open heart surgery, and transplants), it is proposed to disaggregate between these two treatment categories. The proposed disaggregation of expenditure is as follows:

$$
\begin{aligned}
Exp_t^{(HC)} &= \sum_h {}_hExp_t^{(HC)} \\
&= \sum_h \sum_{x,s} {}^{(m)}_{\ h}Exp_{x,s,t}^{(HC)} + \sum_h \sum_{x,s} {}^{(v)}_{\ h}Exp_{x,s,t}^{(HC)} \\
= \sum_h \sum_{x,s} & \left({}^{(m)}pop_{x,s,t} \cdot {}^{(m)}_{\ h}u_{x,s,t}^{(HC/OP)} \cdot {}^{(m)}_{\ h}c_{x,s,t}^{(HC/OP)} + {}^{(m)}pop_{x,s,t} \cdot {}^{(m)}_{\ h}u_{x,s,t}^{(HC/IP)} \cdot {}^{(m)}_{\ h}c_{x,s,t}^{(HC/IP)} \right) \\
+ \sum_h \sum_{x,s} & \left({}^{(v)}pop_{x,s,t} \cdot {}^{(v)}_{\ h}u_{x,s,t}^{(HC/OP)} \cdot {}^{(v)}_{\ h}c_{x,s,t}^{(HC/OP)} + {}^{(v)}pop_{x,s,t} \cdot {}^{(v)}_{\ h}u_{x,s,t}^{(HC/IP)} \cdot {}^{(v)}_{\ h}c_{x,s,t}^{(HC/IP)} \right)
\end{aligned}
\tag{8}
$$

Where: ${}_hExp_t^{(HC)}$ is the aggregated expenditure for HC care and other special treatments for all hospitals of type h, (h = 1,…, 6) in year t

${}^{(m/v)}_{\ \ h}Exp_{x,s,t}^{(HC)}$ is the aggregated HC expenditure for the age cohort of age x and sex s insured on a mandatory/voluntary basis aggregated over all hospitals of type h in the year t

${}^{(m/v)}pop_{x,s,t}$ is the total number of persons of age x and sex s insured under SSS on a mandatory/voluntary basis in year t

${}^{(m/v)}_{\ \ h}u_{x,s,t}^{(HC/IP)}$ is the average HC/IP service utilization rate of the population of age x and sex s insured on a mandatory/voluntary basis in year t for all hospitals of type h, i.e., the average number of HC/IP admissions with providers of type h per insured person per year

[13] In case the main provider of the insured person cannot provide the treatment needed the patient is referred to a higher-level provider.

${}^{(m/v)}_{h}c^{(HC/IP)}_{x,s,t}$ is the average cost per HC/IP admission in year t for the population of age x and sex s that is insured on a mandatory/voluntary basis and seeks treatment with providers of type h

For unit cost, it is questionable whether a distinction between mandatory and voluntary insured is necessary. This will also depend on the availability of relevant data.

4.3.5. Expenditure for dental care (DC)

For dental care, SSO members can seek treatment at any other hospital apart from their main provider, including private dental clinics not contracted by SSO. It is therefore not considered relevant not to disaggregate here by hospital type. It is proposed to disaggregate dental care expenditure as follows:

$$
\begin{aligned}
Exp_t^{(DC)} &= \sum_{x,s} Exp_{x,s,t}^{(DC)} \\
&= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(DC)} \cdot c_t^{(DC)}
\end{aligned}
\qquad (9)
$$

Where:

$Exp_t^{(DC)}$ is the aggregated expenditure for dental care in year t

$Exp_{x,s,t}^{(DC)}$ is the aggregated expenditure for dental care for all insured of age x and sex s in year t

$pop_{x,s,t}$ is the number of insured of age x and sex s in year t

$u_{x,s,t}^{(DC)}$ is the average service utilisation rate for dental care for the insured population of age x and sex s in year t, i.e., the average number of dentist visits per eligible person in the year t

$c_t^{(DC)}$ is the average cost per dentist visit in year t

4.3.6. *Expenditure for HIV drugs and diagnosis*

It is proposed to disaggregate this expenditure item as follows:

$$
\begin{aligned}
Exp_t^{(HIV)} &= {}^{(HIV)}pop_t \cdot c_t^{(HIV)} \\
&= \sum_{x,s} pop_{x,s,t} \cdot i_{x,s,t}^{(HIV)} \cdot c_t^{(HIV)}
\end{aligned}
\qquad (10)
$$

Where:

$Exp_t^{(HIV)}$ is the aggregated expenditure for HIV care (drugs and diagnosis) in year t

${}^{(HIV)}pop_t$ is the HIV+ population of SSO insured in year t

$pop_{x,s,t}$	is the number of insured of age x and sex s in year t
$i_{x,s,t}^{(HIV)}$	is the incidence rate of HIV for the insured population of age x and sex s in year t
$c_t^{(HIV)}$	is the average treatment cost (for drugs and diagnostics) per HIV+ patient per year in year t

4.3.7. Expenditure for medical care provided to non-registered persons (NR)

Medical care for insured persons who are entitled to SSO medical care but have not registered with a provider yet is reimbursed on a fee-for-service basis at the same rate than accident and emergency care. The exact number of persons falling into this category is unknown; it can be estimated based on the difference between the number of contributors and the number of registered persons.[14] It is proposed to disaggregate this expenditure item as follows:

$$Exp_t^{(NR)} = {}^{(NR)}Exp_t^{(OP)} + {}^{(NR)}Exp_t^{(IP)}$$

$$= {}^{(NR)}pop_t \cdot u_t^{(OP/NR)} \cdot c_t^{(OP/NR)} + {}^{(NR)}pop_t \cdot u_t^{(IP/NR)} \cdot c_t^{(IP/NR)} \quad (11)$$

Where:	${}^{(NR)}Exp_t^{(OP)}$	is the aggregated OP expenditure for non-registered persons in year t
	${}^{(NR)}pop_t$	is the estimated number of insured entitled to medical care who are unregistered in year t
	$u_t^{(OP/NR)}$	is the utilisation rate of OP care for the non-registered population in year t, i.e., the average number of OP visits per persons
	$c_t^{(OP/NR)}$	is the average cost per OP visit for the non-registered population in year t

4.3.8. Data specifications

The data requirements for the base year expenditure mapping result from the proposed model structures specified above. For the detailed tables, see the electronic file '*Data_framework_SSO.xls'*.

4.4. Expenditure model proposed for the UC scheme

For the modeling of benefit expenditure of the UC scheme, it is proposed to disaggregate expenditure in the following components:

---

[14] There is a complication here due to the qualifying period (of 3 months) for new entrants. It is proposed to use an estimate for the share of non-registered contributors who are qualify for benefits (e.g., 50%).

- Expenditure for outpatient care (OP)
- Expenditure for inpatient care (IP)
- Expenditure for disease prevention and health promotion services (PP)
- Expenditure for emergency medical services (EMS)
- Expenditure for disability health care services (DIS)
- Expenditure for capital replacement (CAP)
- Expenditure for the settlement of medical malpractice claims (MM)
- Expenditure for medical care provided to non-registered persons (NR)
- Expenditure for other items (OTH)

Total benefit expenditure in year *t* thus writes as follows:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} + Exp_t^{(PP)} + Exp_t^{(EMS)} + Exp_t^{(DIS)} + Exp_t^{(CAP)} + Exp_t^{(CMC)} + Exp_t^{(NR)} + Exp_t^{(OTH)} \quad (12)$$

The further disaggregation of the terms on the right side of equation (12) is discussed below.

4.4.1. Cost for outpatient care

It is proposed to disaggregate the cost for outpatient care by type of hospital, age cohort and sex of patient, and population group (registered/non-registered) of patients.

The annual cost for outpatient services in the year t thus writes as follows:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_h {}_hExp_t^{(OP)} \\ &= \sum_h \sum_{x,s} {}_hExp_{x,s,t}^{(OP)} \\ &= \sum_h \sum_{x,s} {}_hpop_{x,s,t} \cdot {}_hu_{x,s,t}^{(OP)} \cdot {}_hc_{x,s,t}^{(OP)} \end{aligned} \quad (13)$$

Where: ${}_hExp_t^{(OP)}$ is the aggregated OP expenditure for all hospitals of type h, (h = 1,…, 8) in year t

${}_hExp_{x,s,t}^{(OP)}$ is the expenditure for OP care for the age cohort of age x and sex s of the registered population aggregated over all hospitals of type h in the year t

${}_hpop_{x,s,t}$ is the aggregate number of persons of age x and sex s registered in all hospitals of type h in year t

${}_hu_{x,s,t}^{(OP)}$ is the average OP service utilization rate for the population of age x and sex s registered with all hospitals of type h in year t

$_{h}c_{t}^{(OP)}$ is the average cost per OP visit for the age cohorts of age x and sex s among the population registered with all hospitals of type h in year t

4.4.2. Cost for inpatient care

It is proposed to disaggregate the cost for inpatient care provided to UC registered persons by type of hospital, age cohort and sex of patient. For the modeling of annual inpatient expenditure two alternative models are proposed (see discussion above):

<u>Option A (based on unit cost per admission):</u>

$$\begin{aligned} Exp_t^{(IP)} &= \sum_h {}_hExp_t^{(IP)} \\ &= \sum_h \sum_{x,s} {}_hExp_{x,s,t}^{(IP)} \\ &= \sum_h \sum_{x,s} {}_hpop_{x,s,t} \cdot {}_hu_{x,s,t}^{(IP)} \cdot {}_hc_{x,s,t}^{(IP)} \end{aligned} \tag{14.a}$$

Where:

$_hExp_t^{(IP)}$ is the aggregated IP expenditure for all hospitals of type h in year t

$_hExp_{x,s,t}^{(IP)}$ is the IP expenditure relating to the age cohorts of age x and sex s of the registered population as aggregated over all hospitals of type h in year t

$_hpop_{x,s,t}$ is the aggregate number of persons of age x and sex s registered in all hospitals of type h in year t

$_hu_{x,s,t}^{(IP)}$ is the average IP service utilization rate of the registered/non-registered population of age x and sex s in year t for all hospitals of type h

$_hc_{x,s,t}^{(IP)}$ is the average cost per admission for the age cohorts of age x and sex s among the population registered with all hospitals of type h in year t

<u>Option B</u> (based on average DRG case-mix index per admission):

$$\begin{aligned} Exp_t^{(IP)} &= \sum_h {}_hExp_t^{(IP)} \\ &= \sum_h \sum_{x,s} {}_hExp_{x,s,t}^{(IP)} \\ &= \sum_h \sum_{x,s} {}_hpop_{x,s,t} \cdot {}_hu_{x,s,t}^{(IP)} \cdot {}_hcmi_{x,s,t}^{(IP)} \cdot {}_hc_{x,s,t}^{(DRG)} \end{aligned} \tag{14.b}$$

Where: ${}_{h}Exp_{t}^{(IP)}$ is the aggregated IP expenditure for registered members aggregated over all hospitals of type h, (h = 1,…, 8) in year t

${}_{h}Exp_{x,s,t}^{(IP)}$ is the IP expenditure for all UC registered of age x and sex s in year t, aggregated over all hospitals of type h

${}_{h}pop_{x,s,t}$ is the number of persons of age x and sex s registered with all providers of type h in year t

${}_{h}u_{x,s,t}^{(IP)}$ is the average IP service utilization rate of the registered/non-registered population of age x and sex s in year t for all hospitals of type h

${}_{h}cmi_{x,s,t}^{(IP)}$ is the average DRG case-mix index for all persons of age x and sex s registered with providers of type h in year t, i.e., the average number of DRG relative weights per person per year for providers of type h

${}_{h}c_{t}^{(DRG)}$ is the average DRG base rate for IP care provided under UC for providers of type h in year t

4.4.3. *Cost for disease prevention and health promotion (PP)*

The cost for disease prevention and health promotion (PP) relates to the expenditure incurred by UC-contracted hospitals for PP activities targeting the whole population. Since some of the PP activities target special age groups of the population (e.g., vaccination programmes), it is proposed to disaggregate cost by age and sex. The disaggregation by hospital type is not deemed necessary since the PP cost faced by different hospital types are expected to be of similar magnitude.

The cost for disease prevention and health promotion thus writes as follows:

$$
\begin{aligned}
Exp_{t}^{(PP)} &= \sum_{x,s} Exp_{x,s,t}^{(PP)} \\
&= \sum_{x,s} {}^{T}pop_{x,s,t}^{(PP)} \cdot c_{x,s,t}^{(PP)}
\end{aligned}
\qquad (15.b)
$$

Where: $Exp_{x,s,t}^{(PP)}$ is the aggregated expenditure for disease prevention and health promotion activities incurred for the total population of age x and sex s in year t

${}^{T}pop_{x,s,t}^{(PP)}$ is the total number of persons of age x and sex s in the total population targeted by PP activities in year t

$c_{x,s,t}^{(PP)}$ is the average annual cost of PP activities targeting the population of age x and sex s in year t

4.4.4. *Cost for emergency medical services (EMS)*

The cost for emergency medical services consists of cost for emergency medical transportation (ambulance service) and related communication cost. Since some of the providers of ambulance services are specialized in this service or operating under the provincial administration, it is proposed to disaggregate this expenditure item by age and sex only, and not by hospital type.

The cost for emergency medical transportation thus writes as follows:

$$\begin{aligned} Exp_t^{(EMS)} &= \sum_{x,s} Exp_{x,s,t}^{(EMS)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(EMS)} \cdot c_{x,s,t}^{(EMS)} \end{aligned} \tag{16}$$

Where:

$Exp_{x,s,t}^{(EMS)}$	is the aggregated expenditure for emergency medical transportation services for persons of age x and sex s in year t
$pop_{x,s,t}$	is the aggregate number of persons of age x and sex s registered in year t
$u_{x,s,t}^{(EMS)}$	is the average utilization rate of emergency medical transportation services by the registered population of age x and sex s in year t
$c_{x,s,t}^{(EMS)}$	is the average cost per case of emergency medical transportation services for the age cohorts of age x and sex s in year t

4.4.5. *Cost for disability health benefits (DIS)*

The cost for disability health benefits refers to the cost for medical appliances (prosthesis) provided to disabled persons by UC-contracted hospitals. It does not include the cost for medical services (OP/IP) provided to disabled, which is included under OP and IP cost. Since no data is available on beneficiaries (number, age, and sex) by hospital type nor on unit cost amounts, it is proposed to project for this item the aggregate figure only.

4.4.6. *Capital replacement and investment cost (CAP)*

The cost for capital replacement relates to the cost incurred by contract hospitals for capital investment (upgrading) and replacement (e.g. hospital facilities, medical instruments equipment, etc.). It is proposed to disaggregate expenditure by type of hospitals in order to take into account any differentials in capital cost across different hospital types.

Total expenditure for capital replacement and investment cost in the year t thus writes as follows:

$$Exp_t^{(CAP)} = \sum_h {}_h Exp_t^{(CAP)} \tag{17}$$

Where: ${}_{h}Exp_{t}^{(CAP)}$ is the aggregated expenditure for capital replacement and improvement for all hospitals of type h in year t

4.4.7. Cost for the settlement of medical malpractice claims (MM)

This cost item relates to the compensation monies paid by NHSO to settle patient claims regarding medical malpractice. It is proposed to disaggregate this expenditure into cases times average amount.

The annual expenditure for MM in the year t thus writes as follows:

$$Exc_{t}^{(MM)} = n_{t}^{(MM)} \cdot c_{t}^{(MM)} \tag{18}$$

Where: $n_{t}^{(MM)}$ is the number of persons compensated for medical malpractice in year t

$c_{t}^{(MM)}$ is the average amount of compensation for medical malpractice disbursed in year t

4.4.8. Expenditure for medical care provided to non-registered persons (NR)

This cost item relates to the medical care provided to non-registered persons entitled to UC care. The number of persons contained in this group is unknown and difficult to estimate. Since the benefits provided include both OP and IP care, it is proposed to disaggregate expenditure accordingly. Annual expenditure thus writes as follows:

$$\begin{aligned} ExN_{t}^{(NR)} &= ExN_{t}^{(NR/EP)} + ExN_{t}^{(NR/IP)} \\ &+ \; t_{t}^{)NR/OP/} \cdot c_{t}^{)NR/OP/} + t_{t}^{)NR/OP/} \cdot c_{t}^{)NR/OP/} \end{aligned} \tag{19}$$

Where: $n_{t}^{(NR/OP)}$ is the number of OP visits of non-registered persons (with UC entitlements) in year t

$c_{t}^{(NR/OO)}$ is the average cost per OP visit for non-registered persons (with UC entitlements) in year t

4.4.9. Expenditure for other items (OTH)

This cost item relates to miscellaneous items for which a budget is (or will be) allocated by the NHSO. For the fiscal year 2006, this item consists of the subsidies paid to providers located in harsh areas.

It is proposed to to disaggregate expenditure for miscellaneous items by item, unless they have a demographic component. Annual expenditure thus writes as follows:

$$Exp_t^{.OTH1} = Exp_t^{.OTH_1 1} + ... \qquad (20)$$

Where: $Exp_t^{(OTH)}$ is the total expenditure for miscellaneous items in year t

$Exp_t^{(OTH_1)}$ is the total expenditure on subsidies paid to providers located in harsh areas ('Fund for harsh areas') in year t

4.4.10. Data specifications

The data requirements for the base year expenditure result from the proposed model structure specified above. For the detailed tables, see the electronic file '*Data_framework_UC.xls'*.

5. Calibration of CSMBS base year expenditure *(see TORs point 4)*

The Department of the Comptroller General (CGD) keeps records on the total expenditure of the CSMBS for outpatient and inpatient care. However, no detailed information is recorded at the CGD with regard to the break-up of expenditure by category of beneficiary (active, pensioner, dependent) nor by age and sex.

For inpatient care, individual records on reimbursements have been recorded in a database maintained by the CHI (Center for Health Care Information) since 2002. The DRG system used by the CSMBS as of 1 July 2007 allows to generate information on utilization of IP care and related expenditure by category, age, and sex of beneficiary (including the number of DRG relative weights per admission).

For outpatient care, the direct payment system, phased in gradually as of October 2006, also allows to generate detailed statistics on utilization and benefit expenditure by category, age, and sex of beneficiary. However, since the direct payment system is operating in parallel to the old reimbursement system, detailed data on OP care is available only for beneficiaries who chose to make use of the direct payment system. In August 2007, an estimated 80% of all CSMBS outpatient visits were processed through the direct payment system. For the remaining 20% of outpatient visits no electronic figures are available since these have been processed through the paper-based system. The data situation should improve in the near future since the old reimbursement system is due to be completely phased out in the future.

In order to calibrate the expenditure model proposed above for CSMBS (see section 4.1) for the base year (FY 2006), it is necessary to allocate the total expenditure for OP and IP care to the different categories and age/sex cohorts of beneficiaries. Since no detailed data is available for OP care provided during that period, it is proposed to make use of the sample data relating to OP care provided during the month of August 2007, which contains figures on hospital utilization (i.e. OP visits), and expenditure (amount of charges reimbursed by the CSMBS) by age, sex, and type of beneficiary. It is proposed accordingly to extract from the sample data the following:

- Utilization pattern (number of contacts per capita) by age, sex, and type of beneficiary, and type of provider where relevant

- Unit cost pattern (amount reimbursed per contact) by age, sex, type of beneficiary, and type of hospital where relevant

For the base year (FY 2006), it is proposed to use the same utilization pattern, i.e., number of contacts/admission by age and sex as extracted from the sample data (August 2007) together with the number of beneficiaries by category, age, and sex as estimated for the base year (see demographic modeling, section 3.3). In order to calibrate the model, it is proposed to determine the cost inflation factor such by scaling down the unit cost patterns for august 2007 (from the sample) by this factor the base year data adds up, i.e., total expenditure (for OP) is obtained by multiplying the respective matrices (population times utilization rates times unit cost by age/sex/type of beneficiary) in the model outlined in section 4.1.

For IP care it is proposed here to use the model option A (unit cost per admission) instead of the DRG-based option B, this since the DRG system was not in place yet for CSMBS in the base year. Data has been provided from the CHI database on number of admissions and amounts reimbursed by category, age, and sex of beneficiary. It is noted that the data provided presents some inconsistencies, notably an unexplained high number of admissions for dependents aged 20 and 21.[15] A revised set of data has been requested in the meantime but not yet been provided.

For the results of the model calibration as proposed above see the excel file:

(CSMBS_basic_model_calib.xls)

6. Data situation

Data has been requested for the base year according to the proposed model structure. The requested data included the following:

- Annual expenditure by cost item for each scheme
- Number of beneficiaries (registered) by age, sex, type of main provider (for SSO and UC), and type of beneficiary
- Hospital utilization rates by age, sex, type of hospital, and category of beneficiary
- Hospital charges reported by providers by age, sex, type of hospital, and type of beneficiary
- Case-mix index for inpatient care (ARWs) by age, sex, hospital type, and type of beneficiary

It is noted that the data collection process is still ongoing since some of the requested data was not readily available and needed to be compiled by the respective agencies, this in particular for the disaggregated figures by hospital types (utilization and charges).[16]

[15] The problem here relates to the fact that dependent children aged 20 or older are excluded from coverage unless permanently disabled.

[16] As noted earlier, the definition of hospital types has been the subject of discussions, which does not help to accelerate the process.

Some of the data provided presented inconsistencies and had to be revised by the respective agencies. This process is almost completed and a comprehensive database should be available shortly for each scheme.

It is noted however that the data requested on the labour force by age, sex, occupation, and sector of employment has not been provided yet by the National Statistical Office. It is hoped that this data will be made available soon so that the labour force and employment framework of the model can be developed.

As for the data relating to the financial statements of providers (Accounting report nr. 5) further discussion is needed with the project coordinator and component manager in order to clarify the appropriate data format and reference period.

7. Other relevant issues

7.1. The cost of medical benefits to providers

In order to assess the adequacy of payments made to providers by the three schemes for the respective packages of medical services they purchase, it is relevant to assess their production cost they incur for these services. However, since no recent and comprehensive hospital costing study is available, the real cost of services for different types of providers is unknown. It is suspected that differentials in service cost across providers are significant due to the differences in capital investment and replacement cost, level of care provided, technology intensity, provider efficiency, economies of scale, etc.

Data has been made available on hospital charges applied by providers but it is unclear to what extent these correspond to actual cost. For public hospitals, fees charged by providers are bound by the fee schedules currently in force, notably circulars 77, and 177. For private hospitals, these do not apply and reported charges seem to have an element of arbitrariness. Hospital charges reported by providers are being used for distributing expenditure by age and sex but their nominal values are believed to be of limited value.

In light of the above considerations, it was suggested to focus for the time being on current expenditure for the development of the model. It is felt that the issue of adequacy of provider payment in comparison to service cost to providers is beyond the scope of the current assignment and should be dealt with separately and at a later stage.

In order to assess the cost of services to providers, it was suggested (see TORs) to analyze financial reports submitted by public providers (the so-called report nr. 5). This exercise should help to cast light on the composition of production inputs (e.g., labour versus non-labour) and partly on provider cost, although in aggregate only.[17] Furthermore, private providers do not report in the same format (i.e., through report nr.

[17] It is noted that providers do not undertake allocate cost to different services (e.g., OP versus IP), hence the financial reports are of limited use and do not allow to establish a complete picture of service cost by type of service.

5), which leaves a gap in the analysis.[18] It is proposed that this issue be discussed further with the project coordinator and component manager in order to clarify the scope and format of data to be extracted from the financial reports.

7.2. Distribution of unit cost

It was discussed whether the use of the simple [arithmetic] average of unit cost is appropriate for the proposed model since it is based on the assumption that unit cost follow a normal distribution.[19] It was notably suggested that a lognormal distribution may be more appropriate. In order to investigate this issue and to fit the appropriate distribution, sample data on IP unit cost by age, sex, and hospital type has been requested.

8. Next steps

- Completion of base year data base
- Data consistency check and estimation of missing data (ongoing)
- Calibration of base year models for SSS and UC (ongoing)
- Clarification of data format and scope of financial reports
- Development of the macroeconomic framework and projection
- Projection of the population, labour force, and employment
- Drafting of mission report 2 and aggregation of final report

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[18] Private providers report to the Ministry of Commerce. Information on the format and scope of their reporting requirements has not been provided yet.

[19] The simple average is an unbiased estimator of the mean of a normal distribution but not necessarily for other distributions.

ANNEX A

Demographic data

Table A.1. Population as at 1 April 2006

Age group	Thai population			Non-thai population			Total registered population		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
0 – 4	1,995,459	1,881,026	3,876,485	15,550	15,012	30,562	2,011,010	1,896,038	3,907,047
5 – 9	2,461,666	2,332,568	4,794,234	15,424	14,748	30,172	2,477,090	2,347,316	4,824,406
10 - 14	2,532,650	2,408,022	4,940,672	22,595	22,089	44,684	2,555,244	2,430,112	4,985,356
15 - 19	2,421,805	2,326,809	4,748,614	31,239	30,893	62,132	2,453,044	2,357,703	4,810,747
20 - 24	2,680,838	2,614,468	5,295,306	25,328	24,893	50,222	2,706,167	2,639,361	5,345,528
25 - 29	2,786,527	2,765,346	5,551,874	29,693	28,016	57,709	2,816,220	2,793,363	5,609,583
30 - 34	2,839,716	2,894,279	5,733,995	35,649	30,932	66,581	2,875,365	2,925,212	5,800,576
35 - 39	2,786,475	2,907,191	5,693,666	32,456	27,481	59,937	2,818,931	2,934,672	5,753,603
40 - 44	2,542,044	2,672,468	5,214,512	27,983	22,529	50,512	2,570,027	2,694,997	5,265,024
45 - 49	2,128,156	2,279,679	4,407,834	22,263	17,830	40,093	2,150,418	2,297,509	4,447,927
50 - 54	1,648,887	1,796,799	3,445,686	16,099	12,870	28,970	1,664,987	1,809,670	3,474,656
55 - 59	1,196,580	1,314,738	2,511,318	12,177	9,767	21,944	1,208,757	1,324,505	2,533,262
60 - 64	926,079	1,034,855	1,960,934	12,217	9,404	21,621	938,297	1,044,258	1,982,555
65 - 69	777,492	910,954	1,688,447	12,437	9,267	21,705	789,929	920,222	1,710,151
70 - 74	559,912	695,163	1,255,076	13,417	7,820	21,237	573,330	702,983	1,276,313
75 - 79	338,587	450,791	789,377	13,829	8,162	21,991	352,416	458,953	811,369
80 - 84	174,781	249,200	423,981	10,477	9,823	20,300	185,259	259,023	444,282
85 - 89	79,237	122,975	202,213	8,174	8,419	16,593	87,412	131,394	218,806
90 - 94	35,521	55,642	91,163	5,934	5,267	11,202	41,455	60,910	102,365
95 - 99	16,426	25,409	41,835	3,682	2,523	6,205	20,108	27,932	48,040
Total	**30,928,840**	**31,738,384**	**62,667,224**	**366,625**	**317,746**	**684,371**	**31,295,465**	**32,056,130**	**63,351,595**

Source: NHSO

(For the complete data, see electronic file 'Population data MOI.xls')

Table A.2. Persons insured under SSS, FY 2006[a]

Age	Article 33 & 38[b]		Article 39[c]		Total
	Male	Female	Male	Female	
15 – 19	166,948	154,380	155	943	322,425
20 – 24	701,082	799,196	2,553	12,727	1,515,558
25 – 29	1,036,716	1,082,873	9,233	26,925	2,155,747
30 – 34	813,603	811,782	13,804	30,185	1,669,374
35 – 39	626,511	626,517	15,680	27,949	1,296,658
40 – 44	446,889	427,402	15,189	23,226	912,706
45 – 49	285,787	251,900	12,374	18,485	568,546
50 – 54	171,592	125,482	10,507	14,474	322,055
55 – 59	88,683	50,878	7,882	8,490	155,934
60 – 64	23,860	11,844	5,943	4,393	46,040
65 – 69	5,575	2,197	2,631	1,376	11,779
70+	3,450	1,039	1,212	432	6,132
Total	4,370,696	4,345,491	97,163	169,605	8,982,955

a. Persons entitled to medical care under the SSS; monthly average for the fiscal year 2006, estimated based on data provided by SSO; b. Insured on a mandatory basis; c. Insured on a voluntary basis.

Source: Estimation of the consultant based on data provided by SSO

(For the complete data, see electronic file 'SSO basic data.xls')

Table A.3. Persons insured under CSMBS, summary by age group, FY 2006[a]

Age Group	Actives[b]		Pensioners[c]		Dependents[d]		Total
	Male	Female	Male	Female	Male	Female	
0 – 4	0	0	0	0	92,818	88,077	180,895
5 – 9	0	0	0	0	138,762	130,341	269,103
10 - 14	0	0	0	0	186,094	176,273	362,367
15 - 19	307	39	0	0	197,126	187,815	385,286
20 - 24	21,330	4,838	39	1	242	5,618	32,068
25 - 29	61,647	56,181	404	0	2,724	21,126	142,083
30 - 34	107,261	102,718	1,182	37	8,434	44,728	264,361
35 - 39	157,085	105,799	2,894	176	12,305	74,340	352,599
40 - 44	182,008	137,037	4,699	385	18,000	107,739	449,867
45 - 49	264,060	187,578	8,858	1,772	28,816	128,629	619,713
50 - 54	204,673	140,749	19,364	9,700	48,271	138,399	561,156
55 - 59	114,168	66,542	28,585	17,255	67,851	139,328	433,729
60 - 64	19,850	10,534	52,528	28,253	76,518	128,184	315,867
65 - 69	558	181	40,553	19,199	87,858	146,696	295,045
70 - 74	141	113	30,952	10,043	90,532	154,207	285,988
75 - 79	82	71	22,210	5,565	72,547	122,141	222,615
80 - 84	37	35	11,736	3,883	39,284	69,586	124,561
85 - 89	15	17	3,960	926	15,864	29,237	50,020
90 - 94	10	5	953	222	4,846	9,451	15,488
95+	9	1	452	95	957	1,930	3,444
Total	1,133,242	812,439	229,370	97,513	1,189,847	1,903,845	5,366,256

a. Estimate based on sample data provided; b. including civil servants and permanent state employees; c. Includes work-injury pensioners; d. including dependent spouses, children, and parents of active insured

Source: Estimation of the consultant based on data provided by CSMBS

(For the complete data, see electronic file 'CSMBS demographic FY06.xls')

Table A.4. Persons insured under the Universal Coverage Scheme, FY 2006[a]

Age group	*Males*	*Females*	*Total*
0 – 4	1,847,267	1,739,426	3,586,693
5 – 9	2,305,016	2,185,237	4,490,254
10 – 14	2,358,142	2,244,556	4,602,698
15 – 19	1,886,819	1,815,805	3,702,624
20 – 24	1,566,773	1,405,323	2,972,096
25 – 29	1,549,210	1,481,635	3,030,846
30 – 34	1,817,538	1,861,223	3,678,761
35 – 39	1,942,898	2,074,931	4,017,829
40 – 44	1,836,398	2,000,081	3,836,479
45 – 49	1,573,603	1,794,919	3,368,522
50 – 54	1,278,767	1,486,305	2,765,073
55 – 59	948,309	1,110,276	2,058,585
60 – 64	767,721	884,141	1,651,862
65 – 69	644,566	764,465	1,409,031
70 – 74	453,028	574,763	1,027,792
75 – 79	271,774	370,794	642,568
80 – 84	142,021	211,021	353,042
85 – 89	67,466	108,139	175,605
90 – 94	31,284	48,520	79,804
95+	17,118	24,072	41,189
Total	23,305,717	24,185,633	47,491,351

Source: From data provided by NHSO

(For complete data, see electronic file 'UC demographic FY06.xls')

ANNEX B

Expenditure data

Table A.5: CSMBS benefit expenditure, 2002 - 2006

	FY 02	*FY 03*	*FY 04*	*FY 05*	*FY 06*
Outpatient care	9,508.9	11,350.5	13,905.3	16,942.8	21,895.5
Public hospital	9,508.9	11,350.5	13,905.3	16,942.8	21,457.7
Private hospital	0	0	0	0	437.8
Inpatient care	10,967.1	11,335.4	12,137.6	12,437.3	15,108.9
Public hospital	9,684.1	10,960.7	11,778.0	12,437.3	14,825.7
Private hospital	1,283.0	374.7	359.7	0	283.2
TOTAL	20,476.1	22,685.9	26,042.9	29,380.0	37,004.4

Note: In million Baht

Source: The Comptroller General's Department, Ministry of Finance

Table A.6: SSS medical benefit expenditure and contribution income, 2002 – 2006[a]

	2002	*2003*	*2004*	*2005*	*2006*
Contribution income	8,619.72	9,751.55	15,250.88	17,306.69	18,985.70
Benefit expenditure	9,278.16	10,882.18	11,604.22	14,295.14	15,782.28
Basic capitation amount	7,315.83	8,540.76	8,966.92	10,708.10	11,377.81
Utilization incentive (capitation)	372.93	432.21	436.95	488.14	500.19
Risk adjustment (capitation)	997.61	1,164.65	1,222.76	1,756.13	1,865.96
High cost special services	117.81	151.96	184.27	233.34	270.60
Emergency & Accident	146.30	200.31	212.87	283.06	344.71
HIV/AIDS (drugs & diagnostics)	-	-	114.40	284.53	449.45
Bone marrow transplant	16.09	4.25	10.00	7.50	9.75
Hemodialysis (visits)	136.14	178.34	225.32	284.90	353.12
Dental care (pulling, filling & scaling)	175.46	209.69	230.73	245.89	591.65
Kidney transplant	-	-	-	3.55	19.04
Cornea transplant	-	-	-	-	-

Note: a. In million Baht, excluding administration cost; b. Contribution income allocated for medical benefits;

Source: Social Security Office

Table A.7: National Health Security Fund, expenditure FY 2006[a]

	Expenditure (million THB)	*Per cent of total*
Outpatient medical care	27,933.93	34.5%
Inpatient medical care	21,931.74	27.1%
Promotion and prevention services	10,610.84	13.1%
High cost care	8,556.81	10.6%
Accident/emergency care	2,460.33	3.0%
Emergency medical services	256.30	0.3%
Disability (prosthesis)	185.89	0.2%
Capital replacement cost	5,821.28	7.2%
Subsidy fund for harsh areas	334.25	0.4%
Compensation for medical malpractice	39.31	0.05%
Medical care for non-registered persons	24.10	0.03%
HIV/AIDS	2,738.92	3.4%
TOTAL	80,893.69	100%

a. Including salary costs

Source: National Health Security Office

ANNEX C

Development of a Health Care Financing Model

Initial Phase

Terms of reference

ATTACHMENT 1

ILO-SECSOC

Geneva, 26 June 2007

Terms of Reference - Initial Phase (TOR-IP)

(1 July to 30 September 2007)

Attachment: Bangkok Mission Report WS dated 26 June 2007, incl. Annexes I to VI

Development of a health care financing model, and staff capacity building, for

The Civil Servants Medical Benefit Scheme (CSMBS), The Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and The International Health Policy Programme (IHPP)

Thailand

These *Terms of Reference for the Initial Phase* (TOR-IP) specify the activities to be undertaken during the initial phase of the overall modelling process, which stretches into 2008.

They are based on, specify and partially replace, the Draft Terms of Reference (Draft03 dated 02/05/2007). The overall contents of Draft03 remains valid and should be understood as reference for the detailing of further TOR that will follow after the activities of these TOR-IP have been finished. The contractor to these TOR-IP is advised to refer to the Draft03 for putting his / her work into perspective.

The contents of Draft03, as far as not replaced by these TOR-IP, is still valid; the time frame defined in Draft03 is however not fully applicable anymore. For the initial phase of modelling, these TOR-IP replace the time frame of Draft03 (see Attachment 1 to these TOR-IP).

(1) Draft-design of model structures; specify and check data (July 2007)

The *health finance projection and simulation models* to be developed for NHSO, SSO, CSMBS and IHPP will be *described*, in writing, in their core structures (modeling approach).

This includes written description of :

- the legislation (as far as relevant for modelling) of the covered populations;
- the statistical representation of the covered populations (numerical data base);
- the approach of moving the covered populations from t to t+1 (demographic modelling approach);
- the revenue and expenditure (= time series tabulation of fiscal accounts, budgets, and National Health Accounts);
- the costs per health benefits / health services *offered* by health providers, including the rules governing their development ("shadow-fee basis"; adequate time series tabulation);
- the costs per benefits / services *covered* (*reimbursed*) by health purchasers, including the rules governing reimbursements ("reimbursement basis");

for each of the three schemes UC, SSO, and CSMBS, separately (where adequate).

For UC, SSO and CSMBS health expenditure, the modelling approach will be based on similar modelling approaches as follows:

$$\mathbf{Exp = Pop * g * f * c,}$$

Where

Exp =: Health expenditure of scheme [UC, SSO, CSMBS respectively]

Pop =: covered population of scheme [UC, SSO, CSMBS respectively]

g =: factor representing the ratio between number of patients of scheme and insured of scheme [UC, SSO, CSMBS respectively]

f =: factor representing frequency of contact of patients with scheme [UC, SSO, CSMBS respectively]

c =: costs per patients' contact with health system [UC, SSO, CSMBS respectively]

In the case of SSO and UC information on **c** will be derived from hospitals' reports on charges ("shadow fees"). Support will be provided by SSO and NHSO staff in order to collect and interpret the data.

All variables / parameters will be calculated by *single ages* (0, 1, ..., 100), by *sex*, by *in-patients* and *out-patients*, and by *hospital type*, i.e. public (non-teaching hospitals, public teaching hospitals, others) and private – details to be determined in cooperation with Thai counterparts.

(2) *Establishment, description and evaluation of a consistent data base (July 2007)*

The data base will be 2006. If incomplete, data of 2005 will be used to estimate, adjust and complete the 2006 statistical data.

It must be made sure that, in 2006, the data base [for UC, SSO, CSMBS respectively] is consistent in the sense that the above equation, i.e.

$$\mathbf{Exp = Pop * g * f * c,}$$

is being fulfilled for all three schemes, i.e. multiplying and adding up over (single-age) vectors **Exp, Pop, g, f** and **c** provides total expenditure as measured statistically (in the fiscal accounts) in the three schemes [UC, SSO, CSMBS] respectively. *This requires calibration of the data base for 2006.*

The data base, year 2006, will form the basis for model design and model projections over time (moving data-vectors from T to T+1). It is this basis that will have to be updated later, once all models are finished and handed over to the Thai counterparts. *A description of the calibration method is to be included in the deliverable under this point 1) of the TOR-IP.*

In SSO and UC, there are health expenditure items that are not, in the data base, covered by the in-patient and out-patient systematic, but recorded (and projected) separately. Some of these expenses are available by single patients, i.e. can be structured by single ages vectors, by sex, by type of hospital etc. With respect to some items, other structured information is available. The contractor will make adequate use of that information in collaboration with the Thai counterparts for structuring the data base 2006.

When shaping the model design and the data base(s) for UC and SSO it has to be kept in mind that important model outputs in both cases (schemes) are the *capitation rates* for either scheme. The capitation rate calculation should be based on transparent methods such that these can be used, after hand-over of the models to the institutions, for calculating the annual budget proposals to the respective committees.

(3) *Modelling approach for the CSMBS covered population (July 2007)*

It is expected that the contractor pays special attention to an ***adequate modelling approach for moving from* t *to* t+1 *the population covered by the CSMBS***. This special attention is required as there is demographic modelling experience of the ILO with respect to the SSO and the UC, but not with respect to the CSMBS, where the greater part of the covered population is a function of the development of the number and structure of active civil servants, as follows:

Problematique of modelling the CSMBS covered population:

The CSMBS covers

1) Civil servants (most civil servants from 18 (minimum age) to 60 (retirement age; few exemptions);
2) Their parents;
3) Their spouse (if Muslim: their spouses);
4) Maximum of three (3) children per civil servant (idem: couple) until they turn 20 years of age;
5) Permanent employees (incl. their dependents, like for civil servants) from 16 (minimum age) to 60 (retirement age; no exemptions; all receive lump sum at retirement, no pension)

as long as the civil servant maintains his / her status as a civil servant.

By the end of their career, at retirement, *some* opt out – against one time payment of a (high) lump sum – and lose their own CSMBS health coverage and, also, CSMBS health coverage for their dependents.

Permanent employees all loose their status at retirement, i.e. they and their dependents loose CSMBS coverage at retirement of the active.

Unless receiving other health coverage both groups (former actives and their dependents) then refer to UC.

At present, total CSMBS membership is about 5 million persons, of which 1.9 million are active civil servants, 20 thousand permanent employees, and the rest – around 3.1 million persons – dependents.

This totals to a total number of 16 different groups; the information exists by single ages between 0 and 100.

HOWEVER, the CSMBS does not have information about expenditure differentiated by those groups. Accordingly, group-related information does not (yet) exist about allocation of total CSMBS expenditure on in-patients and out-patients.
The only spending information available is TOTAL EXPENDITURE.

Follows preliminary modelling approach for CSMBS-members:

MEMBERS	=	CSm + CSf + CSSPm + CSSPf + CSCHm + CSCHf +
	+	CSPARm + CSPARf +
	+	EMPm + EMPf + EMPSPm + EMPSPf + EMPCHm +
	+	EMPCHf + EMPPARm + EMPPARf

with:

Civil servants

1) CSm	=:	Civil servants, male
2) CSf	=:	Civil servants, female
3) CSSPm	=:	Spouses, male, of civil servants
4) CSSPf	=:	Spouses, female, of civil servants
5) CSCHm	=:	Children, male, of civil servants
6) CSCHf	=:	Children, female, of civil servants
7) CSPARm	=:	Parents, male, of civil servants
8) CSPARf	=:	Parents, female, of civil servants

Permanent employees

9) EMPm	=:	Permanent employees, male
10) EMPf	=:	Permanent employees, female
11) EMPSPm	=:	Spouses, male, of permanent employees
12) EMPSPf	=:	Spouses, female, of permanent employees
13) EMPCHm	=:	Children, male, of permanent employees
14) EMPCHf	=:	Children, female, of permanent employees
15) EMPPARm	=:	Parents, male, of permanent employees
16) EMPPARf	=:	Parents, female, of permanent employees

Modelling problem is mainly to find an algorithm that treats the dependents as a function of the actives. Total actives will have to come from the labour market balance.

See also the file CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

(4) Calibration of CSMBS expenditure data base by different categories (August 2007)

A further problem is that TOTAL EXPENDITURE has to be allocated, in the base year, on single ages of the above groups AND on in-patients and on out-patients.

In other words, the contractor will need to establish a hybrid database such that, for the base year, the sum of all sum products equals TOTAL EXPENDITURE. It is only then, that the standard demography-related projection method can be applied.

The CSMBS maintains two detailed lists of prices to be paid for

(1) medical goods and appliances, and

(2) services.

These lists may be tentatively used as indicators for approaching the above problem. Direct coordination with the Thai counterparts is required.

The two lists are agreed upon between CSMBS and health providers; prices are maximum amounts reimbursed. If hospitals charge higher prices the civil servant has to pay the difference out of pocket. The lists only apply to public hospitals. In other words, thus far, if a civil servant [or dependant] goes to a private hospital s/he has to pay the whole bill out of pocket.

Also, CSMBS applies CSMBS-specific DRGs (in-patient classification system) as of July 2007 to Civil Servant cases of treatment of inpatients.
However, for the time being, different RWs are being multiplied with different base amounts, e.g. in

- $\text{Hospital}_1 = \text{RWs} * \text{RW}_{\text{base rate of Hospital}1}$,
- ...,
- $\text{Hospital}_n = \text{RWs} * \text{RW}_{\text{base rate of Hospital}n}$;

it is planned later to group hospitals by categories (e.g. university hospitals, others) and force them within groups to apply identical, hospital-group specific, base rates.

The contractor is expected to explore whether the estimation of an *average general base rate multiplier* $\text{RW}_{\text{base rate}}$ for all hospitals is possible and, if so, whether it is a "reasonable" parameter to be used in CSMBS expenditure modelling.

Specification of data implies: defining (writing down) the complete list of data required for modelling the above schemes.

It was agreed between ILO, CSMBS, and PIU (Dr Thaworn) that data of CSMBS will be provided by CSMBS (Mr Kulasake Limpiyakorn, Financial Analyst: The Comptroller General Department, Min of Finance; sek139@yahoo.com, mobile: (666) 555-3139).
CSMBS population data format is specified in the file CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

The discussions between the Thai counterparts and the ILO project manager, undertaken in 2006 and spring 2007, have shown that it might be advisable to disaggregate all base year data by different types of hospitals in all three schemes, i.e. in UC, SSO and CSMBS at least by public-teaching, public-non-teaching (sub-district, district, provincial), private, and possible other categories.

It is expected that the contractor establishes the data base (the data bases for the different schemes) in collaboration with the Thai counterparts such that differentiation of the above kind, by type of hospital, is taken into account.

In many respects, the contractor can refer to prior work undertaken by the ILO – especially for the demographic labour market and macro-economic parts (see below: item *(3)*), in other respects new data terrain will have to be covered.

NHSO, CSMBS, SSO and IHPP will collect and provide the specified data.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

(5) ***Data check and first draft table of contents of data dictionary; (August 2007)***

The activity under *(1)*, above, will be supported by a data collection activity through NHSO, CSMBS, SSO and IHPP.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

Data specification and actuarial data check will be used for ***drafting a first table of contents of a data dictionary*** – later to be completed extra these TOR-IP –, containing a statistical description of contents and definitions etc of the data needed for model maintenance.

(6) ***Common demographic, labour market and economic frame for the four models; (September 2007)***

A ***demographic, labour market and economic frame of models*** has to be developed that can be used by CSMBS, NHSO, SSO and IHPP as common input to their respective institutional health models (which are to be developed later, on basis of the work undertaken under these TOR-IP, in detail).

The variables that have to be produced by the above frame-models depend, in detail, on the final design of the institution-specific health models; in other words: the frame-models will be of a preliminary character, and later, extra these TOR-IP, be adjusted, fine-tuned, and finalized.

The contractor, in undertaking his/her work can relate to prior modelling work of the ILO for NHSO and SSO. The ***new approach under these TOR-IP*** is to make sure that the structure of the frame-models is designed such that it equally (simultaneously) satisfies the needs of model-input of *all four institutions' institutional health models*.

The contractor will design the *demographic frame model* such that it calculates the

UC-covered population as a residual of

- total population development,
- SSO-population development,
- CSMBS-population development, and
- "private" population development,

i.e.:

- $Pop_{UC} = Pop - Pop_{SSO} - Pop_{CS} - Pop_{Priv}$

One problem (under this approach) would be to design the model such that "stable", "reasonable" development of Pop_{UC} is guaranteed, allowing for smooth cooperation with all stakeholders of the NHSO, including the Bureau of Budget, over the practice of model application, given the fact that Pop_{Priv} is not explicitly known and a number of statistical inconsistencies between Pop_{UC} and Pop exist and have to be solved.

With respect to Pop the contractor will use the population registration data base of the Ministry of the Interior. (To be provided by the Thai counterparts.)

Labour supply will be designed according to the input needs of the four models for the four institutions.

The labour market balance of the economic sub-module will be designed consistently with labour supply. The ***contractor will explore, and make a respective proposal*** (in writing), to what extent labour supply calculations (by sex and single ages) can be used as input to the demand side of the labour market balance and to which extent, vice versa, labour market demand can function congruently as input for the supply side.

Accordingly, the economic sub-module will have to produce output on costing elements, i.e.

- Price indexes, and
- Average wages
- Productivity,
- Employment of various type,

for each of the four institutions' models.

Consistency between SNA and NHA is to be maintained.

(7) ***Design and data base; specify demographic model for CSMBS; (September 2007)***

The contractor is expected to develop, as a result of his / her work during TOR-IP a decisive view on how the institutional modelling for the revenue and expenditure for NHSO, SSO, CSMBS, IHPP (model design) can best be developed. In other words, the initial draft design must be turned into a concrete proposal for modelling, explaining the structure and, especially, the problems that need to be solved. This is not "the modeling" yet, which follows later in the phase after the work on TOR-IP.

The ***concrete proposal for modelling NHSO, SSO, CSMBS, IHPP should be delivered in writing***; any attachments can be delivered in electronic format (i.e.: Excel and / or Visual Basic program examples).

Further, it is expected that the contractor will have developed, by the end of his / her work, a practical proposal with respect to modelling the population covered under the CSMBS, taking into account the explanations under *(3), above,* section: <u>*Problematique of modelling the CSMBS covered population*</u>. In developing the proposal the contractor will pay special attention to modelling entries and exits into the CSMBS system; this includes exploring possibilities of applying civil service (CSMBS) specific assumptions on fertility and mortality. ***The CSMBS covered population modelling proposal (model) is expected in electronic format; it must be described separately in writing.***

<u>In summary, therefore, the TOR-IP basically stipulate the following:</u>

- Clarification and fine-tuning of modelling designs;
- Depending on the proposed model designs: establishment of the data base, including data calibration, for 2006 (2005); the data base must be complete; Specific care must be taken with respect to the making consistent of *calendar year data* with *fiscal year data*; where data are not available, but necessary for reasonable modelling (example: cost data CSMBS), the contractor provides consistent estimates (to the extent possible: theory based or otherwise "reasonably" constructed, based on established mathematical / statistical estimation procedures or methods of numerical / actuarial mathematics, or on other methods of rational reasoning);
- Development (finalize) of draft modules for the outer framework for the institutional models, i.e. demography, labour supply, labour demand, economy;
- Develop a concrete demographic model, related to the labour market balance of the macro-economic model, for the covered population of CSMBS (incl. computer application);
- And other activities as stipulated in detail above.

All work steps and results will be conceptually tested for their robustness and practicability in a framework of cooperation of modelling between NHSO, SSO, CSMBS, and IHPP to be established and implemented latest as of mid-2008. This comprises questions of routines, during a year, of updating the data base(s), especially.

Schedule

The work is expected to be accomplished over the three months July to September 2007.

A *work flow chart* indicatively stipulating which work should reasonably be done when will be made available in electronic format.

Preconditions and caveats

It is assumed that necessary data bases for the models should be developed in collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff.

In case delays are caused in the data collection process, there could be the delay in delivery of the intermediate and final results und these TOR-IP.

THAILAND

Development of a Health Care Financing Model

Initial Phase

DRAFT

MISSIONREPORT 2

(Product 3)

30 November 2007

Jean-Claude Hennicot
Consulting Actuary
ILO

CONTENTS

ANNEXES

Electronic attachments (EXCEL files)

- Pop MOI – *Population data for 2006 and 2007, MOI database*
- Pop – *Results of the preliminary population projection (ILO population model)*
- Control – *Control file (ILO population model)*
- Mort estimation – *Estimation of mortality rates*
- Mort – *Input data on mortality and LEB (ILO population model)*
- Fert – *Input data on fertility rates (ILO population model)*
- Mig - *Input data on migration rates (ILO population model)*
- Labour force MOI – *Labour force data and projection*
- ECON – Economic data and module
- NHA 02 – 05 – National Health Accounts, 2002 - 2005
- CSMBS pop data Nov 07 – CSMBS-covered population, CGD database

1. Background

The present report is prepared in the framework of the consultancy agreement concluded by the consultant and the International Labour Office (ILO) on 1 July 2007 (External Collaboration Contract no. 40029956/0) in the context of the ILO activity on 'Development of a Health Care Financing Model for Thailand'.

The assignment of the consultant is taking place within the wider context of the contribution agreement signed between the ILO and the European Commission (EC) on 9 February 2006 with regard to the EC project on Heath Care Reform in Thailand (THA/AID/CO/2002/0411, 2004 – 2009). The agreement stipulates the implementation of the EC project component 'Financial Management of the Thai Health System' by the ILO.

The present report is part of the reporting requirements stipulated in the consultant's contract; it is referred to as 'product 3' in the terms of reference (see Annex D). The report summarizes the work of the consultant with regard to the following:

- Common demographic, labour market and economic frame proposed for the models to be developed for UC, SSS, and CSMBS (see TORs point 6).
- Detailed specification of the demographic model for the CSMBS (see TORs point 7)
- Draft table of contents for data dictionary (see TORs point 5)

The report also includes a section on the IHPP model to be developed under the project. A meeting had been organized with IHPP on 14 November 2007 to discuss modeling and other issues and historical data on the Thai National Health Accounts (NHA) for the period 2001 – 2005 was provided by the IHPP.

It is noted that some of the data presented in this report is not final yet (e.g. population data). It is hoped that the final data will be provided shortly so that it can be included in the summary report (product 4) of the consultant's assignment.

The consultant would like to acknowledge the kind cooperation extended by the national counterparts, in particular their efforts undertaken towards gathering data and improving their quality and providing insights on their respective schemes. Special thanks are due to the national project component manager, Dr. Thaworn Sakunphanit, who provided continuous guidance, support, and invaluable insights.

2. Common demographic, labour market, and economic frame

The demographic and economic frame is the common model framework within which the four models are to be embedded. The purpose of the demographic and economic frame is to link the models to the overall situation and development trend of the country's population and economy, this in a logical and consistent manner.

The common demographic and economic frame is described below:

2.1. *Population*

2.1.1. Base year population

The base year population is given by the MOI-registered population as at 1 April 2006 (see 1st mission report)

For the population figures presented in the first report of the consultant (product 2), some inconsistencies were discovered. Updated figures were provided by the NHSO upon request from the consultant (see attached EXCEL file '*Population MOI'*). The revised figures included a sizeable number of persons with unknown age (about 1.5 million) and presented a high and irregular variation in the population of successive cohorts. It was proposed by the consultant to distribute the population with unknown age over all age groups such that these variations are smoothed out (see figures A.1 and A.2 in Annex B). The population figures also presented a very low number of persons registered in the age cohort with age less than 12 months. This can probably be attributed to a time lag between birth and registration of newborns.

It was therefore proposed to adjust the number of persons in those cohorts (males and females aged less than 1 year) by taking into account the number of newborn registered in the fiscal year 2006. The resulting figures are presented in the attached electronic EXCEL file ('*Population MOI*')

A cohort-by-cohort comparison of the MOI population figures for the years 2006 and 2007 was carried out by the consultant to assess age-specific mortality rates and to verify the assumption of zero migration. This comparison revealed further inconsistencies particularly for young age cohorts (age 0 – 12), which presented abnormal population increases for which no satisfactory explanation (e.g. migration) could be found. A thorough check of the MOI population database is currently being undertaken by the MOI and a further revision of the base year population data is likely. The base year population data as provided in the attached file should therefore be considered as preliminary and subject to change. This also applies to the results of the population projection presented in the following section. It is hoped that the revised population figures, if a further revision is necessary, will be provided shortly such that they can be included in the final report of the consultant's assignment.

2.1.2. Population projection

The Thai population has been projected with the ILO population model starting from the base year population (as at 1 April 2006, see previous section) presented in the worksheet *'pop 2006'* (see attached EXCEL file *'Pop MOI'*). The assumptions of the proposed population projection are discussed below:

Total fertility rate

Age-specific fertility rates have been estimated from the data on newborns (by sex and age of mother) as extracted from the MOI database by the NHSO team and on the adjusted base year population figures. The resulting fertility rates are presented in Figure A.3 (see Annex B). The total fertility rate, given by the sum of the age-specific fertility rates, is estimated at 1.406 for the fiscal year 2006.

For the population projection it has been assumed that the age-specific fertility rates (and thus the total fertility rate) will remain constant at the same level over the whole projection period.

Age-specific mortality rates

Mortality rates by age and sex have been estimated from the data on death (by age and sex) as extracted from the MOI database by the NHSO staff. The resulting mortality rates are presented in figure A.5. (see Annex B). It can be observed that the pattern of death rates by age and sex presents a standard shape (decreasing rapidly after birth to reach a minimum at around the age of 10/11 and increasing gradually thereafter), this for the ages 0 to 85. For ages above 80/85 the observed pattern is unusual since the estimated death rates do not increase according to the standard pattern. It is believed that the observed irregularity is due to the fact that the percentage of deaths that are registered with MOI decreases after the age of 80/85.

For the establishment of a life table, a standard model pattern of mortality rates has been fitted to the death rates observed for the ages 0 – 85. The life table obtained in this manner (for the year 2006) results in a life expectancy at birth (LEB) of 68.4 years for males and 75.9 years for females. This is in line with the LEB suggested in the last population census carried out in the year 2000, which suggested a life expectancy at birth of 67.1 years for males and 74.8 years for females. The data on observed death rates and the life table obtained from the fitted mortality model for the base year is provided in the attached electronic file 'Mortality estimation'.

For the population projection, it has been assumed that the life expectancy at birth will increase gradually for both males and females over the whole projection period to reach 75.3 years for males and 80.9 years for females in the year 2056. It is further assumed that the pattern of age-specific mortality rates will remain unchanged but with individual mortality rates decreasing at the same pace so as to result in the assumed LEB values.[1]

The assumed future LEB values for males and females are presented in the worksheet *workmort'* (see attached EXCEL file *'Mort'*). The mortality rates by age and sex as estimated based on the assumed LEB values are presented in the worksheets *'Mort M'* and *'Mort F' (same file).*

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[1] This has been done by scaling down the whole mortality model curve in order to match the desired/assumed LEB value in a given year.

Sex ratio of newborns

The sex ratio of newborns is estimated at 1.020 newborn males per newborn female, this based on the data of newborn extracted from the MOI database for the fiscal year 2006. It is assumed that sex ratio at birth will remain constant at the same rate over the whole projection horizon.

Based on the assumptions summarized above, the population a projected with the ILO population projection model is expected to increase from a total 63.4 million as reported for the fiscal year 2006 to 66.7 million in the fiscal year 2025, and to decrease gradually thereafter to reach 56.9 million in the year 2056.

The demographic assumptions and results of the population projection are attached in electronic format to this report (see EXEL files in the attached electronic folder '*population projection*'). It is noted that these figures should be considered as preliminary since the ongoing review of the population data by MOI has not been completed yet and a revision of the MOI population figures is expected as a result of the review.

2.2. *Labour force and Employment*

2.2.1. Base year labour force data

Data on the labour force for the year 2006 was provided by the National Statistical Office (NSO). The data provided includes quarterly labour force figures (by age group and sex) as determined through the labour force surveys (LFS) carried out by the NSO on a quarterly basis. It was agreed earlier with the ILO project coordinator to use the nominal figures on the labour force as reported in the LFS. The NSO data is included in electronic format in the EXCEL file '*Labour force MOI*' (see worksheet '*NSO 2006*') attached to this report.

2.2.2. Labour force participation rates

Since the labour force participation rates reported by the NSO are based on population figures taken from the NESDB population projection (which differ from the MOI population data used in the context of the HCF models to be developed), these have been recalculated, the results differing from the official NSO figures.

Age-specific labour force participation rates have been determined by dividing the 2006 labour force (allocated to single age cohorts) by the respective cohort population (as per MOI population data, see section 2.1), this for males and females.[2] Minor adjustments have been made to ensure that the labour force in each age/sex cohort does not exceed the respective population. The resulting labour force participation rates as estimated for the year 2006 are shown in figure A.3 (see Annex B). The figures are included in the attached EXCEL file '*Labour force MOI*' (see worksheet '*LFPR 2006*').

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[2] It is noted that due to the expected revision of the MOI population figures, changes may result for the estimated labour force participation rates, although these should be minor.

2.2.3. Labour force projection

For the projection of the labour force, it is assume that age-specific labour force participation rates will be constant at the same rates as estimated for the year 2006, this over the whole projection period. The projected labour force is obtained by multiplying the projected population in each age/sex cohort by the assumed labour force participation rate for the respective cohort. The projected labour force resulting from the (preliminary) population projection and the assumed age-specific labour force participation rates is shown in the attached EXCEL file '*Labour force MOI*' (see worksheets '*LabM*' and '*LabF*').

It can be observed that the projected labour force is expected to increase gradually from the total number of 35.5 million as estimated in the fiscal year 2006 to about 39.2 million in 2021 and to decrease thereafter due to the projected decrease in the population.

2.2.4. Employment

According to the NSO figures on employment, the unemployment rate in the fiscal year 2006 is estimated at 2.4% for males, 2.9% for females, and 2.6% in aggregate. For the projection of employment, it is assumed that the unemployment rate in aggregate will remain constant at the same rate (2.6%) over the whole projection period. The projected total number of employed is obtained by deducting from the projected labour force the projected number of unemployed.

The projected number of employed is needed in the model for projecting average wages and the coverage rate of the SSS. The projected number of employed is shown in the attached EXCEL file '*Labour force MOI*' (see bottom line in worksheet '*Labf ToT').*

2.3. Economic model

A common economic module is needed to relate the models to the macroeconomic context within which the schemes operate. This is notably relevant for the projection of certain model parameters that do not evolve independently but rather in line with or in a correlated manner with key economic variables determined by the overall development of the economy.

In order to establish the economic frame of the models, historical data is also needed in order to analyze past trends with regard to the pace of economic expansion and the exact nature of the parametrical relationships referred to above. The data collected by the consultant include the following:

- Quarterly figures on the Gross Domestic Product (GDP) by economic sector both at constant prices and at current market prices for the period 1993 – 2006.
- Quarterly figures of GDP by composition of expenditure at constant and current market prices for the period 1993 – 2006.
- Annual figures on National Income by composition at constant and market prices for the period 1993 – 2005.
- Annual figures on average wages by economic sector, 2001 - 2006

- Monthly figures on the Consumer Price Index (CPI) by composition for the period Jan 1990 - Sep 2007.
- GDP, employment, and average wage in the Health Sector, 2001 – 2006

Historical data on the Thai economy, labour force, and employment was also retrieved from the database established in the context of the actuarial valuation of the SSO pension branch carried out by ILO during 2003 – 2004.

For the projection of cost factors, the proposed economic module includes a list of indices and endogenous parameters such as the following:

- The Consumer Price Index (CPI)
- The Producer Price Index (PPI)[3]
- The GDP deflator for total GDP and health sector GDP
- The annual rate of change in labour productivity
- The annual rate of change in average wages (health sector and in aggregate)

The method to be used for projecting unit cost is yet to be determined; it is therefore still unclear which one of the reference indices listed above will be used (explicitly or implicitly) for constructing a cost index considered appropriate. This issue was discussed in depth during the mission of the project coordinator during October/November 2007. A note summarizing a possible option that was considered is attached (see Annex A). The feasibility of the proposed option is yet unclear however. This will depend on the outcomes of the analysis of historical cost data to be carried out during the next stage of the modeling process (see also section 3.3).

Economic data as available at the time of writing has been compiled in the attached EXCEL file '*ECON*'.

3. Model design and database

4.1. Model design for CSMBS, SSS, and UC

The draft model structures proposed for the CSMBS, SSS, and UC schemes was presented in the first report of the consultant. In the meantime these have been presented and discussed with national counterparts and other stakeholders who agreed in principle with the proposed design and methodology. Minor adjustments have been undertaken, mainly to reflect availability of data on miscellaneous expenditure items. The detailed model design as proposed for the CSMBS, SSS, and UC schemes will be presented in the final report of the consultant's assignment.

4.2. Demographic modeling and database for the CSMBS

Base-year data

[3] For the PPI historical data could not be made available yet.

Demographic modeling for CSMBS was addressed in the first mission report of the consultant (see product 1). CSMBS coverage in the base year was estimated initially at 5.4 million, this based on the quota figures on civil servants and permanent state employees and the dependency ratios obtained from sample data provided by the CSMBS.

Following an attempt to reconcile the estimated coverage figures of the SSS, the UCS, and the CSMBS with the overall population figures, it was concluded that the initial estimate for the CSMBS coverage was too high.[4]

It was acknowledged by the CSMBS project counterpart that the quota figure on civil servants and permanent employees results in an overestimation of active CSMBS members due to the following reasons:

- An undetermined share of the quota positions for civil servants and permanent stte employees remain permanently vacant due to budget constraints and employment turnover
- Civil servants and permanent employees who work part-time in the private sector (e.g. some doctors and teachers) and who are covered on a mandatory basis by SSO through their secondary employment are not eligible for CSMBS benefits.[5]

It was also pointed out by the CSMBS counterpart that the sample data on registrations relating to the OP direct payment system included duplicate entries since CSMBS beneficiaries can register with several hospitals. It was suggested to use the data on civil servants registered with the Comptroller General's Department (CGD), although this database is believed to be incomplete. According to the CGD database the total number of CSMBS members (including pensioners and dependents) reported as at 1 April 2006 amounts to 4.21 million persons.

This figure compares to the estimate from the MOI database, which suggests that about 4.24 million people were covered under CSMBS at that date.[6]

Demographic projection

The projection of the CSMBS-covered population was also addressed in the previous report of the consultant. It was notably proposed to fix the total future number of active members (i.e. civil servants and permanent state employees) based on the government's

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[4] The attempted reconciliation resulted in negative numbers for the residual population relating to other schemes (local government, school teachers, etc. and non registered) for a significant number of age cohorts.

[5] According to Khun Kulsek, our CSMBS counterpart in this project, the relevant laws stipulate that CSMBS benefit are only provided to those who are not covered under any other statutory or private health insurance scheme.

[6] The MOI database includes information on social security coverage of registered persons. However, since a substantial number of persons are not allocated to a single scheme but to a group of schemes (e.g. member of the private teachers' scheme, the CSMBS, or the state-owned enterprise scheme), the data cannot be used as the main data source (e.g. for determining CSMBS coverage) but is useful nevertheless for comparison.

staff plan for the civil service. According the CSMBS project counterpart, the Office of the Civil Service Commission plans to keep the number of civil servant and permanent state employees at constant levels in the near to medium term future. It is proposed to fix the total number of actives for the first five years of the projection period, i.e. for the period 2006 – 2011. For the period thereafter, it is proposed to increase/decrease the total number of actives in line with the [projected] total population.

As explained in the previous report of the consultant, it is proposed to move the existing population forward in time, this cohort by cohort, and to apply constant age-specific exit rates (as estimated from sample data) and to generate annually a total number of new entrants equal to the total number of exists in the same year in order to obtain the target total number of active members in each year. Is it further proposed to generate new entrants according to the age/sex distribution of new entrants in the base year. It is noted that the age structure of actives will thus not be assumed exogenously but result endogenously based on the simulated dynamics of ageing, exists and new entrants.

For dependents, it is proposed to assume constant dependency ratios (by age and sex) based on the age/sex-specific dependency ratios given in the base year.

An update of data on entrants, exists, and dependency ratios in the base year has been requested in order to ensure consistency with the revised data on the active population.

For pensioners, it was proposed earlier to project the base year stock and adjust annually for exits (e.g. deaths) and new entrants (i.e. new retirement and disability pensioners). As for the mortality rates to be assumed for civil servants, further data and analysis is needed to determine whether these deviate markedly from those observed for the overall population.

4.3. Projection of unit cost

The methodology for projecting of unit cost was discussed extensively during the visit of the project coordinator in October/November. It was agreed that the unit cost inflation index, which is yet to be specified, should take into account to the extent possible the composition of unit cost, i.e., its constituent elements (e.g. unit cost of labour, pharmaceuticals, medical supplies, etc.). It was considered initially to use producer prices (i.e., providers' production input factor prices) instead of consumer prices since the latter do not adequately reflect providers' production cost (they include profit margins for instance, particularly for private providers). It is still unclear however, to what extent producer price indices can be made available to project the different cost factors. Further analysis is warranted on this matter in the coming months. The suggested approach is summarized in Annex A for discussion.

In connection with the above, it was also explored whether providers' accounting data could be used to determine the structure and past development of input factor cost. However, it was found that providers' financial reports as submitted to NHSO on a monthly basis (report nr. 5) do not contain information on production cost of different services but only in aggregate. Furthermore they do not contain information on input volumes and unit price but only total expenditure for different factor inputs (e.g., cost of drugs, staff cost, medical supplies, etc.). In order to estimate input volumes, it was suggested to determine proxy data, which could give indications on input volumes (e.g. number of hospital beds) but this possibility needs to be explored further.

In light of the above, further data analysis is warranted in order to assess what information can be extracted from the providers' accounting data available and to explore alternative options with regard to the construction of an index appropriate for inflating unit cost.

4. National Health Accounts and IHPP model

According to the terms of reference, it is planned to develop a model for the International Health Policy Programme (IHPP) under the project. The purpose of the model, referred to below as the IHPP model, is to project aggregate national health expenditure in Thailand. Health care expenditure for Thailand has been compiled by the IHPP for past years (1994 – 2005) in the so-called 'National Health Accounts (NHA)', this based on the commonly accepted data template and methodology. The NHA data framework consists of five standard tables presenting national health care expenditure in predefined formats, displaying different synthetic combinations of the data, this by disaggregation (resp. aggregation) along the following dimensions:

- Type of expenditure (in-patient services, out-patient services, prevention services, pharmaceuticals, administration cost, etc.)
- Type of provider (Different types of public and private hospitals, physicians' and dentists' offices, nursing and residential care facilities, etc.)
- Financing agency (MOPH, various health insurance schemes, employer benefits, private insurance, non-profit organizations, out-of pocket, etc.)

The data comprises expenditure figures for recurrent expenses on health, capital investment in health, and also other expenditure data on health-related functions, referred to as 'memorandum items', such as training of health personnel, research and development in health, administration of health-related cash benefits, etc.

The NHA table headings are listed below:

Table 1. Current expenditure on health by function of care, type of provider, and source of funding (annual)

Table 2. Recurrent expenditure on health by function of care and provider industry (annual)

Table 3. Current expenditure on health by provider industry and source of funding

Table 4. Current expenditure on health by function of care and source of funding.

Table 5. Total expenditure on health including health-related functions

Data has been provided in electronic format for table 1. only so far (see attached EXCEL file '*Thailand NHA - table 1*'). Tables 2 -5 relating to the years 1994 – 2005 have been provided in hardcopy. *Available upon request.*

For the modeling of aggregate health expenditure further discussions are needed on model design and modeling methodology (IHPP model). It is natural that the expenditures of UC, CSMBS, and SSS, which make up for a substantial portion of total expenditure (about 37% in the year 2005), are to be projected separately by using the respective model to be developed for each scheme. Other major items are MOPH and household expenditure, which in 2005 amounted to about 19.4% and 27.8% respectively.

Further analysis of historical data (time series) is also needed in order to identify past trends in cost evolution and parametrical relationships to be used in the design of the model.

5. Data dictionary – draft table of contents *(cf TOR item 5)*

The purpose of the data dictionary to be prepared in conjunction with the different health care financing models is to provide a detailed specification and concise definition of the data needed in the future for the maintenance of each model. The data dictionary should thus comprise a comprehensive list of data items needed for updating the different model components so as to incorporate the latest developments of demographic, economic, and scheme-specific variables. Regular model maintenance is relevant in order to ensure that the model accurately reflects reality, i.e., the scheme situation (coverage, benefit provisions, financing arrangements, utilization rates, etc.) and the macro economic situation at each point in time when the model is used for generating financial projections.

The data dictionary should thus help to facilitate the model updating process by providing a concise definition and specification of data, this together with a clear set of instructions pertaining to model maintenance (which ought to be included in the model manuals that will be drafted under the next phase of the modeler’s assignment).

It is proposed to include in the data dictionary, for each data item, a concise definition, the data format and dimension, the type of variable, the source material (e.g., reference document and agency), reference date, recommended periodicity of undertaking data updates, and the suggested dates for future data updates.

It is proposed that the data dictionary be structured as follows:

a.) Model frame.

This section should include all data needed for the macro frame of the models such as all data related to the Thai economy, population, etc. This part is meant to include all data that is not scheme-specific, for instance the national population figures and related variables such as age-specific mortality and fertility rates (if relevant for the respective scheme model), the national economic parameters such as GDP, employment, price and wage inflation rates, etc.

For the variables mentioned above, it is considered important that a clear and precise definition, source, and updating schedule be agreed upon by all stakeholders in order to ensure consistency between the four models over time. Since the demographic and economic frame is a shared component of the four models, a common understanding and congruent usage with regard to data configuration by the four institutions is vital.

b.) Scheme-specific data

This second part should comprise the definitions and specifications of data items that relate to the specificities and recent experience of each scheme. This part should notably include the following data elements:

- Scheme coverage and related demographic variables (e.g., dependency ratios),
- Variables reflecting the prevailing benefit package and provider payment mechanism of the scheme
- Data on benefit utilization rates for the covered population,
- Data on scheme expenditure, unit cost structure and levels
- Other scheme-specific variables as relevant for each scheme

It is noted that in principle only model input variables, i.e., exogenous model variables need to be specified in the data dictionary since all variables appearing endogenously in the respective models shall not be modified by model operators (yet to be designated by each institution). However, in order to enhance understanding of the underlying theory and model mechanics, it may be useful to include in the data dictionary a separate description of endogenous model variables *(to be discussed).* It is suggested to specify clearly the nature of each data item or variable in relation to the design of the model (e.g., data input, assumption, endogenous variable, etc).

The proposed draft table of contents, formulated in a generic way is provided in Annex E. It is obvious that a separate data dictionary needs to be developed for each scheme respectively model so as to reflect model specificities (e.g. base year data input format and assumptions) and design. For the common model frame (part 1), the data dictionary will be the same (see section 1 in draft TOC).

With regard to the structure of the data dictionary, a tabular format has been suggested earlier. It is suggested to include in the table the following fields or headings:

➢ *Data/variable name*	this should be the name of the variable as referred to in the manual to be developed.
➢ *Symbol*	The symbol or letter representing the respective variable in the formulas given in the model description
➢ *Data/variable description*	A short definition or description of the variable
➢ *Variable type*	Specification of variable type, i.e., input data, assumption, or endogenous variable
➢ *Data format*	This should specify the statistical representation of the variable, i.e., the dimension, unit of measurement (years, contacts per person per year, million Baht, etc.) and number format (e.g., number of decimals)
➢ *Source document*	stating reference document or publication and the publishing agency (e.g., Labour Force Survey, National Statistical Office)
➢ *Source item*	specifying the designation and location of the respective variable in the reference document

➢ *Last publication date*	specifying the most recent date of publication of the source document
➢ *Periodicity of publication*	specifying the normal periodicity of publication of the reference document
➢ *Next update recommended*	specifying the time when the next variable update is recommended

For illustration, the suggested format for the proposed data dictionary is provided in Annex E.

6. Next steps

- Drafting of final assignment report
- Completion and reconciliation of population database
- Revision of demographic framework based on updated MOI population data (yet to be provided)
- Recalibration of base year data based on updated population MOI population data
- Analysis of NHA data and development of IHPP model
- Analysis of hospital accounting data and development of cost inflation index

ANNEX A

Concept note on unit cost projection

(Proposal for discussion)

a) Basic model structure

It is proposed to model health care benefit expenditure of the three schemes according to the following generic formula:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} + Exp_t^{(other)} \qquad (1)$$

Equation (1) refers to all cost incurring to hospitals for providing medical treatment to scheme members, this excluding capital costs Is this positively so? , which are supposed to be financed separately (e.g. from the government budget or from a separate budget allocation by the respective scheme, if applicable)

Disaggregation of OP and IP components by age and sex, and break up of cohort-specific expenditure in utilization rate times unit cost:

- $$\begin{aligned} Exp_t^{(OP)} &= \sum_{x,s} Exp_{x,s,t}^{(OP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(OP)} \cdot c_{x,s,t}^{(OP)} \end{aligned} \qquad (2)$$

- $$\begin{aligned} Exp_t^{(IP)} &= \sum_{x,s} Exp_{x,s,t}^{(IP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot c_{x,s,t}^{(IP)} \end{aligned} \qquad (3)$$

b) Base year modelling (t = 0):

Model Calibration → Determine for OP, IP and other components, the matrices PoP, U and C, such that equations (1) – (3) hold, this based on the actual scheme expenditure incurred in year t = 0 and the available data on service utilization, and cost structure.[7]

c) Expenditure projection (t > 0):

Projection of OP and IP expenditure based on model structure displayed in equations (2) and (3) according to the following methodology:

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[7] In the absence of reliable information on unit cost per contact/admission, it is proposed to use charges per contact/admission as reported by hospitals (average) to determine age-specific unit cost.

- Entitled population by age/sex cohort: to be projected for each scheme based on the respective demographic model framework.
- Service utilization rate by age/sex cohort: formulate assumption e.g., constant rates over the short to medium term (1 – 5 years).
- Unit cost: inflate base year unit cost per contact/admission (for OP and IP) by the estimated cost inflation rate to be determined as described in point d).

For the projection of other (scheme expenditure?) costs (non OP/IP), it is proposed to determine, separately for each expenditure ? cost item, an appropriate methodology by taking into account the nature of expenditure ? costs (e.g., age-dependency?) and the availability of data.

d) Estimation of cost inflation rate for OP/IP unit cost

It is proposed to consider the disaggregation of unit cost in principal components or cost factors in order to single out as much as possible the main cost drivers:

$$c_t = c_t^{(lab)} + c_t^{(drg)} + c_t^{(meq)} + c_t^{(ut)} + c_t^{(other)} \tag{4}$$

Where:

c_t	is the average unit cost per medical treatment as incurred by providers in year t
$c_t^{(lab)}$	is the labour component in unit cost (i.e., excluding capital) for the year t
$c_t^{(drg)}$	is the drug component in unit cost in year t
$c_t^{(meq)}$	is the component reflecting the cost of medical supplies and equipment (excluding fixed assets) in year t
$c_t^{(ut)}$	is the cost component relating to utilities (electricity and water) in year t
$c_t^{(other)}$	is the component relating to costs that are not included in the above categories (e.g., hospital accommodation and other expenses) in year t

Hence we can write:

$$\frac{dc_t}{c_t} = \frac{dc_t^{(lab)}}{c_t} + \frac{dc_t^{(drg)}}{c_t} + \frac{dc_t^{(meq)}}{c_t} + \frac{dc_t^{(ut)}}{c_t} + \frac{dc_t^{(oth)}}{c_t} \tag{5}$$

$$= \frac{c_t^{(lab)}}{c_t} \cdot \frac{dc_t^{(lab)}}{c_t^{(lab)}} + \frac{c_t^{(drg)}}{c_t} \cdot \frac{dc_t^{(drg)}}{c_t^{(drg)}} + \frac{c_t^{(meq)}}{c_t} \cdot \frac{dc_t^{(meq)}}{c_t^{(meq)}} + \frac{c_t^{(ut)}}{c_t} \cdot \frac{dc_t^{(ut)}}{c_t^{(ut)}} + \frac{c_t^{(oth)}}{c_t} \cdot \frac{dc_t^{(oth)}}{c_t^{(oth)}}$$

$$= \frac{c_t^{(lab)}}{c_t} \cdot d\ln(c_t^{(lab)}) + \frac{c_t^{(drg)}}{c_t} \cdot d\ln(c_t^{(drg)}) + \frac{c_t^{(meq)}}{c_t} \cdot d\ln(c_t^{(meq)}) + \frac{c_t^{(ut)}}{c_t} \cdot d\ln(c_t^{(ut)}) + \frac{c_t^{(oth)}}{c_t} \cdot d\ln\left(c_t^{(oth)}\right)$$

For the projection of unit cost, the following assumptions are proposed:

A.1. Factor input ratios are constant over time, i.e.,:

$$\frac{c_0^{(lab)}}{c_0} = \frac{c_1^{(lab)}}{c_1} =: \alpha^{(lab)}; \quad \frac{c_0^{(drg)}}{c_0} = \frac{c_1^{(drg)}}{c_1} =: \alpha^{(drg)}; \quad etc$$

A.2. Factor input quantities (per unit amount of service) are increasing/decreasing at a constant rate over time:

$$c_t^{(lab)} = q_t^{(lab)} \cdot u_t^{(lab)} = q_0^{(lab)}\left(1 + t \cdot \beta^{(lab)}\right) \cdot u_t^{(lab)} \quad ; \qquad c_t^{(drg)} = \ldots$$

Where: $c_t^{(lab)}$ is the labour component in unit cost (i.e., excluding capital) in the year t
$q_t^{(lab)}$ is the average quantity of labour (e.g. hrs) needed to produce one unit of service (OP/IP) at time t
$u_t^{(lab)}$ is the cost per unit of labour in year t (e.g. gross wage per hour or month of work)
$\beta^{(lab)}$ is the rate of change of labour units (quantity) needed to produce one unit of service in year t

It follows that:

$$d\ln(c_t^{(lab)})/dt = \beta^{(lab)} \cdot d\ln(u_t^{(lab)})/dt$$

Equation (5) thus writes as follows:

$$\frac{d\ln(c_t)}{dt} = \alpha^{(lab)} \cdot \frac{d\ln(c_t^{(lab)})}{dt} + \alpha^{(drg)} \cdot \frac{d\ln(c_t^{(drg)})}{dt} + \alpha^{(med)} \cdot \frac{d\ln(c_t^{(med)})}{dt} + \alpha^{(ut)} \cdot \frac{d\ln(c_t^{(ut)})}{dt} + \alpha^{(oth)} \cdot \frac{d\ln(c_t^{(oth)})}{dt} \tag{6}$$

$$= \alpha^{(lab)} \cdot \beta^{(lab)} \cdot \frac{d\ln(u_t^{(lab)})}{dt} + \alpha^{(drg)} \cdot \beta^{(drg)} \cdot \frac{d\ln(u_t^{(drg)})}{dt} + \alpha^{(med)} \cdot \beta^{(med)} \cdot \frac{d\ln(u_t^{(med)})}{dt} + \alpha^{(ut)} \cdot \beta^{(ut)} \cdot \frac{d\ln(u_t^{(ut)})}{dt} + \alpha^{(oth)} \cdot \beta^{(oth)} \cdot \frac{d\ln(u_t^{(oth)})}{dt} + \varepsilon$$

The last term "ε" in equation (6) represents an error term, which reflects the change of unit cost that cannot be explained by the combination of the different cost inflation factors singled out.

By applying the expected value operator *E* equation (6) writes as follows:

$$E[d\ln(c_t)/dt] = \alpha^{(lab)} \cdot \beta^{(lab)} \cdot E\left[d\ln(u_t^{(lab)})/dt\right] + \alpha^{(drg)} \cdot \beta^{(drg)} \cdot E\left[d\ln(u_t^{(drg)})/dt\right] + \alpha^{(med)} \cdot \beta^{(med)} \cdot E\left[d\ln(u_t^{(med)})/dt\right]$$
$$+ \alpha^{(ut)} \cdot \beta^{(ut)} \cdot E\left[d\ln(u_t^{(ut)})/dt\right] + \alpha^{(oth)} \cdot \beta^{(oth)} \cdot E\left[d\ln(u_t^{(oth)})/dt\right] + E[\varepsilon] \tag{7}$$

Estimation of parameters:

- Factor input ratios (alphas)

It is proposed to estimate factor input ratios (the alphas) based on the aggregate hospital cost information to be extracted from the financial reports of hospitals (report nr. 5 for public hospitals) in the base year.

- Rate of change of unit factor inputs (betas) and error term "ε"

It is suggested to estimate betas based on historical data (as available) and to formulate a future assumption accordingly. Since it is unlikely that detailed historical financial data can be made available in aggregate (i.e., for all contracted hospitals), a possible alternative would be to estimate parameters from a sample of selected hospitals who have maintained detailed and reliable accounting reports in the past years).

(Further technical discussions needed on feasibility and methodology)

- Factor cost inflation rates (wage inflation rate, etc.)

The estimation of the rate of relative cost increase (i.e., inflation rates) for each one of the cost drivers singled out in equation (4) is discussed below:

- Labour cost inflation rate ($du_t^{(lab)}/ u_t^{(lab)}dt$)

  To be estimated based on the projected macroeconomic indicators and assumption on the rate of increase of public sector wages (e.g., in line with the trend observed in the past)

- Drug cost inflation rate ($du_t^{(drg)}/ u_t^{(drg)}dt$)

  To be projected based on the pharmaceutical industry component in the producer price index (PPI) *(further investigation needed here to assess feasibility)*

- Medical equipment and supplies ($du_t^{(meq)}/ u_t^{(meq)}dt$)

  (to be discussed)

- Utilities ($du_t^{(ut)}/ u_t^{(ut)}dt$)

  To be projected based on the projected unit cost of utility costs for public institutions *(further discussion needed here)*

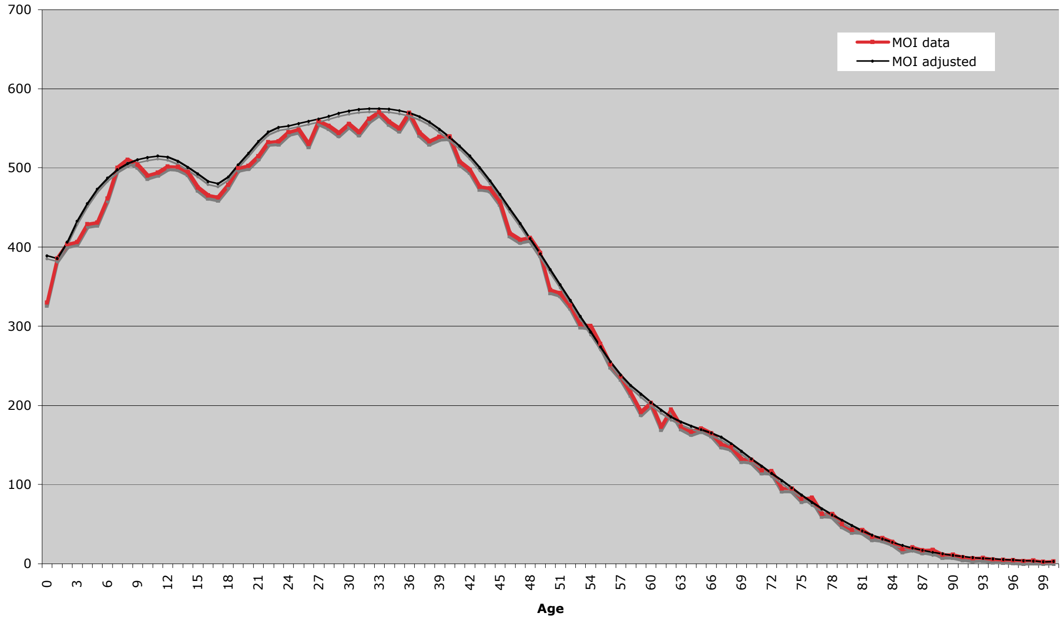
- Other cost ($du_t^{(oth)}/ u_t^{(oth)}dt$)

  (to be discussed)

ANNEX B

Tables and figures

Figure A.1. Registered male population as at 1 April 2006, MOI database



Figures A.2: Registered female population as at 1 April 2006, MOI database

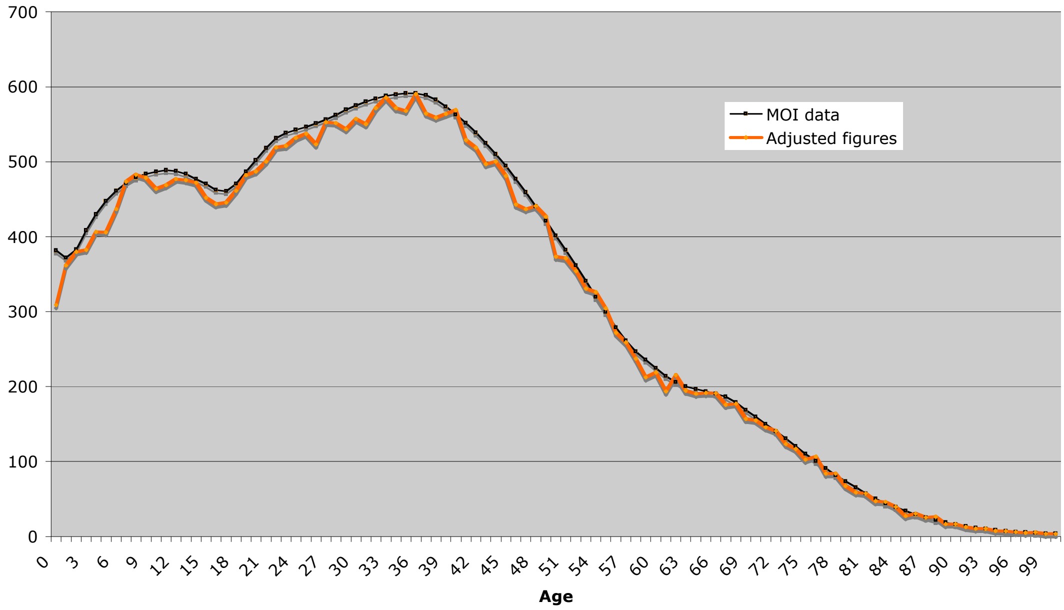


Figure A.3. Fertility rate by age, estimated from MOI data on births during FY 2006

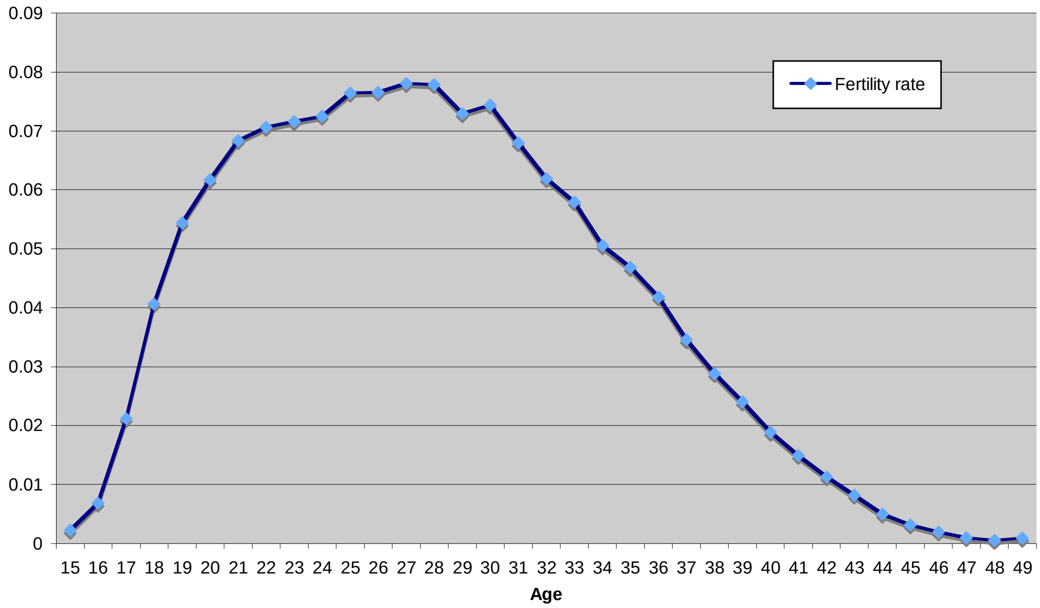


Figure A.4. Estimated labour force participation rates, FY 2006 (from LFS 2006, Q1 & Q2)

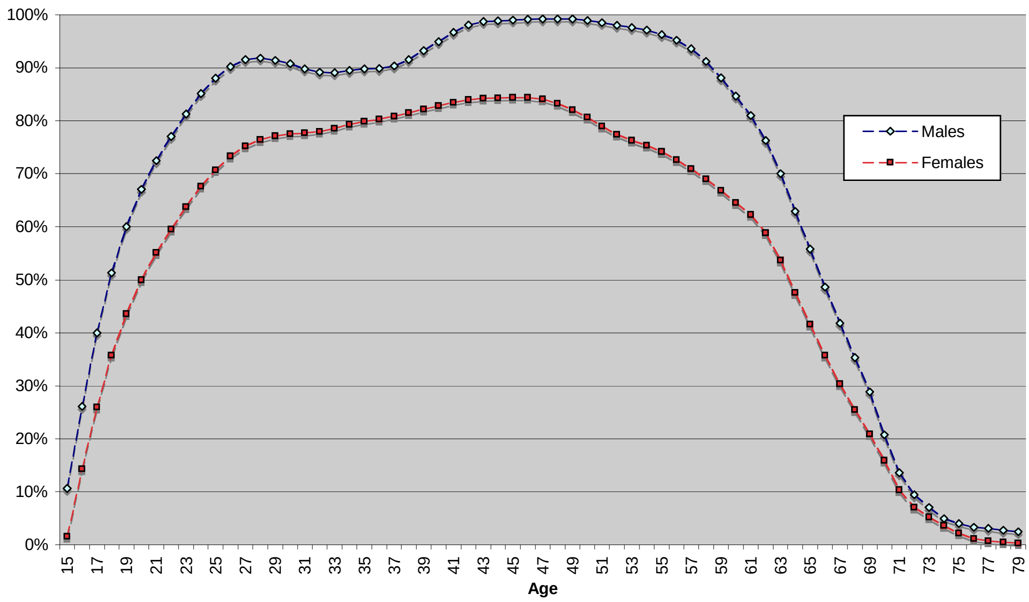
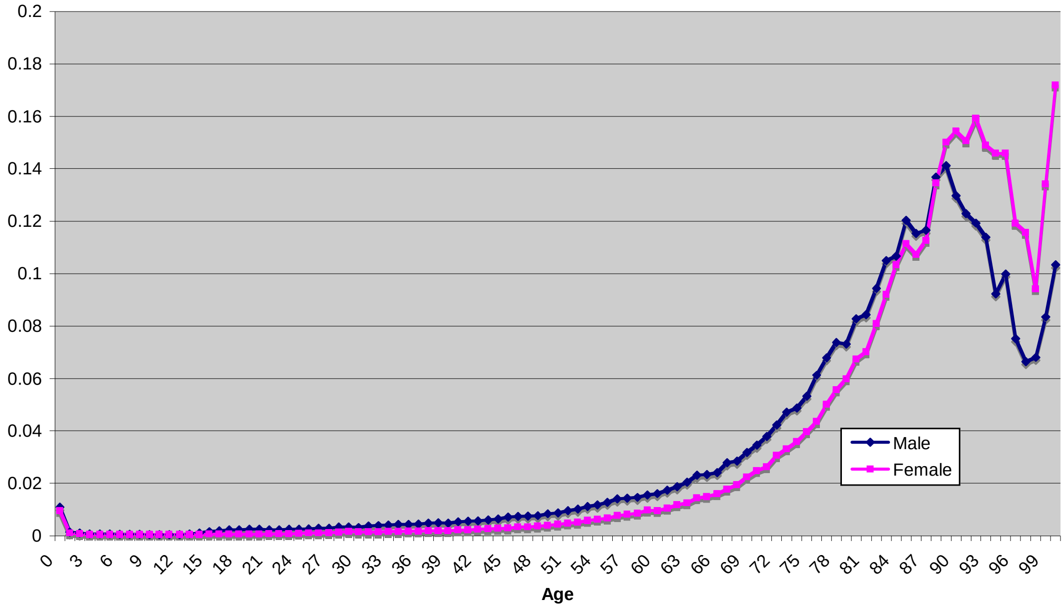


Figure A.5. Death rates as reported to MOI, FY 2006



ANNEX C

Data dictionary – draft table of contents

1. Macro-model data and assumptions
   1.1. Demographic data and assumptions
      1.1.1. Population data and related variables (if relevant)
      1.1.2. Labour force and employment data
      1.1.3. Demographic assumptions
      1.1.4. Endogenous model variables - *to be discussed*
   1.2. Economic data and assumptions
      1.2.1. Macro-economic data and variables (GDP, etc.)
      1.2.2. Wage and price data (CPI, etc)
      1.2.3. Macro-economic assumptions
      1.2.4. Endogenous model variables - *to be discussed*
   1.3. Health sector data and assumptions
      1.3.1. Macro data on health sector (GDP, employment, wages, etc.)
      1.3.2. Price indices for health sector (drug price index, etc.)
      1.3.3. Health sector related assumptions
2. Scheme-specific data
   2.1. Demographic data (scheme-specific)
      2.1.1. Scheme coverage and related variables (e.g., dependency ratios)
      2.1.2. Demographic assumptions (scheme-specific)
   2.2. Benefit provisions and provider payment
      2.2.1. Data on benefit provisions (as relevant)
      2.2.2. Provider payment data (e.g. amounts paid for fee schedule items)
      2.2.3. Assumptions (if relevant)
   2.3. Benefit history and assumptions
      2.3.1. Service utilization rates
      2.3.2. Assumptions on future service utilization
   2.4. Financial data and assumptions (scheme-specific)
      2.4.1. Expenditure data
      2.4.2. Unit cost/charges and per capita cost
      2.4.3. Financial assumptions (scheme-specific)
      2.4.4. Endogenous model variables (as relevant) – *to be discussed*

ANNEX D

Development of a Health Care Financing Model

Initial Phase

Terms of reference

ATTACHMENT 1

ILO-SECSOC

Geneva, 26 June 2007

Terms of Reference - Initial Phase (TOR-IP)

(1 July to 30 September 2007)

Attachment: Bangkok Mission Report WS dated 26 June 2007, incl. Annexes I to VI

Development of a health care financing model, and staff capacity building, for

The Civil Servants Medical Benefit Scheme (CSMBS), The Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and The International Health Policy Programme (IHPP)

Thailand

These *Terms of Reference for the Initial Phase* (TOR-IP) specify the activities to be undertaken during the initial phase of the overall modelling process, which stretches into 2008.

They are based on, specify and partially replace, the Draft Terms of Reference (Draft03 dated 02/05/2007). The overall contents of Draft03 remains valid and should be understood as reference for the detailing of further TOR that will follow after the activities of these TOR-IP have been finished. The contractor to these TOR-IP is advised to refer to the Draft03 for putting his / her work into perspective.

The contents of Draft03, as far as not replaced by these TOR-IP, is still valid; the time frame defined in Draft03 is however not fully applicable anymore. For the initial phase of modelling, these TOR-IP replace the time frame of Draft03 (see Attachment 1 to these TOR-IP).

(1) Draft-design of model structures; specify and check data (July 2007)

The *health finance projection and simulation models* to be developed for NHSO, SSO, CSMBS and IHPP will be *described*, in writing, in their core structures (modeling approach).

This includes written description of :

- the legislation (as far as relevant for modelling) of the covered populations;
- the statistical representation of the covered populations (numerical data base);
- the approach of moving the covered populations from t to t+1 (demographic modelling approach);
- the revenue and expenditure (= time series tabulation of fiscal accounts, budgets, and National Health Accounts);
- the costs per health benefits / health services *offered* by health providers, including the rules governing their development ("shadow-fee basis"; adequate time series tabulation);
- the costs per benefits / services *covered* (*reimbursed*) by health purchasers, including the rules governing reimbursements ("reimbursement basis");

for each of the three schemes UC, SSO, and CSMBS, separately (where adequate).

For UC, SSO and CSMBS health expenditure, the modelling approach will be based on similar modelling approaches as follows:

$$\mathbf{Exp = Pop * g * f * c,}$$

Where

Exp =: Health expenditure of scheme [UC, SSO, CSMBS respectively]

Pop =: covered population of scheme [UC, SSO, CSMBS respectively]

g =: factor representing the ratio between number of patients of scheme and insured of scheme [UC, SSO, CSMBS respectively]

f =: factor representing frequency of contact of patients with scheme [UC, SSO, CSMBS respectively]

c =: costs per patients' contact with health system [UC, SSO, CSMBS respectively]

In the case of SSO and UC information on **c** will be derived from hospitals' reports on charges ("shadow fees"). Support will be provided by SSO and NHSO staff in order to collect and interpret the data.

All variables / parameters will be calculated by *single ages* (0, 1, ..., 100), by *sex*, by *in-patients* and *out-patients*, and by *hospital type*, i.e. public (non-teaching hospitals, public teaching hospitals, others) and private – details to be determined in cooperation with Thai counterparts.

(2) *Establishment, description and evaluation of a consistent data base (July 2007)*

The data base will be 2006. If incomplete, data of 2005 will be used to estimate, adjust and complete the 2006 statistical data.

It must be made sure that, in 2006, the data base [for UC, SSO, CSMBS respectively] is consistent in the sense that the above equation, i.e.

$$\mathbf{Exp = Pop * g * f * c,}$$

is being fulfilled for all three schemes, i.e. multiplying and adding up over (single-age) vectors **Exp, Pop, g, f** and **c** provides total expenditure as measured statistically (in the fiscal accounts) in the three schemes [UC, SSO, CSMBS] respectively. *This requires calibration of the data base for 2006.*

The data base, year 2006, will form the basis for model design and model projections over time (moving data-vectors from T to T+1). It is this basis that will have to be updated later, once all models are finished and handed over to the Thai counterparts. *A description of the calibration method is to be included in the deliverable under this point 1) of the TOR-IP.*

In SSO and UC, there are health expenditure items that are not, in the data base, covered by the in-patient and out-patient systematic, but recorded (and projected) separately. Some of these expenses are available by single patients, i.e. can be structured by single ages vectors, by sex, by type of hospital etc. With respect to some items, other structured information is available. The contractor will make adequate use of that information in collaboration with the Thai counterparts for structuring the data base 2006.

When shaping the model design and the data base(s) for UC and SSO it has to be kept in mind that important model outputs in both cases (schemes) are the *capitation rates* for either scheme. The capitation rate calculation should be based on transparent methods such that these can be used, after hand-over of the models to the institutions, for calculating the annual budget proposals to the respective committees.

(3) *Modelling approach for the CSMBS covered population (July 2007)*

It is expected that the contractor pays special attention to an ***adequate modelling approach for moving from* t *to* t+1 *the population covered by the CSMBS***. This special attention is required as there is demographic modelling experience of the ILO with respect to the SSO and the UC, but not with respect to the CSMBS, where the greater part of the covered population is a function of the development of the number and structure of active civil servants, as follows:

Problematique of modelling the CSMBS covered population:

The CSMBS covers

1) Civil servants (most civil servants from 18 (minimum age) to 60 (retirement age; few exemptions);
2) Their parents;
3) Their spouse (if Muslim: their spouses);
4) Maximum of three (3) children per civil servant (idem: couple) until they turn 20 years of age;
5) Permanent employees (incl. their dependents, like for civil servants) from 16 (minimum age) to 60 (retirement age; no exemptions; all receive lump sum at retirement, no pension)

as long as the civil servant maintains his / her status as a civil servant.

By the end of their career, at retirement, *some* opt out – against one time payment of a (high) lump sum – and lose their own CSMBS health coverage and, also, CSMBS health coverage for their dependents.

Permanent employees all loose their status at retirement, i.e. they and their dependents loose CSMBS coverage at retirement of the active.

Unless receiving other health coverage both groups (former actives and their dependents) then refer to UC.

At present, total CSMBS membership is about 5 million persons, of which 1.9 million are active civil servants, 20 thousand permanent employees, and the rest – around 3.1 million persons – dependents.

This totals to a total number of 16 different groups; the information exists by single ages between 0 and 100.

HOWEVER, the CSMBS does not have information about expenditure differentiated by those groups. Accordingly, group-related information does not (yet) exist about allocation of total CSMBS expenditure on in-patients and out-patients.
The only spending information available is TOTAL EXPENDITURE.

Follows preliminary modelling approach for CSMBS-members:

MEMBERS	=	CSm + CSf + CSSPm + CSSPf + CSCHm + CSCHf +
	+	CSPARm + CSPARf +
	+	EMPm + EMPf + EMPSPm + EMPSPf + EMPCHm +
	+	EMPCHf + EMPPARm + EMPPARf

with:

Civil servants

1) CSm	=:	Civil servants, male
2) CSf	=:	Civil servants, female
3) CSSPm	=:	Spouses, male, of civil servants
4) CSSPf	=:	Spouses, female, of civil servants
5) CSCHm	=:	Children, male, of civil servants
6) CSCHf	=:	Children, female, of civil servants
7) CSPARm	=:	Parents, male, of civil servants
8) CSPARf	=:	Parents, female, of civil servants

Permanent employees

9) EMPm	=:	Permanent employees, male
10) EMPf	=:	Permanent employees, female
11) EMPSPm	=:	Spouses, male, of permanent employees
12) EMPSPf	=:	Spouses, female, of permanent employees
13) EMPCHm	=:	Children, male, of permanent employees
14) EMPCHf	=:	Children, female, of permanent employees
15) EMPPARm	=:	Parents, male, of permanent employees
16) EMPPARf	=:	Parents, female, of permanent employees

Modelling problem is mainly to find an algorithm that treats the dependents as a function of the actives. Total actives will have to come from the labour market balance.

See also the file CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

(4) *Calibration of CSMBS expenditure data base by different categories (August 2007)*

A further problem is that TOTAL EXPENDITURE has to be allocated, in the base year, on single ages of the above groups AND on in-patients and on out-patients.

In other words, the contractor will need to establish a hybrid database such that, for the base year, the sum of all sum products equals TOTAL EXPENDITURE. It is only then, that the standard demography-related projection method can be applied.

The CSMBS maintains two detailed lists of prices to be paid for

(1) medical goods and appliances, and

(2) services.

These lists may be tentatively used as indicators for approaching the above problem. Direct coordination with the Thai counterparts is required.

The two lists are agreed upon between CSMBS and health providers; prices are maximum amounts reimbursed. If hospitals charge higher prices the civil servant has to pay the difference out of pocket. The lists only apply to public hospitals. In other words, thus far, if a civil servant [or dependant] goes to a private hospital s/he has to pay the whole bill out of pocket.

Also, CSMBS applies CSMBS-specific DRGs (in-patient classification system) as of July 2007 to Civil Servant cases of treatment of inpatients.
However, for the time being, different RWs are being multiplied with different base amounts, e.g. in

- $\text{Hospital}_1 = \text{RWs} * \text{RW}_{\text{base rate of Hospital}\mathit{1}}$,
- ...,
- $\text{Hospital}_n = \text{RWs} * \text{RW}_{\text{base rate of Hospital}\mathit{n}}$;

it is planned later to group hospitals by categories (e.g. university hospitals, others) and force them within groups to apply identical, hospital-group specific, base rates.

The contractor is expected to explore whether the estimation of an *average general base rate multiplier* $\text{RW}_{\text{base rate}}$ for all hospitals is possible and, if so, whether it is a "reasonable" parameter to be used in CSMBS expenditure modelling.

Specification of data implies: defining (writing down) the complete list of data required for modelling the above schemes.

It was agreed between ILO, CSMBS, and PIU (Dr Thaworn) that data of CSMBS will be provided by CSMBS (Mr Kulasake Limpiyakorn, Financial Analyst: The Comptroller General Department, Min of Finance; sek139@yahoo.com, mobile: (666) 555-3139).
CSMBS population data format is specified in the file CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

The discussions between the Thai counterparts and the ILO project manager, undertaken in 2006 and spring 2007, have shown that it might be advisable to disaggregate all base year data by different types of hospitals in all three schemes, i.e. in UC, SSO and CSMBS at least by public-teaching, public-non-teaching (sub-district, district, provincial), private, and possible other categories.

It is expected that the contractor establishes the data base (the data bases for the different schemes) in collaboration with the Thai counterparts such that differentiation of the above kind, by type of hospital, is taken into account.

In many respects, the contractor can refer to prior work undertaken by the ILO – especially for the demographic labour market and macro-economic parts (see below: item *(3)*), in other respects new data terrain will have to be covered.

NHSO, CSMBS, SSO and IHPP will collect and provide the specified data.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

(5) ***Data check and first draft table of contents of data dictionary; (August 2007)***

The activity under *(1)*, above, will be supported by a data collection activity through NHSO, CSMBS, SSO and IHPP.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

Data specification and actuarial data check will be used for ***drafting a first table of contents of a data dictionary*** – later to be completed extra these TOR-IP –, containing a statistical description of contents and definitions etc of the data needed for model maintenance.

(6) ***Common demographic, labour market and economic frame for the four models; (September 2007)***

A ***demographic, labour market and economic frame of models*** has to be developed that can be used by CSMBS, NHSO, SSO and IHPP as common input to their respective institutional health models (which are to be developed later, on basis of the work undertaken under these TOR-IP, in detail).

The variables that have to be produced by the above frame-models depend, in detail, on the final design of the institution-specific health models; in other words: the frame-models will be of a preliminary character, and later, extra these TOR-IP, be adjusted, fine-tuned, and finalized.

The contractor, in undertaking his/her work can relate to prior modelling work of the ILO for NHSO and SSO. The ***new approach under these TOR-IP*** is to make sure that the structure of the frame-models is designed such that it equally (simultaneously) satisfies the needs of model-input of *all four institutions' institutional health models*.

The contractor will design the *demographic frame model* such that it calculates the

UC-covered population as a residual of

- total population development,
- SSO-population development,
- CSMBS-population development, and
- "private" population development,

i.e.:

- $Pop_{UC} = Pop - Pop_{SSO} - Pop_{CS} - Pop_{Priv}$

One problem (under this approach) would be to design the model such that "stable", "reasonable" development of Pop_{UC} is guaranteed, allowing for smooth cooperation with all stakeholders of the NHSO, including the Bureau of Budget, over the practice of model application, given the fact that Pop_{Priv} is not explicitly known and a number of statistical inconsistencies between Pop_{UC} and Pop exist and have to be solved.

With respect to Pop the contractor will use the population registration data base of the Ministry of the Interior. (To be provided by the Thai counterparts.)

Labour supply will be designed according to the input needs of the four models for the four institutions.

The labour market balance of the economic sub-module will be designed consistently with labour supply. The ***contractor will explore, and make a respective proposal*** (in writing), to what extent labour supply calculations (by sex and single ages) can be used as input to the demand side of the labour market balance and to which extent, vice versa, labour market demand can function congruently as input for the supply side.

Accordingly, the economic sub-module will have to produce output on costing elements, i.e.

- Price indexes, and
- Average wages
- Productivity,
- Employment of various type,

for each of the four institutions' models.

Consistency between SNA and NHA is to be maintained.

(7) ***Design and data base; specify demographic model for CSMBS; (September 2007)***

The contractor is expected to develop, as a result of his / her work during TOR-IP a decisive view on how the institutional modelling for the revenue and expenditure for NHSO, SSO, CSMBS, IHPP (model design) can best be developed. In other words, the initial draft design must be turned into a concrete proposal for modelling, explaining the structure and, especially, the problems that need to be solved. This is not "the modeling" yet, which follows later in the phase after the work on TOR-IP.

The ***concrete proposal for modelling NHSO, SSO, CSMBS, IHPP should be delivered in writing***; any attachments can be delivered in electronic format (i.e.: Excel and / or Visual Basic program examples).

Further, it is expected that the contractor will have developed, by the end of his / her work, a practical proposal with respect to modelling the population covered under the CSMBS, taking into account the explanations under *(3), above,* section: <u>*Problematique of modelling the CSMBS covered population*</u>. In developing the proposal the contractor will pay special attention to modelling entries and exits into the CSMBS system; this includes exploring possibilities of applying civil service (CSMBS) specific assumptions on fertility and mortality. ***The CSMBS covered population modelling proposal (model) is expected in electronic format; it must be described separately in writing.***

<u>In summary, therefore, the TOR-IP basically stipulate the following:</u>

- Clarification and fine-tuning of modelling designs;
- Depending on the proposed model designs: establishment of the data base, including data calibration, for 2006 (2005); the data base must be complete; Specific care must be taken with respect to the making consistent of *calendar year data* with *fiscal year data*; where data are not available, but necessary for reasonable modelling (example: cost data CSMBS), the contractor provides consistent estimates (to the extent possible: theory based or otherwise "reasonably" constructed, based on established mathematical / statistical estimation procedures or methods of numerical / actuarial mathematics, or on other methods of rational reasoning);
- Development (finalize) of draft modules for the outer framework for the institutional models, i.e. demography, labour supply, labour demand, economy;
- Develop a concrete demographic model, related to the labour market balance of the macro-economic model, for the covered population of CSMBS (incl. computer application);
- And other activities as stipulated in detail above.

All work steps and results will be conceptually tested for their robustness and practicability in a framework of cooperation of modelling between NHSO, SSO, CSMBS, and IHPP to be established and implemented latest as of mid-2008. This comprises questions of routines, during a year, of updating the data base(s), especially.

Schedule

The work is expected to be accomplished over the three months July to September 2007.

A *work flow chart* indicatively stipulating which work should reasonably be done when will be made available in electronic format.

Preconditions and caveats

It is assumed that necessary data bases for the models should be developed in collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff.

In case delays are caused in the data collection process, there could be the delay in delivery of the intermediate and final results und these TOR-IP.

ANNEX E

Data dictionary – proposed template

Nr	*Variable name*	*Description*	*Symbol*	*Variable type*	*Data format*	*Source document*	*Source item*	*Last publication date*	*Periodicity of publication*	*Next update recommended*
1										
1.1	Cohort population	Persons in age/sex cohort	$pop_{x,s,t}$	Data input	Persons	MOI database		n.a.	Daily update (?)	
1.2	Age-specific fertility rate	Probability of giving birth		Assumption	Births per female in cohort					2010/2011 (Pop census)
1.3	Age-specific mortality rate	Probability of death in age/sex cohort		Assumption	Probability of death (0 – 1)					

THAILAND

Development of a Health Care Financing Model

Initial Phase

FINAL REPORT

(Product 4)

7 December 2007

Jean-Claude Hennicot
Consulting Actuary
ILO

CONTENTS

ANNEXES

1. Background and introduction

The present report was prepared in the context of the consultancy agreement signed by the consultant with the International Labour Office (ILO) on 1 July 2007 (External Collaboration Contract no. 40029956/0) in the context of the ILO activity on 'Development of a Health Care Financing Model for Thailand'.

The activity is taking place within the wider context of the contribution agreement signed between the ILO and the European Commission (EC) on 9 February 2006 with regard to the EC project on Heath Care Reform in Thailand (THA/AID/CO/2002/0411, 2004 – 2009). The agreement stipulates that the project component 'Financial Management of the Thai Health System' shall be implemented by ILO.

This report is part of the reporting requirements stipulated in the consultant's contract; it is the final assignment report referred to as 'product 4' in the terms of reference (see Annex D). The substance of the report constitutes a synthesis of the findings and proposals presented by the consultant in the two mission reports submitted earlier (see product 2 and 3).

The report is structured as follows:

Section 2 provides an overview of the work accomplished under the contract.

In section 3 a general description is presented for the three schemes (CSMBS, SSS, and UCS). It includes information on their respective legal framework, benefit provisions, current provider payment system and/or budget allocation method, income and expenditure, and scheme coverage in the base year of each model.

Section 4 deals with the Thai national health accounts (NHA) in the context of the model to be developed for the International Health Policy Programme (IHPP).

The overall demographic and macroeconomic framework underpinning the four models is presented in section 5.

Section 6 deals with demographic modeling specific to the three schemes.

Section 7 presents the expenditure models proposed for the four institutions.

Section 8 deals with specific issues related to modeling of CSMBS expenditure.

Miscellaneous issues are covered in section 9.

Section 10 provides an outline of the consultant's view on the next steps to be undertaken under the project.

The consultant would like to acknowledge the good cooperation extended by the national counterparts from the respective institutions, notably their relentless efforts to collect data and to provide qualitative information on their schemes. Special thanks are due to Khun Rangsima, SSO, Khun Kulsek Limpiyakorn, CSMBS, Khun Taweesri Greetong, NHSO, and particularly to the national project component manager, Dr. Thaworn Sakunphanit, who provided guidance throughout, organizational support, and invaluable insights.

2. Work accomplished

The objectives pursued under the assignment of the consultant are specified in the terms of reference (see Annex D); it is believed that these have been largely achieved. Accomplishments are manifold and the various outputs produced so far are considered satisfactory by the consultant, which is party due to the good cooperation extended by the national counterparts.

During the first weeks of the assignment, the focus of the consultant was directed towards increasing his understanding of the intricacies of the three schemes, mainly with regard to provider payment mechanisms in place, existing conventions on financial reporting, budgeting procedures, and availability of data at various levels. This enabled him to develop the data framework and develop a sketch of the model structure proposed for each scheme. A routine of weekly meetings with each scheme was established in order to facilitate information exchange and to build a working relationship with the national counterparts.

This initial stage was followed by the data collection exercise per se, undertaken in parallel by the three schemes. Preliminary modeling and data checks ensued; these revealed data gaps and/or inconsistencies, which led to new data requests and revisions. During this interactive process the database was established for each scheme and the remaining data gaps identified. In early September preliminary data and model structure were presented to the national counterparts and conceptual issues were identified and discussed.

The focus of the consultant then gradually shifted towards the details of model design and resolution of conceptual issues. Some of these proved as non trivial and were subject to intense discussions (notably the issue of whether the model component for IP care should take into account the DRG system). Conceptual issues were clarified during the mission of the project coordinator in October/November and the final model structure and methodology presented to national stakeholders.

The assignment of the consultant benefited greatly from the two missions of the project coordinator, Mr Wolfgang Scholz, Senior Economist, ILO, in early September 2007 and October/November 2007; these provided much needed opportunities to brainstorm on conceptual issues and to redefine the strategy pursued. It also helped to foster communication with national stakeholders and achieve a broad consensus on the methodology pursued.

It is noted that the duration of the consultant’s assignment exceeded the time frame set out in the terms of reference by about two months. It is felt that considering the wealth of data and qualitative information needed, and the conceptual modeling issues to be resolved, the given timeframe was a bit unrealistic and overly ambitious, this particularly from an ex-post perspective.

It also noted that some of the work undertaken by the consultant went beyond the scope of the TORs and is considered part of the follow-up assignment. This in particular for the joint work undertaken with the project coordinator during his mission in October/November 2007.

3. Scheme description of CSMBS, SSS, and UC

Thailand has currently three main national health care schemes, which include the Social Security Scheme (SSS), the Civil Servants' Medical Benefits Scheme (CSMBS), and the Universal Coverage (UC) scheme as administered by the National Health Security Office (NHSO). The three schemes are the main purchasers of health care services from public and private medical service providers (hospitals) in the country.

The main features of the three schemes are summarized below:

3.1. The Civil Servants' Medical Benefits Scheme

The CSMBS provides free health care to all Thai civil servants, permanent employees in the public sector, and to dependents spouses, children, and parents.

3.1.1. Legal framework

The legal basis of the CSMBS rests on the 'Royal Decree on the Disbursement of Medical Benefits for Civil Servants, B.E. 2550'. A revised draft of the decree is currently under consideration by the Ministry of Finance; its endorsement by the Cabinet before the general elections to be held in December this year is unlikely however.

3.1.2. Coverage

The CSMBS provides medical care to all civil servants, permanent state employees, and public sector pensioners. It also covers their dependent spouses and children if not older than 19, this up to three children per family. Permanently disabled children are covered for life. Parents of active insured and pensioners are also covered by the scheme if financially dependent.

The exact figure on CSMBS beneficiaries is unknown. Based on the available data and information the total coverage of the scheme for the fiscal year 2006 is estimated at about 4.2 million persons.

3.1.3. Benefit provisions

According to the Royal Decree quoted above the CSMBS reimburses all cost for medical care incurred by eligible members in case of illness or accident, including the cost for the following:

- All drugs included in the national drug list if prescribed by a medical doctor
- Medical services, diagnostics, laboratory tests, operations, etc.
- Medical devices and artificial organs
- Room and board during hospital admissions
- Annual medical checkup (for actives and pensioners only)

Non-curative goods and services are excluded (unless included explicitly), such as:

- Cost related to disease prevention and testing (incl. vaccines, etc.)
- Cost for pregnancy tests
- Plastic surgery, transexual operations, sterilization, etc.

The CSMBS reimburses only the cost of medical care provided by public hospitals, with the exception of in-patient accident and emergency care and only for a specific list of outpatient treatments (e.g., hemodialysis).

3.1.4. Financing

Financial arrangements

The CSMBS is financed solely through the government budget. Medical providers are reimbursed by the scheme on a fee-for-service basis for treatments provided to its members. Amounts reimbursable by the scheme are subject to ceilings stipulated in the following official documents:

- Circular nr. 0417/77 of the Ministry of Finance (15 Feb 05) on the reimbursement of cost for medical devices and artificial organs
- Circular nr. 0417/177 of the Ministry of Finance (1 Dec 2006) on the reimbursement of cost for medical service fees for outpatient and inpatient care

For the reimbursement of IP care CSMBS introduced the DRG system (version 3.3) in July 2007. However, the CSMBS uses the DRG system in a different way than NHSO since it does not include the reimbursement of cost for room and board, medical devices and appliances, and certain drugs (e.g., for cancer treatments), and for the reimbursement of the cost for IP services provided during the non-acute phase of admissions. Furthermore the CSMBS currently applies a different base rate per unit of DRG relative weight (RW) for each hospital.[1] In order to enhance equity and transparency in their provider payment system, CSMBS plans to introduce uniform base rates for different types of providers in the future although no timetable has yet been adopted for this move.

Expenditure

The expenditure of the CSMBS for the period 2002 – 2006 (fiscal years) is shown in table A.5. It can be observed that total expenditure of the scheme has increased considerably over the past years, from about 20.5 billion THB in the fiscal year 2002 to about 37 billion THB in the fiscal year 2006.

3.2. The Social Security Scheme

The Social Security Fund provides social health insurance to all workers employed in the private sector and to public sector workers with temporary employment contracts.

3.2.1. Legal framework

The legal basis of the Social Security Fund rests on the Social Security Act (1990), which stipulates the establishment of the Social Security Fund and its administrative body, the Social Security Office. The Social Security Act stipulates the basic principles of the scheme,

[1] Provider specific base rates are currently determined by the CHI based on past IP charges reported by each provider.

the list of benefits provided, and the financial arrangements and administrative rules and regulations.

3.2.2. Coverage

According to the Social Security Act, 1990, the Social Security Fund covers all employees working in private sector enterprises. Excluded from mandatory coverage are the following:

- Domestic workers who are not involved in a business;
- Public officials including permanent employees, daily temporary employees and hourly temporary employees of central, provincial, and local administrations, but excluding monthly temporary employees (who fall under mandatory coverage);
- Employees of foreign governments and international organizations;
- Employees of enterprises that have offices in the country but are being stationed abroad;
- Teachers and headmasters of private schools operating under the law on private schools;
- Students, nurse students, undergraduate and interning physicians who are employees of schools, universities, or hospitals;
- Other employees the exclusion of which is stipulated by law;
- Workers under the age of 15 or aged 60 and above.[2]

According to article 39 of the Social Security Act, 1990, workers who cease to be insured due to a change in their employment situation can continue their membership on a voluntary basis provided that they have been subject to compulsory contributions for a period of 12 months at least.

According to article 40 of the Social Security Act, any person who is not covered by the scheme under article 33 (mandatory coverage) or 39 (voluntary coverage following article 33 membership) can apply to become an insured person under the scheme.[3]

According to article 38 of the Social Security Act, employees who cease their employment and loose their membership under article 33 or 39 are entitled to benefits for a further period of six months starting from the date of termination of their employment.

In the year 2006, an average of 9.1 million members were entitled to medical benefits under the Social Security Fund, including about 7.92 million covered under article 33, about 874,000 workers covered under article 38, and about 285,000 workers covered under article 39. Only two persons were insured under article 40 in 2006.

3.2.3. Health care benefit provisions

According to article 63 of the Social Security Act, health care benefits provided under the Social Security Fund in case of non-occupational injury or disease include the following:

- Medical examination expense

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[2] According to the Social Security Act, 1990, workers older than 60 can be insured if they commenced their membership before they reached the age of 60.

[3] Members insured under article 40 qualify only for the following benefits: health insurance, sickess cash benefits (in case of in-patient care), maternity, and death benefits

- Medical treatment expense
- Room, board, and treatment expense in hospitals
- Drugs and medical supplies,
- Cost of ambulance and medical transportation services
- Other expenses as necessary

Medical treatments covered by SSO are extensive and include in principle all but those listed on the benefit exclusion list adopted by the Medical Committee. Treatments explicitly excluded from SSO coverage are the following:

- Cosmetic surgery
- Psychosis treatment except for acute attacks
- Specific treatments used against drug addiction
- Long-term hospitalization (exceeding 180 days per year)
- Hemodialysis except for acute renal failure requiring immediate treatment not exceeding 60 days and end-stage treatment for chronic renal failure
- Treatments administered for a purely research-oriented purpose
- Treatment against infertility
- Organ transplant except for bone marrow, kidney, and cornea transplant
- Tissue biopsy for organ transplant with the exception of bone marrow transplant
- Non-medical procedures
- Transsexual operations
- Reproductive surgery
- Non-essential treatments provided during convalescence periods
- Artificial lenses

3.2.4. Financing

Financial arrangements

The Social Security Fund is financed by tripartite contributions from workers, employers, and the government. For the sickness, maternity, invalidity, and death benefit branches, each party currently pays an equal share of 1.5 per cent of insurable earnings, or 4.5 per cent in total.[4]

Medical providers are paid according to the capitation system for both out-patient and in-patient care, with certain items excluded and reimbursed on a fee-for-service basis up to a fixed ceiling. Not included in the capitation fee are the following benefits/services:

▪ Accident/emergency care if provided by another provider than the main provider with which the insured person is registered

▪ Treatments classified as high-cost, which include the following:
  - Hemodialysis

[4] Insurable earnings are subject to a ceiling of 15,000 Thai baht per month.

- Chemotheraphy and radiotheraphy
- Open heart surgery
- Brain surgery
- Medical implants
- Corronary bypass
- Percutaneous balloon valvuloplasty
- Cryptococcal meningitis
- Coronary dilatation using balloon or PTCA bypass
- Atrial septal occluder
- Sterilization (male & female)

▪ Dental care

▪ Bone marrow transplant including related drugs

▪ Hemodialysis, chronic peritoneal dialysis, and renal failure drugs

▪ HIV/AIDS drugs and diagnostics

▪ Kidney transplant

▪ Cornea transplant

The benefits listed above are reimbursed separately up to a ceiling, the amount of which is fixed specifically for each treatment. The ceilings on reimbursements are adjusted occasionally although no timetable has been set for regular adjustments.[5]

The capitation fee is negotiated annually by the SSO Medical Committee; it includes a basic amount and two separate increments reflecting service utilization (for both OP and IP care) and high risk / high cost patients respectively. The risk adjustment partially compensates providers for higher cost caused by high utilization rates, high incidence rates of chronic diseases, and high cost IP treatments (according to DRG relative weights) based on the actual care provided by the provider over a fixed period in the past.

The utilization increment of the capitation fee referred to as ‘utilization incentive’ is based on a combined annual OP/IP utilization rate index calculated as follows:

$$UI = \sum_{i=1}^{12} \left(\frac{n_i^{(OP)} + (n_i^{(IP)} \cdot d_i^{(IP)} \cdot 4.97)}{pop_i} \right)$$

Where: $n_i^{(OP)}$ is the number of OP visits in month i

$n_i^{(IP)}$ is the number of IP admissions in month i

$d_i^{(IP)}$ is the average length of stay in month i

pop_i is the average number of persons registered over month i

The utilization index is calculated for all providers separately and then grouped in percentiles. In 2006 the amount disbursed as utilization incentive was calculated as follows:

THB 30/person/year for providers with UI in the percentiles 1 – 3 (lowest 30% of UI)

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[5] The ceiling amounts for certain treatments have never adjusted since the launch of the scheme in 1991.

THB 40/person/year for the 4th percentile

…

THB 100/person/year for 10th percentile (highest 10% of UI)

The average amount of utilization incentive disbursed in 2006 was 55 THB.

The risk adjustment component of the capitation fee is divided into two parts: an OP portion fixed at 55 per cent of the total amount and an IP portion fixed at 45 per cent of the total amount [of risk adjustment]. The OP portion is paid based on actual treatments provided to chronic disease patients over a fixed period in the past (6 months). It is calculated based on the cumulative risk score index as allocated to treatments provided to chronic disease patients. The OP risk adjustment for provider *i* is thus given by:

$$RA_{i,t}^{(OP)} = \left(cds_{i,t} / \sum_i cds_{i,t} \right) \cdot pop_t \cdot 205 \cdot 0.55$$

Where: $RA_{i,t}^{(OP)}$ is the OP risk adjustment for provider *i* in the period *t*

$cds_{i,t}$ is the cumulative chronic disease score reported by provider *i* over a predetermined period *t* (6 months in general)

pop_t is the average number of persons registered with all providers in the period *t*

The IP portion of the risk adjustment is based on the actual cumulative DRG case-mix index reported by the provider over a fixed period in the past (6 months in general). The IP risk adjustment is calculated as follows:

$$RA_{i,t}^{(IP)} = \left(cw_{i,t} / \sum_i cw_{i,t} \right) \cdot pop_t \cdot 205 \cdot 0.45$$

Where: $RA_{i,t}^{(IP)}$ is the OP risk adjustment paid to provider i for the period t

$cw_{i,t}$ is the cumulative amount of adjusted relative DRG weights reported by provider *i* over a predetermined period t

pop_t is the average number of persons registered with all providers in the period t

The capitation system is currently under review by the SSO Medical Committee.

Revenue and expenditure

The annual medical benefit expenditure and contribution income allocated for medical benefits under the Social Security Fund is shown in table A.6 for the period 2002 - 2006.

It can be observed that the medical benefit expenditure of the Social Security Fund has increased from 9.3 billion Baht in the year 2002 to about 15.8 billion Baht in the year 2006.

3.3. *The Universal Coverage Scheme*

The Universal Coverage Scheme was established in 2002 aiming to provide health care coverage to all Thai citizens who are not covered by any other statutory health insurance scheme. The scheme initially charged beneficiaries a co-payment of 30 baht per hospital visit/admission, but the co-payment was abolished at the end of 2006 by the new government. The scheme is administered by the National Health Security Office and funded through the National Health Security Fund.

3.3.1. Legal framework

The National Health Security Act, B.E. 2545, adopted in the year 2002 constitutes the legal basis for the Universal Coverage scheme. The Act stipulates the establishment of the National Health Security Office, which is entrusted with the administrative management of the scheme, and of the National Health Security Fund, aiming to ensure adequate financing of the scheme.

3.3.2. Coverage

The National Health Security Act stipulates that every Thai citizen has the right to medical care under the scheme unless he/she is already covered by another statutory scheme, including under the CSMBS and the SSS. Excluded specifically from coverage are the following persons:

- Government officials (civil servants) and employees in the public sector
- Officials and employees working for local governments
- Officials and employees working in state enterprises, in independent government agencies, and those already entitled to medical benefits from the state budget under other arrangements
- Parents, spouses, and children of the aforementioned categories who are entitled to medical care as dependents
- Beneficiaries of the Social Security Fund

The coverage of the UC scheme in the fiscal year 2006 is shown in table A.4. It can be observed that in 2006 about 47 million people were registered under the scheme.

3.3.3. Benefit provisions

According to the National Health Security Act, the benefits provided under UC include curative services, health promotion and disease prevention services, rehabilitation services, and services provided according to Thai traditional or other alternative medical schools. The scheme applies a similar exclusion list than the Social Security Scheme.

In addition to the curative benefits provided in a similar than under the other two schemes, the UC scheme also provides disease prevention and health promotion services targeting the whole Thai population.

3.3.4. Financing

Financial arrangements

Scheme financing is ensured through the National Health Insurance Fund, which is funded from the government budget. Initially the scheme applied a co-payment of 30 Baht but this has been abolished shortly after the current government was instituted.

The provider payment mechanism operated by the NHSO is similar to the SSO, with certain treatments paid on a fee-for-service basis. The scheme however subsidizes providers for salary costs and capital replacement cost and provides special subsidies for providers operating in harsh (i.e., remote) areas of the country.

Expenditure

The expenditure of the UC scheme is shown table A.7 for the fiscal year 2006. It can be observed that the total expenditure including salary cost amounted to about 80.9 billion Baht, of which the main items are about 34.5 per cent for outpatient care, 27.1 per cent for inpatient care, 10.6 per cent for high cost care, and 13.1 per cent for disease prevention and health promotion services.

4. The System of National Health Accounts (NHA) in Thailand

According to the terms of reference, it is planned to develop a model for the International Health Policy Programme (IHPP) aiming to project aggregate national health expenditure for Thailand. The IHPP is mandated to calculate aggregate national health expenditure for Thailand by compiling national health expenditure data in the so-called ‘National Health Accounts (NHA)’, this based on the commonly accepted data format and methodology developed jointly by the World Bank, WHO and USAID.[6]

NHA data has been compiled by the IHPP for the years 1994 – 2005, this in the standard NHA tables no. 1 - 5 listed below:

Table 1. Current expenditure on health by function of care, type of provider, and source of funding (annual)

Table 2. Current expenditure on health by function of care and provider industry (annual)

Table 3. Current expenditure on health by provider industry and source of funding

Table 4. Current expenditure on health by function of care and source of funding.

Table 5. Total expenditure on health including health-related functions

The data was made available to the project by IHPP in early November. An electronic version of the data was only provided for table no. 1 (see Missionreport 2, attached EXCEL file ‘*NHA 02 - 05’*) for the years 2002 - 2005. Data relating to the tables no. 2 -5 have been provided in hardcopy for the years 1994 – 2005. - *Available upon request*

NHA tables no. 1 – 5 present national health expenditure from different perspectives, displaying alternative combinations of the data by disaggregating (resp. aggregating) along the following dimensions:

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[6] See Guide to producing national health accounts, World Health Organisation, 2003

- Function of expenditure (in-patient services, out-patient services, prevention services, pharmaceuticals, administration cost, etc.)
- Type of provider (Different types of public and private hospitals, physicians' and dentists' offices, nursing and residential care facilities, etc.)
- Financing agency (MOPH, various health insurance schemes, employer benefits, private insurance, non-profit organizations, out-of pocket, etc.)

The data comprises expenditure figures for recurrent expenses on health, capital investment in health, and also other expenditure data on health-related functions, referred to as 'memorandum items', such as training of health personnel, research and development in health, administration of health-related cash benefits, etc.

The proposed model for IHPP is discussed in section 7.5.

5. Common model framework

The demographic and economic frame is the common model framework within which the four models are to be embedded. The purpose of the demographic and economic frame is to link the models to the overall situation and development trend of the country's population and economy, this in a logical and consistent manner.

The common demographic and economic model is described below:

5.1. Population

5.1.1. Base year population

The base year population is given by the MOI-registered population as at 1 April 2006 (see 1st mission report).

For the population figures presented in the first report of the consultant (product 2), some inconsistencies were discovered. Updated figures were provided by the NHSO upon request from the consultant. The revised figures included a sizeable number of persons with unknown age (about 1.5 million) and presented a high and irregular variation in the population of successive cohorts. It was proposed by the consultant to distribute the population with unknown age over all age groups such that these variations are smoothed out (see figures A.1 and A.2 in Annex B). The population figures also presented a very low number of persons registered in the age cohort with age less than 12 months. This can probably be attributed to a time lag between birth and registration of newborns.

It was therefore proposed to adjust the number of persons in those cohorts (males and females aged less than 1 year) by taking into account the number of newborn registered in the fiscal year 2006. The data and resulting figures are presented in the electronic file '*Population MOI*' (see Mission report 2)

A cohort-by-cohort comparison of the MOI population figures for the years 2006 and 2007 was carried out by the consultant to assess age-specific mortality rates and to verify the assumption of zero migration. This comparison revealed further inconsistencies particularly for young age cohorts (age 0 – 12), which presented abnormal population increases for which no satisfactory explanation (e.g. migration) could be found. A thorough check of the MOI population database is currently being undertaken by the MOI and a further revision of the base year population data is likely. The base year population data as provided in the attached file should therefore be considered as preliminary and subject to change. This also applies to the results of the population projection presented in the following section. It is hoped that the revised population figures, if a further revision is necessary, will be provided shortly such that the model can be updated shortly.

5.1.2. Population projection

The Thai population has been projected with the ILO population model starting from the base year population (as at 1 April 2006) presented in the worksheet *'pop 2006'* (see Missionreport 2, EXCEL file *'Pop MOI'*). The assumptions of the proposed population projection are discussed below:

Total fertility rate

Age-specific fertility rates have been estimated from the data on newborns (by sex and age of mother) as extracted from the MOI database by the NHSO team and on the adjusted base year population figures. The resulting fertility rates are presented in Figure A.3 (see Annex B). The total fertility rate, given by the sum of the age-specific fertility rates, is estimated at 1.406 for the fiscal year 2006.

For the population projection it has been assumed that the age-specific fertility rates (and thus the total fertility rate) will remain constant at the same level over the whole projection period.

Age-specific mortality rates

Mortality rates by age and sex have been estimated from the data on death (by age and sex) as extracted from the MOI database by the NHSO staff. The resulting mortality rates are presented in figure A.5. (see Annex B). It can be observed that the pattern of death rates by age and sex presents a standard shape (decreasing rapidly after birth to reach a minimum at around the age of 10/11 and increasing gradually thereafter), this for the ages 0 to 85. For ages above 80/85 the observed pattern is unusual since the estimated death rates do not increase according to the standard pattern. It is believed that the observed irregularity is due to the fact that the percentage of deaths that are registered with MOI decreases after the age of 80/85.

For the establishment of a life table, a standard model pattern of mortality rates has been fitted to the death rates observed for the ages 0 – 85. The life table obtained in this manner (for the year 2006) results in a life expectancy at birth (LEB) of 68.4 years for males and 75.9 years for females. This is in line with the LEB suggested in the last population census carried out in the year 2000, which suggested a life expectancy at birth of 67.1 years for males and 74.8 years for females. The data on observed death rates and the life table obtained from the fitted mortality model for the base year is provided in the electronic file 'Mortality estimation' (see attachments of Missionreport 2).

For the population projection, it has been assumed that the life expectancy at birth will increase gradually for both males and females over the whole projection period to reach 75.3 years for males and 80.9 years for females in the year 2056. It is further assumed that the pattern of age-specific mortality rates will remain unchanged but with individual mortality rates decreasing at the same pace so as to result in the assumed LEB values.[7]

The assumed future LEB values for males and females are presented in the worksheet *workmort'* (see Missionreport 2, EXCEL file *'Mort'*). The mortality rates by age and sex as estimated based on the assumed LEB values are presented in the worksheets *'Mort M'* and *'Mort F' (same file).*

Sex ratio of newborns

The sex ratio of newborns is estimated at 1.020 newborn males per newborn female, this based on the data of newborn extracted from the MOI database for the fiscal year 2006. It is assumed that sex ratio at birth will remain constant at the same rate over the whole projection horizon.

Based on the assumptions summarized above, the population a projected with the ILO population projection model is expected to increase from a total 63.4 million as reported for the fiscal year 2006 to 66.7 million in the fiscal year 2025, and to decrease gradually thereafter to reach 56.9 million in the year 2056.

The demographic assumptions and results of the population projection were presented in the previous report of the consultant (see Missionreport 2, electronic folder '*population projection*'). It is noted that these figures should be considered as preliminary since the ongoing review of the population data by MOI has not been completed yet and a revision of the MOI population figures is expected as a result of the review.

International migration

Since no reliable data is available on emigration and immigration figures, international migration has been assumed nil in the population model.

5.2. Labour force and employment

5.2.1. Base year labour force data

Data on the labour force for the year 2006 was provided by the National Statistical Office (NSO). The data provided includes quarterly labour force figures (by age group and sex) as determined through the labour force surveys (LFS) carried out by the NSO on a quarterly basis. It was agreed earlier with the ILO project coordinator to use the nominal figures on the labour force as reported in the LFS. The NSO data is included in electronic format in the EXCEL file '*Labour force MOI*' (see worksheet '*NSO 2006*') attached to the previous report of the consultant (Missionreport 2).

5.2.2. Labour force participation rates

[7] This has been done by scaling down the whole mortality model curve in order to match the desired/assumed LEB value in a given year.

Since the labour force participation rates reported by the NSO are based on population figures taken from the NESDB population projection (which differ from the MOI population data used in the context of the HCF models to be developed), these have been recalculated, the results differing from the official NSO figures.

Age-specific labour force participation rates have been determined by dividing the 2006 labour force (allocated to single age cohorts) by the respective cohort population (as per MOI population data, see section 5.1), this for males and females.[8] Minor adjustments have been made to ensure that the labour force in each age/sex cohort does not exceed the respective population. The resulting labour force participation rates as estimated for the year 2006 are shown in figure A.3 (see Annex B). The figures were provided in electronic format with the previous report (see Missionreport 2, EXCEL file '*Labour force MOI*', worksheet '*LFPR 2006*').

5.2.3. Labour force projection

For the projection of the labour force, it is assume that age-specific labour force participation rates will be constant at the same rates as estimated for the year 2006, this over the whole projection period. The projected labour force is obtained by multiplying the projected population in each age/sex cohort by the assumed labour force participation rate for the respective cohort. The projected labour force resulting from the (preliminary) population projection and the assumed age-specific labour force participation rates were provided in electronic format with the previous report of the consultant (see Missionreport 2, EXCEL file '*Labour force MOI*', worksheets '*LabM*' and '*LabF*').

It can be observed that the projected labour force is expected to increase gradually from the total number of 35.5 million as estimated in the fiscal year 2006 to about 39.2 million in 2021 and to decrease thereafter due to the projected decrease in the population.

5.2.4. Employment

According to the NSO figures on employment, the unemployment rate in the fiscal year 2006 is estimated at 2.4% for males, 2.9% for females, and 2.6% in aggregate. For the projection of employment, it is assumed that the unemployment rate in aggregate will remain constant at the same rate (2.6%) over the whole projection period. The projected total number of employed is obtained by deducting from the projected labour force the projected number of unemployed.

The projected number of employed is needed in the model for projecting average wages and the coverage rate of the SSS. The projected number of employed is shown in the EXCEL file '*Labour force MOI*' attached to the previous report (see bottom line in worksheet '*Labf ToT').*

5.3. Economic model

A common economic module is needed to relate the models to the macroeconomic context within which the schemes operate. This is notably relevant for the projection of certain

[8] It is noted that due to the expected revision of the MOI population figures, changes may result for the estimated labour force participation rates, although these should be minor.

model parameters that do not evolve independently but rather in line with or in a correlated manner with key economic variables determined by the overall development of the economy.

In order to establish the economic frame of the models, historical data is also needed in order to analyze past trends with regard to the pace of economic expansion and the exact nature of the parametrical relationships referred to above. The data collected by the consultant include the following:

- Quarterly figures on the Gross Domestic Product (GDP) by economic sector both at constant prices and at current market prices for the period 1993 – 2006.
- Quarterly figures of GDP by composition of expenditure at constant and current market prices for the period 1993 – 2006.
- Annual figures on National Income by composition at constant and market prices for the period 1993 – 2005.
- Annual figures on average wages by economic sector, 2001 - 2006
- Monthly figures on the Consumer Price Index (CPI) by composition for the period Jan 1990 - Sep 2007.
- GDP, employment, and average wage in the Health Sector, 2001 – 2006

Historical data on the Thai economy, labour force, and employment was also retrieved from the database established in the context of the actuarial valuation of the SSO pension branch carried out by ILO during 2003 – 2004.

For the projection of cost factors, the proposed economic module includes a list of indices and endogenous parameters such as the following:

- The Consumer Price Index (CPI)
- The Producer Price Index (PPI)[9]
- The GDP deflator for total GDP and health sector GDP
- The annual rate of change in labour productivity
- The annual rate of change in average wages (health sector and in aggregate)

The method to be used for projecting unit cost is yet to be determined; it is therefore still unclear which one of the reference indices listed above will be used (explicitly or implicitly) for constructing a cost index considered appropriate. This issue was discussed in depth during the mission of the project coordinator during October/November 2007. A note summarizing a possible option that was considered is attached (see Annex A). The feasibility of the proposed option is yet unclear however. This will depend on the outcomes of the analysis of historical cost data to be carried out during the next stage of the modeling process (see also section 10.3).

Economic data as available at the time of writing has been compiled in the EXCEL file '*ECON*' attached to the previous report (see Missionreport 2).

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[9] For the PPI historical data could not be made available yet.

6. Demographic modeling for CSMBS, SSS, and UCS

6.1. Overall framework

In the context of the present exercise, it was proposed to model the total resident population in order to devise the population insured under each scheme. It was notably proposed to break up the total population into population groups as registered under the different national health care schemes including the UC scheme, the CSMBS, the SSS, and other known statutory schemes. The total registered population thus writes as follows:

$$Pop_t^{tot} = Pop_t^{UC} + Pop_t^{CSMBS} + Pop_t^{SSS} + Pop_t^{OS} + Pop_t^{other} \quad (1)$$

Where Pop_t^{OS} stands for the population that is not registered with CSMBS, SSS, and UC but with any other statutory health insurance schemes. This group includes notably the following:

- Private school teachers covered by the 'Health Insurance Scheme for private school teachers'.
- State-owned enterprise workers (e.g. Thai Airways), which are covered by various health insurance benefits provided through their respective enterprises.
- Local government officials (e.g. provincial and district officials) covered under the health care scheme for local government employees.
- Employees of independent state agencies (e.g. Bank of Thailand), which are covered by health insurance benefits provided through their respective agencies

Pop_t^{other} comprises the non-registered population, which comprises the following:

- the non-registered population entitled to UC benefits: ${}^{NR}Pop_t^{(UC)}$.[10]
- the remaining non-registered population, if any (e.g., foreign residents and/or Thai citizen who have lost their entitlement under one scheme but do not yet have acquired entitlement or registered under an other scheme): Pop_t^{ε} .[11]

The modeling of the total population was discussed in section (5.1). For the terms on the right side of equation (1), a discussion on modeling follows below.

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[10] According to Article 8 of the National Health Security Act, all Thai citizens with no health care coverage are entitled to medical care under the UC scheme even if they are not registered. In practice, medical care is provided only to unregistered persons who were never registered with a scheme.

[11] The size of this group is believed to be small since all Thai citizen can register with the UC scheme at most hospitals as soon as their coverage under other schemes is discontinued. This term should thus be considered as a residual error term.

6.2. The Social Security Scheme

6.2.1. Modeling approach

The coverage of SSS (i.e., persons entitled to SSS health care benefits) by age group, sex, and category is shown in table A.2. Since the SSS covers only employees in the private (formal) sector, it is proposed to model the coverage of SSS based on projected employment in the private sector, which is to be derived from the common macroeconomic and labour force model. In order to project the coverage rate, i.e., the total number of insured expressed as a percentage of total employed, it is relevant to analyze the trend observed in past years. It is thus proposed to project the future coverage rate by extrapolating the trend observed in the past (provided that a marked trend can be observed). The total population insured by SSS in year t thus writes as follows:

$$Pop_t^{SSS} = LF_t \cdot (1 - u_t) \cdot priv_t \cdot \mathrm{cov}_t \qquad (2)$$

Where:

	Pop_t^{SSS}	is the population insured under the SSS in year t
	LF_t	is the total labour force in year t
	u_t	is the unemployment rate in year t
	$priv_t$	is the ratio of private (formal) sector employed in total employed in year t
	cov_t	is the coverage rate in year t, i.e., the ratio of SSS insured (in aggregate) to the total number of private sector employees.

It is proposed to project the total number of insured based on equation (2) above, this for males and females separately. In order to obtain the future age structure of the insured population it is proposed to move forward in time the base year population, this by applying the cohort projection method applied for projecting the total population. For age-specific entry and dropout rates, it is proposed to use the same rates as observed in the base year (together with the age-specific mortality rates taken from the population model), this for the whole projection period.

6.2.2. Base year data

The coverage of SSS in the fiscal year 2006 is summarized in table A.2. The detailed data were provided with the first missionreport of the consultant (see EXCEL file '*SSO_basic_data.xls*')

Demographic modeling and projection of the SSS-insured population will be undertaken as soon as the final population data has not been provided, since this is necessary to project the labour force and employment based on which the future SSS coverage will depend (and be modeled according to the methodology outlined in the previous section).

6.3. *The Civil Servants' Medical Benefits Scheme*

6.3.1. Base year data (FY 2006)

CSMBS coverage in the fiscal year 2006 was estimated initially at 5.4 million persons, this based on the quota figures on civil servants and permanent state employees and the dependency ratios obtained from the sample data (August 2007) provided by the CSMBS.

Following an attempt to reconcile the estimated coverage figures of the SSS, the UCS, and the CSMBS with the overall population figures, it was concluded that the initial estimate for the CSMBS coverage was too high.[12]

It was acknowledged by the CSMBS project counterpart that the quota figure on civil servants and permanent employees results in an overestimation of active CSMBS members due to the following reasons:

- An undetermined share of the quota positions for civil servants and permanent stte employees remain permanently vacant due to budget constraints and employment turnover
- Civil servants and permanent employees who work part-time in the private sector (e.g. some doctors and teachers) and who are covered on a mandatory basis by SSO through their secondary employment are not eligible for CSMBS benefits.[13]

It was also pointed out by the CSMBS counterpart that the sample data on registrations relating to the OP direct payment system included duplicate entries since CSMBS beneficiaries can register with several providers. It was suggested to use the data on civil servants registered with the Comptroller General's Department (CGD), although this database is known to be incomplete. According to the CGD database the total number of CSMBS members (including pensioners and dependents) reported as at 1 April 2006 amounts to 4.21 million persons.

This figure compares to the estimate from the MOI database, which suggests that about 4.24 million people were covered under CSMBS at that date.[14]

6.3.2. *Modeling approach*

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[12] The attempted reconciliation resulted in negative numbers for the residual population relating to other schemes (local government, school teachers, etc. and non registered) for a significant number of age cohorts.

[13] According to Khun Kulsek, our CSMBS counterpart in this project, the relevant laws stipulate that CSMBS benefit are only provided to those who are not covered under any other statutory or private health insurance scheme.

[14] The MOI database includes information on social security coverage of registered persons. However, since a substantial number of persons are not allocated to a single scheme but to a group of schemes (e.g. member of the private teachers' scheme, the CSMBS, or the state-owned enterprise scheme), the data cannot be used as the main data source (e.g. for determining CSMBS coverage) but is useful nevertheless for comparison.

The projection of the CSMBS-covered population was also addressed in the previous report of the consultant. It was notably proposed to fix the total future number of active members (i.e. civil servants and permanent state employees) based on the government's staff plan for the civil service. According the CSMBS project counterpart, the Office of the Civil Service Commission plans to keep the number of civil servant and permanent state employees at constant levels in the near to medium term future. It is proposed to fix the total number of actives for the first five years of the projection period, i.e. for the period 2006 – 2011. For the period thereafter, it is proposed to increase/decrease the total number of actives in line with the [projected] total population.

As explained in the previous report of the consultant, it is proposed to move the existing population forward in time, this cohort by cohort, and to apply constant age-specific exit rates (as estimated from sample data) and to generate annually a total number of new entrants equal to the total number of exists in the same year in order to obtain the target total number of active members in each year. Is it further proposed to generate new entrants according to the age/sex distribution of new entrants in the base year. It is noted that the age structure of actives will thus not be assumed exogenously but result endogenously based on the simulated dynamics of ageing, exists and new entrants.

For dependents, it is proposed to assume constant dependency ratios (by age and sex) based on the age/sex-specific dependency ratios observed in the base year.

An update of data on entrants, exists, and dependency ratios in the base year has been requested in order to ensure consistency with the revised data on the active population.

For pensioners, it was proposed earlier to project the base year population stock and adjust annually for exits (e.g. deaths) and new entrants (i.e. new retirement and disability pensioners). As for the mortality rates to be assumed for civil servants, further data and analysis is needed to determine whether these deviate markedly from those observed for the overall population.

The revised data on CSMBS coverage as available at the time of writing is compiled in the electronic file '*CSMBS_demographic_FY06 REV*'.

6.4. The Universal Coverage Scheme

6.4.1. Base-year data (FY 2006)

Comprehensive data has been provided by the NHSO on UC coverage in the fiscal year 2006, this by age, sex, and main contractor hospital where they are registered (see table A.3.). The detailed data is compiled in the electronic file '*UC_demographic_FY06.xls' (see Missionreport 1).*

6.4.2. Modeling approach

Since the UC scheme covers all Thai citizens that are not covered by any other scheme, the coverage under the UC scheme is given by the residual obtained after subtraction from the total population of all Thai citizens insured under other statutory health insurance schemes. The population registered under UC can thus be written as follows:

$$Pop_t^{UC} = Pop_t^{tot} - Pop_t^{CSMBS} - Pop_t^{SSS} - Pop_t^{OS} - Pop_t^{other} \quad (3)$$

And equally for each cohort of age x and sex s:

$$pop_{x,s,t}^{UC} = pop_{x,s,t}^{tot} - pop_{x,s,t}^{CSMBS} - pop_{x,s,t}^{SSS} - pop_{x,s,t}^{OS} - pop_{x,s,t}^{other}$$

The projection of the first three terms on the right side of the above equations has been discussed in the previous sections. For the remaining terms, Pop^{OS} and Pop^{other}, no data could be made available. It is proposed to project these terms in aggregate as a constant share of the population. For the base year, an estimate for the sum $\mathrm{Pop}^{OS} + \mathrm{Pop}^{other}$ is given by deducting the population insured under UC, CSMBS, and SSS from the total population.

Hence:

$$Pop_t^{OS} + Pop_t^{other} = Pop_t^{tot} - Pop_t^{UC} - Pop_t^{CSMBS} - Pop_t^{SSS}$$

And for each cohort of age x and sex s:

$$pop_{x,s,t}^{OS} - pop_{x,s,t}^{other} = pop_{x,s,t}^{tot} - pop_{x,s,t}^{UC} - pop_{x,s,t}^{CSMBS} - pop_{x,s,t}^{SSS}$$

It is now proposed to determine for the base year (FY06) factors $\theta_{x,s}$ such that:

$$pop_{x,s,06}^{OS} + pop_{x,s,06}^{other} = \theta_{x,s} \cdot pop_{x,s,06}^{tot} \qquad \textit{, x = 1,\ldots,100, and s = male, female}$$

Or alternatively:

$$\theta_{x,s} = \frac{pop_{x,s,06}^{OS} + pop_{x,s,06}^{other}}{pop_{x,s,2006}^{tot}} \quad (4)$$

By assuming $\theta_{x,s}$ constant over the whole projection period (for all x and s), the projected UC population for the cohort of age x and sex s is given as follows:

$$pop_{x,s,t}^{UC} = (1-\theta_{x,s}) \cdot pop_{x,s,t}^{tot} - pop_{x,s,t}^{CSMBS} - pop_{x,s,t}^{SSS} \quad (5)$$

And consequently:

$$Pop_t^{UC} = \sum_{x,s} pop_{x,s,t}^{UC}$$

Since the base year population figures are still being revised by MOI, the estimation of $\theta_{x,s}$ will be undertaken when the final population data is made available.

7. Expenditure modeling

7.1. Conceptual issues

For expenditure modeling of the three schemes, a generic formula is proposed in the terms of reference as the general modeling approach to be adopted in the three models:

$$Exp_t = Pop_t \cdot g_t \cdot f_t \cdot c_t$$

Where: Exp_t is the total expenditure of the scheme for a specific benefit

Pop_t is the population covered (i.e. eligible to benefits) under the respective scheme

g_t is the probability that an eligible person of the scheme seeks treatment at least once during the years t (given by the ratio of all eligible scheme members seeking treatment at least once during the year t to the number of scheme members eligible in the year t).

f_t is the frequency of patient contacts in the year t for scheme members seeking treatment (at least once) during the year t.

c_t is the average cost per treatment incurring for the scheme.

Since the composition of expenditure and financing arrangements differ between the three schemes, the models have to be tailored to each scheme. It is notably relevant to take into account the nature of expenditure components, which include not only medical benefits but also other items such as, for the UC scheme, capital replacement cost and cost of compensation in case of medical malpractice. It is also considered relevant to take into consideration the provider payment method of each scheme since this affects the way expenditure is reported under each scheme.

It was unclear at the start of the assignment to what extent the models should reflect the cost accounting methods adopted by each scheme. These differ considerably between the three schemes due to the different budget allocation methods adopted. For the UC scheme in particular it was unclear whether the model should reflect the break-up of OP and IP benefit expenditure between general OP/IP care, high cost OP/IP care, and OP/IP disease management (new category used as of FY 2007), given the separate budget allocations by the NHSO for these items. Since these categories are not universally defined and seem to be changing regularly, it is proposed to project cost in aggregate for OP respectively IP care.

For the expenditure models presented below, it is proposed to disaggregate total expenditure into major components differing either by the nature of the services they represent (e.g., outpatient, inpatient, and preventive care) or by the difference in provider payment method adopted (e.g., capitation versus fee-for-service).

For the major expenditure components singled out in that manner, it is proposed to disaggregate, where possible and relevant, by age/sex cohort of beneficiary, by population group (e.g. registered versus non-registered), and by type of provider. Regarding the latter, it is still unclear how provider types should be distinguished for each scheme. The break-up by provider type is recommended only if it adds value to the model given that it increases model complexity by introducing an additional dimension.

However, despite the added complexity the disaggregation by provider types may be useful for the budget allocation mechanism used by each scheme. This aspect cannot be ignored in light of the fact that the models should be of practical use for the respective institutions. Since the budget allocation issue is beyond the scope of this assignment, the disaggregation by provider type is presented below as an option model feature.

For the modeling of inpatient care, it was unclear at first whether expenditure should be reflected based on DRG Adjusted Relative Weights (ARWs) per admission or alternatively based on unit cost per admission. It was argued by the consultant that ARWs may be very useful for budget allocation purposes, but that they do not reflect costs accurately but only approximately. Furthermore, the regular updating of the DRG system and the recent exclusion of some IP treatments from the DRG system (e.g., the treatments included under the new ‘disease management’ category) does not help since any time series of ARWs per admission (or age/sex cohort) becomes meaningless if not referring to the same set of treatments and weighting scale.

However, since ARWs reflect level of treatment or severity together with cost, it was argued that their use could nevertheless be beneficial for modeling, particularly for the modeling and analysis of level of care provided to different age cohorts (e.g., for a trend analysis over time, or for a comparison between different age cohorts). It is also believed that since the three schemes now use the DRG system for reporting IP care provided to their members, ARW values could be useful as an indicator to establish a comparison between the three schemes. Having the same frame of reference, ARWs do have the benefit that they enable a comparison and allow in a sense to circumvent the controversies surrounding the discussion on unit cost differentials between providers.

Despite the informational values of the DRG system, it was decided by the team not to reflect ARWs in the model design but to use unit cost instead.

The proposed expenditure models for the three schemes are presented below:

7.2. *Expenditure model proposed for the CSMBS*

Total benefit expenditure for the Civil Servants Medical Benefits’ Scheme consists of two main components, which are inpatient and outpatient care. Hence:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} \qquad (6)$$

7.2.1. Outpatient care

It is proposed to disaggregate expenditure for outpatient care by age, sex, and possibly provider type, if relevant. Hence:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_{x,s} Exp_{x,s,t}^{(OP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(OP)} \cdot c_{x,s,t}^{(OP)} \qquad (7a) \end{aligned}$$

Where: $Exp^{(OP)}_{x,s,t}$ is the aggregate expenditure for OP care relating to the age cohort of age x and sex s in year t

$pop_{x,s,t}$ is the number of CSMBS insured persons in the cohort of age x and sex s in year t

$u^{(OP)}_{x,s,t}$ is the average OP service utilization rate of the insured cohort of age x and sex s in year t for all providers

$c^{(OP)}_{x,s,t}$ is the average cost per OP contact for the insured cohort of age x and sex s in year t for all providers

Or alternatively:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_h {}_h Exp_t^{(OP)} \\ &= \sum_h \sum_{x,s} {}_h Exp^{(OP)}_{x,s,t} \\ &= \sum_h \sum_{x,s} pop_{x,s,t} \cdot {}_h u^{(OP)}_{x,s,t} \cdot {}_h c^{(OP)}_{x,s,t} \end{aligned} \tag{7b}$$

Where: ${}_h Exp_t^{(OP)}$ is the aggregated OP expenditure for all providers of type h, (h = 1,…, 8) in year t

${}_h Exp^{(OP)}_{x,s,t}$ is the OP expenditure relating to the age cohorts of age x and sex s aggregated over all providers of type h in year t

$pop_{x,s,t}$ is the number of persons of age x and sex s insured under CSMBS in year t

${}_h u^{(OP)}_{x,s,t}$ is the average OP service utilization rate of the insured population of age x and sex s in year t with all providers of type h, i.e., the average number of OP contacts per person per year with providers of type h in year t

${}_h c^{(OP)}_{x,s,t}$ is the average cost per contact for OP visits of the insured population of age x and sex s with all providers of type h in year t

7.2.2. Inpatient care

It is proposed to disaggregate inpatient expenditure by age, sex, and possibly by provider type if relevant.[15] Hence:

---

[15] The disaggregation by hospital types could be useful here in the future, depending on the provider payment mechanism to be adopted for IP care by CSMBS (A reform is currently under discussion).

$$
\begin{aligned}
Exp_t^{(IP)} &= \sum_{x,s} Exp_{x,s,t}^{(IP)} \\
&= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot c_{x,s,t}^{(IP)}
\end{aligned} \tag{8a}
$$

Where:

$Exp_{x,s,t}^{(IP)}$	is the aggregate expenditure for IP care relating to the age cohort of age x and sex s in year t
$pop_{x,s,t}$	is the number of CSMBS insured persons in the cohort of age x and sex s in year t
$u_{x,s,t}^{(IP)}$	is the average IP service utilization rate of the insured cohort of age x and sex s in year t for all providers
$c_{x,s,t}^{(IP)}$	is the average cost per admission for the insured cohort of age x and sex s in year t for all providers

Or alternatively:

$$
\begin{aligned}
Exp_t^{(IP)} &= \sum_h {}_h Exp_t^{(IP)} \\
&= \sum_h \sum_{x,s} {}_h Exp_{x,s,t}^{(IP)} \\
&= \sum_h \sum_{x,s} pop_{x,s,t} \cdot {}_h u_{x,s,t}^{(IP)} \cdot {}_h c_{x,s,t}^{(IP)}
\end{aligned} \tag{8b}
$$

Where:

${}_h Exp_t^{(IP)}$	is the aggregated IP expenditure for all providers of type h, (h = 1,…, 8) in year t
${}_h Exp_{x,s,t}^{(IP)}$	is the IP expenditure relating to the age cohorts of age x and sex s aggregated over all providers of type h in year t
$pop_{x,s,t}$	is the number of persons of age x and sex s insured under CSMBS in year t
${}_h u_{x,s,t}^{(IP)}$	is the average IP service utilization rate of the insured population of age x and sex s in year t with all providers of type h, i.e., the average number of admission per person per year with providers of type h in year t
${}_h c_{x,s,t}^{(IP)}$	is the average cost per admission for the insured population of age x and sex s with all providers of type h in year t

7.3. *Expenditure model proposed for SSS*

In the year 2006, the total health care benefit expenditure of the Social Security Scheme consisted of the following items:

- Capitation amount (including risk adjustments) for general OP and IP care
- Expenditure for high cost items (both OP and IP)
- Expenditure for Accident/Emergency care comprising both OP and IP care (including the cost for treatments provided to non-registered persons entitled to SSO medical benefits)
- Expenditure for dental care
- Expenditure for HIV drugs and diagnostics
- Expenditure for renal failure treatment including hemodialysis, chronic peritoneal dialysis and renal failure related drugs.
- Expenditure for bone marrow transplant
- Expenditure for kidney transplant
- Expenditure for cornea transplant

For modeling total expenditure it is proposed to group the above expenditure items into the following components:

a) Expenditure for general OP care (GOP)
b) Expenditure for general IP care (GIP)
c) Expenditure for Accident/Emergency care (AE)
d) Expenditure for high cost care (including other specific items such as bone marrow transplant, kidney transplant, and cornea transplant)
e) Expenditure for renal failure treatments (RF)
f) Expenditure for dental care (DC)
g) Expenditure for HIV drugs and diagnostics (HIV)
h) Expenditure for medical care provided to non-registered persons (NR)

Total benefit expenditure thus writes as follows:

$$Exp_t^{(TOT)} = Exp_t^{(GOP)} + Exp_t^{(GIP)} + Exp_t^{(AE)} + Exp_t^{(HC)} + Exp_t^{(DC)} + Exp_t^{(HIV)} + Exp_t^{(NR)} \qquad (9)$$

The disaggregation of the different terms is discussed below:

7.3.1. *General outpatient care*

It is proposed to disaggregate general outpatient expenditure by age, sex, and provider type, if relevant. Hence:

$$
\begin{aligned}
Exp_t^{(GOP)} &= \sum_{x,s} Exp_{x,s,t}^{(GOP)} \\
&= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(GOP)} \cdot c_{x,s,t}^{(GOP)} \qquad (10)
\end{aligned}
$$

Where: $Exp_t^{(GOP)}$ is the aggregated expenditure for general OP care in year t

$Exp_{x,s,t}^{(GOP)}$ is the GOP expenditure relating to all insured in the age cohort of age x and sex in year t

$pop_{x,s,t}$ is the number of insured persons of age x and sex s in year t

$u_{x,s,t}^{(GOP)}$ is the average GOP service utilization rate of the insured population of age x and sex s in year t, i.e., the average number of GOP visits per person in year t

$c_{x,s,t}^{(GOP)}$ is the average cost per GOP contact for the insured population of age x and sex s in year t

The further disaggregation by provider type could be considered if it adds value to the model *(needs further discussion)*. The break-up of expenditure by type of insured (mandatory/voluntary) could also be useful provided that the necessary data can be made available.[16]

7.3.2. General inpatient care (GIP)

It is proposed to disaggregate inpatient expenditure by age and sex as follows:

$$
\begin{aligned}
Exp_t^{(GIP)} &= \sum_{x,s} Exp_{x,s,t}^{(GIP)} \\
&= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(GIP)} \cdot c_{x,s,t}^{(GIP)} \qquad (11)
\end{aligned}
$$

Where: $Exp_t^{(GIP)}$ is the aggregated expenditure for GIP care in year t

$Exp_{x,s,t}^{(GIP)}$ is the aggregated GIP expenditure for the insured cohort of age x and sex s in year t

$pop_{x,s,t}$ is the number of insured persons of age x and sex s in year t

$u_{x,s,t}^{(GIP)}$ is the average GIP service utilization rate of the population of age x and sex s in year t, i.e., the average number of GIP admissions per person in year t

[16] Data by type of insured (mandatory/voluntary) has been made available but so far but not yet on their respective service utilization rates and related cost.

$c_{x,s,t}^{(GIP)}$	is the average cost per GIP admission for the insured population of age x and sex s in year t

The further disaggregation by provider type could be considered if it adds value to the model *(needs further discussion)*. The break-up of expenditure by type of insured (mandatory/voluntary) could also add value to the model, provided that the necessary data can be made available.[18]

7.3.3. *Expenditure for accident and emergency care (AE)*

For accident and emergency care, SSO members can seek treatment at any other hospital apart from their main provider, including those not contracted by SSO. It is therefore considered relevant to separate this item from the general OP and IP care. Since the types of providers providing AE care do not correspond to the normal types (of main contract hospitals) and the utilisation pattern for AE has a random element, it is proposed not to disaggregate expenditure for AE care by provider type. As accident and emergency care consists of both IP and OP care, it is proposed to disaggregate AE expenditure as follows:

$$\begin{aligned} Exp_t^{(AE)} &= Exp_t^{(AE/OP)} + Exp_t^{(AE/IP)} \\ &= \sum_{x,s} Exp_{x,s,t}^{(AE/OP)} + \sum_{x,s} Exp_{x,s,t}^{(AE/IP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(AE/OP)} \cdot c_{x,s,t}^{(AE/OP)} + \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(AE/IP)} \cdot c_{x,s,t}^{(AE/IP)} \end{aligned} \qquad (12)$$

Where:	$Exp_t^{(AE/OP)}$	is the aggregated expenditure for AE outpatient care for all providers in year t
	$Exp_{x,s,t}^{(AE/IP)}$	is the aggregated expenditure for AE inpatient care for all insured of age x and sex s in year t
	$pop_{x,s,t}$	is the number of insured of age x and sex s in year t
	$u_{x,s,t}^{(AE/OP)}$	is the average service utilisation rate for AE outpatient care for the insured population of age x and sex s in year t, i.e., the average number of AE/OP visits per person in the year t
	$c_{x,s,t}^{(AE/OP)}$	is the average cost per AE/OP visit for all insured of age x and sex s in year t

The further disaggregation between mandatory and voluntary insured may be of relevance if relevant data can be made available and a difference in utilisation rates can be established from historical data for these two distinct groups of insured.

7.3.4. Expenditure for high cost care and other special treatments (HC)

High cost care and other specific treatments are provided mainly at tertiary (e.g., teaching) hospitals.[17] Since this component comprises both OP care (e.g., chemotheraphy and hemodialysis) and IP care (e.g., open heart surgery, and transplants), it is proposed to disaggregate between these two treatment categories. The proposed disaggregation of expenditure is as follows:

$$\begin{aligned} Exp_t^{(HC)} &= Exp_t^{(HC/OP)} + Exp_t^{(HC/IP)} \\ &= \sum_{x,s} Exp_{x,s,t}^{(HC/OP)} + \sum_{x,s} Exp_{x,s,t}^{(HC/IP)} \\ &= \sum_{x,s} \left(pop_{x,s,t} \cdot {}^{(cap)}c_{x,s,t}^{(HC/OP)} + pop_{x,s,t} \cdot {}^{(cap)}\, c_{x,s,t}^{(HC/IP)} \right) \end{aligned} \tag{13}$$

Where: $Exp_t^{(HC/OP)}$ is the aggregate expenditure for HC outpatient care in year t

$Exp_{x,s,t}^{(HC/OP)}$ is the aggregate HC/OP expenditure for the cohort of age x and sex s in the year t

$pop_{x,s,t}$ is the total number of persons of age x and sex s insured in year t

${}^{(cap)}c_{x,s,t}^{(HC/OP)}$ is the average per capita cost for HC/OP care in year t for the insured cohort of age x and sex s

The further disaggregation of the population and utilization rate by type of insured (mandatory/voluntary) could be considered if the relevant data can be made available. This also applies for the disaggregation by provider types.

7.3.5. *Expenditure for renal failure treatment*

It is proposed to disaggregate expenditure for renal failure treatment as follows:

$$\begin{aligned} Exp_t^{(RF)} &= \sum_{x,s} Exp_{x,s,t}^{(RF)} \cdot \\ &= \sum_{x,s} pop_{x,s,t} \cdot {}^{(cap)}c_{x,s,t}^{(RF)} \end{aligned} \tag{14}$$

Where: $Exp_t^{(RF)}$ is the aggregated expenditure for renal failure treatment in year t

$pop_{x,s,t}$ is the number of insured of age x and sex s in year t

[17] In case the main provider of the insured person cannot provide the treatment needed the patient is referred to a higher-level provider.

${}^{cap}c^{(RF)}_{x,s,t}$	is the average annual per capita cost for renal failure treatment for the cohort of age x and sex s in year t

7.3.6. *Expenditure for dental care (DC)*

For dental care, SSO members can seek treatment at any other hospital apart from their main provider, including private dental clinics not contracted by SSO. It is therefore not considered relevant not to disaggregate here by hospital type. It is proposed to disaggregate annual expenditure for dental care as follows:

$$\begin{aligned} Exp_t^{(DC)} &= \sum_{x,s} Exp_{x,s,t}^{(DC)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot {}^{cap}c_t^{(DC)} \end{aligned} \qquad (15)$$

Where:

$Exp_t^{(DC)}$	is the aggregated expenditure for dental care in year t
$Exp_{x,s,t}^{(DC)}$	is the aggregated expenditure for dental care for all insured of age x and sex s in year t
$pop_{x,s,t}$	is the number of insured of age x and sex s in year t
${}^{cap}c_t^{(DC)}$	is the average per capita DC cost for the age cohort of age x and sex s in year t

7.3.7. *Expenditure for HIV drugs and diagnosis*

It is proposed to disaggregate this expenditure item as follows:

$$\begin{aligned} Exp_t^{(HIV/DD)} &= \sum_{x,s} Exp_{x,s,t}^{(HIV/DD)} \cdot \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(HIV/DD)} \cdot c_{x,s,t}^{(HIV/DD)} \end{aligned} \qquad (16)$$

Where:

$Exp_t^{(HIV/DD)}$	is the aggregated expenditure for HIV care (drugs and diagnosis only) in year t
$pop_{x,s,t}$	is the number of insured of age x and sex s in year t
$u_{x,s,t}^{(HIV/DD)}$	is the utilization rate for HIV/DD care for the insured population of age x and sex s in year t
$c_{x,s,t}^{(HIV/DD)}$	is the average treatment cost (for drugs and diagnostics) per HIV+ patient per year in year t

7.3.8. Expenditure for medical care provided to non-registered persons (NR)

Medical care for insured persons who are entitled to SSO medical care but have not registered with a provider yet is reimbursed on a fee-for-service basis at the same rate than accident and emergency care. The exact number of persons falling into this category is not known exactly; however the number can be estimated based on the difference between contributors and registered persons.[18] It is proposed to disaggregate this expenditure item as follows:

$$\begin{aligned} Exp_t^{(NR)} &= {}^{(NR)}Exp_t^{(OP)} + {}^{(NR)}Exp_t^{(IP)} \\ &= {}^{(NR)}pop_{x,s,t} \cdot u_{x,s,t}^{(OP/NR)} \cdot c_{x,s,t}^{(OP/NR)} + {}^{(NR)}pop_{x,s,t} \cdot u_{x,s,t}^{(IP/NR)} \cdot c_{x,s,t}^{(IP/NR)} \end{aligned} \tag{17}$$

Where:

${}^{(NR)}Exp_t^{(OP)}$	is the aggregated OP expenditure for non-registered persons in year t
${}^{(NR)}pop_{x,s,t}$	is the estimated number of insured in the cohort of age x and sex s who are unregistered in year t
$u_{x,s,t}^{(OP/NR)}$	is the OP utilization rate of the cohort of age x and sex s among the non-registered population in year t
$c_{x,s,t}^{(OP/NR)}$	is the average cost per OP visit for the age cohort of age x and sex s among the non-registered population in year t

7.4. Expenditure model proposed for the UC scheme

For the modeling of benefit expenditure of the UC scheme, it is proposed to disaggregate expenditure into the following components:

- Expenditure for outpatient care (OP)
- Expenditure for inpatient care (IP)
- Expenditure for disease prevention and health promotion services (PP)
- Expenditure for emergency medical services (EMS)
- Expenditure for disability health care services (DIS)
- Expenditure for capital replacement (CAP)
- Expenditure for the settlement of medical malpractice claims (MC)
- Expenditure for medical care provided to non-registered persons (NR)
- Expenditure for other items (OTH)

[18] There is a complication here due to the qualifying period (of 3 months) for new entrants. It is proposed to use an estimate for the share of non-registered contributors who qualify for benefits (e.g., 50%).

Total benefit expenditure in year *t* thus writes as follows:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} + Exp_t^{(PP)} + Exp_t^{(EMS)} + Exp_t^{(DIS)} + Exp_t^{(CAP)} + Exp_t^{(MC)} + Exp_t^{(NR)} + Exp_t^{(OTH)} \quad (18)$$

The further disaggregation of each one of the terms on the right side of equation (18) is discussed below.

7.4.1. Cost for outpatient care

It is proposed to disaggregate expenditure for outpatient care by age and sex of insured, and by type of provider. The disaggregation by provide type is relevant for the UC scheme since the capitation calculation method currently applied takes into account structural cost differentials between provider types.[19]

The annual cost for outpatient services in the year t thus writes as follows:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_h {}_h Exp_t^{(OP)} \\ &= \sum_h \sum_{x,s} {}_h Exp_{x,s,t}^{(OP)} \\ &= \sum_h \sum_{x,s} {}_h pop_{x,s,t} \cdot {}_h u_{x,s,t}^{(OP)} \cdot {}_h c_{x,s,t}^{(OP)} \end{aligned} \quad (19)$$

Where:

$_h Exp_t^{(OP)}$ is the aggregated OP expenditure for all providers of type h in year t

$_h Exp_{x,s,t}^{(OP)}$ is the expenditure for OP care for the cohort of age x and sex s in the registered population aggregated over all providers of type h in year t

$_h pop_{x,s,t}$ is the aggregate number of persons of age x and sex s registered with all providers of type h in year t

$_h u_{x,s,t}^{(OP)}$ is the average OP service utilization rate for the population of age x and sex s registered with all providers of type h in year t

$_h c_t^{(OP)}$ is the average cost per OP visit for the age cohorts of age x and sex s among the population registered with all providers of type h in year t

7.4.2. Cost for inpatient care

It is proposed to disaggregate the cost for inpatient care provided to UC registered persons by age and sex of patient and type of provider (see footnote 21). Annual expenditure for IP care thus writes as follows:

---

[19] A distinction is currently made between three types of providers (PCU, district hospital, and general hospital). It is yet unclear whether a further break-up of those categories would be useful in the future, and if so, how the new provider categories should be defined.

$$
\begin{aligned}
Exp_t^{(IP)} &= \sum_h {}_hExp_t^{(IP)} \\
&= \sum_h \sum_{x,s} {}_hExp_{x,s,t}^{(IP)} \\
&= \sum_h \sum_{x,s} {}_hpop_{x,s,t} \cdot {}_hu_{x,s,t}^{(IP)} \cdot {}_hc_{x,s,t}^{(IP)}
\end{aligned}
\qquad (20)
$$

Where: ${}_hExp_t^{(IP)}$ is the aggregated IP expenditure for all providers of type h in year t

${}_hExp_{x,s,t}^{(IP)}$ is the IP expenditure relating to the age cohorts of age x and sex s of the registered population as aggregated over all providers of type h in year t

${}_hpop_{x,s,t}$ is the aggregate number of persons of age x and sex s registered with all providers of type h in year t

${}_hu_{x,s,t}^{(IP)}$ is the average IP service utilization rate of the registered/non-registered population of age x and sex s in year t for all providers of type h

${}_hc_{x,s,t}^{(IP)}$ is the average cost per admission for the age cohorts of age x and sex s among the population registered with providers of type h in year t

7.4.3. Expenditure for preventive care and health promotion (PP)

This item comprises all expenditures related the disease prevention and health promotion (PP) activities funded under the UC programme. It is noteworthy that these are not limited to the UC-contracted providers and the UC-registered population but they target the whole resident population. Given that some of the PP activities target special age groups of the population (e.g., vaccination programmes) and/or are gender-specific programmes (e.g., breast cancer screening), it is proposed to disaggregate cost by age and sex. The disaggregation by provider type is not relevant since the average cost for a specific PP activity can be assumed equal for all providers.

Annual expenditure for preventive care in year t thus writes as follows:

$$
\begin{aligned}
Exp_t^{(PP)} &= \sum_{x,s} Exp_{x,s,t}^{(PP)} \\
&= \sum_{x,s} {}^{tot}pop_{x,s,t} \cdot k_t \cdot c_{x,s,t}^{(PP)}
\end{aligned}
\qquad (21)
$$

Where: $Exp_t^{(PP)}$ is the aggregate expenditure for disease prevention and health promotion activities funded under UC in year t

${}_{h}Exp_{x,s,t}^{(PP)}$	is the aggregate expenditure for disease prevention and health promotion activities for PP activities provided to the population cohort of age x and sex s in year t
${}^{tot}pop_{x,s,t}$	is the number of persons in the population cohort of age x and sex in year t
$c_{x,s,t}^{(PP)}$	is the average annual cost of PP care for the population cohort of age x and sex s in year t
k_t	is the outreach factor for PP care in year t, i.e., the percentage of the targeted population who benefit from PP activities.

7.4.4. Cost for emergency medical services (EMS)

The expenditure for emergency medical services consists of expenditure for emergency medical transportation (ambulance service) and related communication cost. Emergency medical transportation is coordinated and sometimes operated under provincial administrations. A distinction is made by NHSO between three different levels of service, reimbursed according to a given fee schedule. Since no data is available on service utilization by age and sex, it is proposed to disaggregate expenditure by type of service and to use the respective utilization rates in aggregate. The cost for emergency medical transportation thus writes as follows:

$$\begin{aligned} Exp_t^{(EMS)} &= Exp_t^{(EMS/T1)} + Exp_t^{(EMS/T2)} + Exp_t^{(EMS/T3)} \\ &= pop_t \cdot u_t^{(EMS/T1)} \cdot c_t^{(EMS/T1)} + pop_t \cdot u_t^{(EMS/T2)} \cdot c_t^{(EMS/T2)} + pop_t \cdot u_t^{(EMS/T3)} \cdot c_t^{(EMS/T3)} \\ &= pop_t \cdot \left[u_t^{(EMS/T1)} \cdot c_t^{(EMS/T1)} + u_t^{(EMS/T2)} \cdot c_t^{(EMS/T2)} + u_t^{(EMS/T3)} \cdot c_t^{(EMS/T3)}\right] \end{aligned} \tag{22}$$

Where:	$Exp_t^{(EMS/T1)}$	is the aggregated expenditure for emergency medical transportation services of type 1 in year t
	pop_t	is the aggregate number of UC-registered persons in year t
	$u_t^{(EMS/T1)}$	is the average utilization rate of emergency medical transportation services of type 1 in year t
	$c_t^{(EMS/T1)}$	is the average cost per case of emergency medical transportation services of type 1 in year t

7.4.5. Cost for disability health benefits (DIS)

The cost for disability health benefits refers here to the cost for medical appliances (prosthesis) provided to insured persons by UC-contracted providers. It does not include the cost for medical services (OP/IP) provided to disabled, these are included under the OP and IP cost items. Disability benefits (for prosthesis) are currently disbursed according to fee schedule. Since no data is available on number of beneficiaries nor on average benefit amount, it is proposed to project for this item the aggregate expenditure figure.

7.4.6. Capital replacement and investment cost (CAP)

The cost for capital replacement relates to the cost incurred by contract hospitals for capital investment (upgrading) and replacement (e.g. hospital facilities, medical instruments equipment, etc.). It is proposed to disaggregate expenditure by type of providers in order to take into account any differentials in capital expenditure across different provider types.

Total expenditure for capital replacement and investment cost in the year t thus writes as follows:

$$Exp_t^{(CAP)} = \sum_h {}_h Exp_t^{(CAP)} \qquad (23)$$

Where: ${}_h Exp_t^{(CAP)}$ is the aggregated expenditure for capital investment and replacement for all providers of type h in year t

7.4.7. Cost for the settlement of medical malpractice claims (MM)

This cost item relates to the compensation monies paid by NHSO to settle patient claims regarding medical malpractice. It is proposed to disaggregate this expenditure item into volume (i.e., number of cases) times average amount.

Annual expenditure in the year t thus writes as follows:

$$Exp_t^{(MM)} = n_t^{(MM)} \cdot c_t^{(MM)} \qquad (24)$$

Where: $n_t^{(MM)}$ is the number of insured persons compensated for medical malpractice in year t

$c_t^{(MM)}$ is the average amount of compensation paid for medical malpractice in year t

7.4.8. Expenditure for medical care provided to non-registered persons (NR)

This cost item relates to the medical care provided to non-registered persons entitled to UC care. The number of persons contained in this group is unknown and difficult to estimate. Since the benefits provided include both OP and IP care, it is proposed to disaggregate expenditure by type of care. Annual expenditure thus writes as follows:

$$\begin{aligned} Exp_t^{(NR)} &= Exp_t^{(NR/OP)} + Exp_t^{(NR/IP)} \qquad (25) \\ &= n_t^{(NR/OP)} \cdot c_t^{(NR/OP)} + n_t^{(NR/IP)} \cdot c_t^{(NR/IP)} \end{aligned}$$

Where: $n_t^{(NR/OP)}$ is the number of OP visits of non-registered persons (with UC entitlement) in year t

$c_t^{(NR/OP)}$ is the average expenditure per OP visit for non-registered persons (with UC entitlement) in year t

7.4.9. Expenditure for other items (OTH)

This cost item relates to miscellaneous items for which a budget is (or will be) allocated through the NHSO. For the fiscal year 2006, this item consisted of subsidies paid to providers operating in harsh areas.

It is proposed to project expenditure for these miscellaneous items on an aggregate basis unless they have a demographic component. Annual expenditure thus writes as follows:

$$Exp_t^{(OTH)} = Exp_t^{(OTH_1)} + ...$$

Where: $Exp_t^{(OTH)}$ is the total expenditure for miscellaneous items in year t

$Exp_t^{(OTH_1)}$ is the total expenditure for miscellaneous item of type 1 as paid in year t

7.4.10. Data specifications

The data requirements for the base year expenditure result from the proposed model structure specified above. For the detailed tables, see the electronic file '*Data_framework_UC.xls' (see Missionreport 1, electronic attachments).*

7.5. Modeling approach proposed for IHPP

The objective of the model to be developed for IHPP is to project aggregate health expenditure for Thailand based on the historical data compiled in the National Health Accounts. It is proposed here to start from the break-up by funding agency as shown in table 1 of the NHA (see Missionreport 2, EXCEL file '*NHA 02 – 05*'), building thereby on the models to be developed for UC, SSS, and CSMBS. The NHA is based on the differentiation between the following financing agencies:

<u>Public financing agencies:</u>

- The Universal Coverage Scheme (UC)
- The Civil Servants Medical Benefits' Scheme (CSMBS)
- The Social Security Scheme (SSS)
- The Ministry of Public Health (MoPH)
- Other Ministries (OM)
- Local governments (LGov)

- State-owned enterprises (SOE)
- The Workmens' Compensation Fund (WCF)

Private financing agencies/sources:

- Private insurance (Ins)
- Traffic Insurance (Tins)
- Employer benefit (EB)
- Household (H)
- Non-profit (NP)
- Rest-of-the-World (RW)

Aggregate national health expenditure thus writes as follows:

$$Exp_t^{(tot)} = Exp_t^{(public)} + Exp_t^{(private)} \quad \text{, where}$$

$$Exp_t^{(public)} = Exp_t^{(UC)} + Exp_t^{(CSMBS)} + Exp_t^{(SSS)} + Exp_t^{(MOPH)} + Exp_t^{(OM)} + Exp_t^{(LGov)} + Exp_t^{(SOE)} + Exp_t^{(WCF)}$$

$$Exp_t^{(private)} = Exp_t^{(Ins)} + Exp_t^{(Tins)} + Exp_t^{(EB)} + Exp_t^{(H)} + Exp_t^{(NP)} + Exp_t^{(RW)} \qquad (27)$$

For modeling the different components, it is relevant to assess their respective composition and to single out the cost drivers they are subject to. For some of the expenditure components, it is considered relevant to disaggregate expenditure by volume and 'unit amount', referring to the expenditure per unit of volume (e.g., per insured person, unit of service, registered vehicle, etc).

For projecting expenditure for UC, CSMBS, and SSS, it is natural to make use of the models to be developed for these institutions. However, it is necessary to project and add their administration cost, since these are excluded from the respective models. The suggested modeling approach for the other expenditure components is outlined below:

- $Exp_t^{(MOPH)}$: Break-up into staff cost, capital cost, and other cost, and projection of each category? *(to be discussed)*
- $Exp_t^{(OM)}$: Same as for MoPH? *(to be discussed)*
- $Exp_t^{(LGov)}$: disaggregation into number of insured (i.e., number of local government staff) and annual per capita cost per insured
- $Exp_t^{(SOE)}$: Disaggregation into number of insured (i.e., number of SOE workers) and annual per capita cost per insured
- $Exp_t^{(WCF)}$: Disaggregation into number of insured and annual per capita cost per insured
- $Exp_t^{(Ins)}$: Disaggregation into number of private health insurance contracts and average annual premium

- $Exp_t^{(Tins)}$: Disaggregation into number of registered vehicles and annual per capita cost per insured
- $Exp_t^{(EB)}$: Disaggregation into number of employees (total or those excluded from SSO/WCF coverage? – *to be discussed)* and average expenditure per employee.
- $Exp_t^{(H)}$: Disaggregation into population and annual household expenditure per capita for health. Since the latter is a component of disposable income, it may be relevant to link the annual increase per capita to the projected increase I disposable income per capita. A break-up by cost category (e.g., drugs, medical supplies (durables), curative services, home care, etc.) may shed light on the nature and trend of household expenditure on health.
- $Exp_t^{(NP)}$: Projection in aggregate by extrapolation (trend analysis)?
- $Exp_t^{(RW)}$: Projection in aggregate by extrapolation (trend analysis)?

It is noted that the expenditure components singled out in equation (27) do not evolve independently over time but are interdependent. Since the allocation of liabilities for the financing of national health care is a matter of policy, expenditure can shift over time with changes in policy and the development of or creation of new institutions. For Thailand in particular, the national health care financing policy has undergone substantial changes in recent years, such the establishment of the SSS, the UC scheme, and the traffic accidents' insurance fund. It is thus necessary to take into account these policy developments and those expected in the future and to factor in their implications on the shift of financing liabilities.

In order to avoid the modeling complications stemming from policy changes in the approach outlined above, an alternative approach would be to model expenditure in aggregate for each type or function of care provided (i.e., OP care, IP care, preventive care, home care, etc). This approach would put health care needs in the forefront, by assuming an aggregate (national) demand for health care services of the different types (a part of which is probably unmet). Aggregate demand for health could be modeled as a function of the age structure of the population and other determining factors such as economic development (i.e., GDP per capita) for instance.

In light of the above, further discussions are needed with all stakeholders regarding the appropriate modeling approach to be adopted. Further analysis of historical data (time series) is also planned in order to identify past trends in cost evolution and parametrical relationships to be used in the design of the model.

8. Calibration of CSMBS base year expenditure

The Department of the Comptroller General (CGD) routinely compiles monthly figures on total expenditure for outpatient and inpatient care provided under CSMBS. Financial data made is limited to aggregate figures since no detailed information is compiled by the CGD on expenditure by category of beneficiary (active, pensioner, or dependent) or their age and sex.

For inpatient care, individual data is being stored in a database maintained by the Center for Health Care Information (CHI), recording information on all inpatient cases and related provider payments, this from the year 2002. Since CSMBS introduced the DRG system on 1 July 2007, related data and clinical information has been stored since by CHI. The CHI database allows to generate detailed information on CSMBS utilization of IP care and related expenditure by category, age, and sex of beneficiary, and also on number of DRG relative weights per admission.

For outpatient care, individualized data has been recorded as of October 2006, when the direct payment system was phased in. The direct payment system, which is meant to replace gradually the old payment system, enables CSMBS to reimburse providers directly for outpatient visits by scheme members, instead of reimbursing beneficiaries, who under the old payment system have to pay providers first when they seek treatment and claim back the money later from CSMBS. The CHI database related to the direct payment system allows to generate detailed statistics on utilization and benefit expenditure by category, age, and sex of beneficiary. However, since the direct payment system is operating in parallel to the old reimbursement system, detailed data on OP care is available only for beneficiaries who chose to make use of the direct payment system. In August 2007, an estimated 80% of all CSMBS outpatient visits were processed through the direct payment system. For the remaining 20% of outpatient visits no electronic figures are available since these have been processed through the paper-based reimbursement system. The data situation is expected improve in the near future since the old reimbursement system is due to be phased out.

In order to calibrate the expenditure model proposed above for CSMBS (see section 7.2) for the base year (FY 2006), it is necessary to allocate total expenditure for OP and IP care to the different age/sex cohorts of beneficiaries and to different types of providers. Since no individual data is available for OP care provided before October 2006, it is proposed to make use of the sample data from August 2007, which contains figures on hospital utilization (i.e. OP visits), and expenditure (provider charges reimbursed by CSMBS) by age, sex, type of beneficiary, and type of provider, this for the subgroup of beneficiaries who used the direct payment system in that month (about 80% the total).

It is proposed to calculate from the sample data (August 2007) and the projected CSMBS population the following:

- Utilization pattern (number of contacts per capita per year) by age, sex, and type of provider for the month of August 2007
- Unit cost pattern (amount reimbursed per contact) by age, sex, and type of provider for August 2007

For the base year (FY 2006), it is proposed to assume for OP care the same utilization pattern and cost structure (pattern of cost curve by age) as estimated for August 2007. In order to calibrate the model, it is proposed to scale down unit costs (from August 2007) such that the base year data adds up, i.e., total OP expenditure in 2006 (actual) is obtained by multiplying the respective matrices for the year 2006 (population, utilization rates, and unit cost) based on the model outlined in section 7.2.

For IP care there are no complications with model calibration. Data on admissions and provider charges by category, age, and sex of beneficiary have been provided from the CHI database. Utilization rates for IP have been calculated based on the number of beneficiaries estimated for 2006. Unit cost have been modeled and adjusted such that actual expenditure is obtained by multiplying the respective matrices.

The preliminary results of the model calibration exercise were presented earlier (see Missionreport 1, EXCEL file '*CSMBS_basic_model_calib.xls')*. These are currently being updated to take into account the revised data on CSMBS beneficiaries provided in November.

9. Data dictionary – draft table of contents

The purpose of the data dictionary to be prepared in conjunction with the different health care financing models is to provide a detailed specification and concise definition of the data needed in the future for model maintenance. The data dictionary should thus comprise a comprehensive list of data items needed for updating the different model components so as to incorporate the latest developments of demographic, economic, and scheme-specific variables. Regular model maintenance is relevant in order to ensure that the model accurately reflects reality, i.e., the scheme situation (coverage, benefit provisions, financing arrangements, utilization rates, etc.) and the macro economic situation; this (to the extent possible) at each point in time when the model is used for generating financial projections.

The data dictionary should thus help to facilitate the model updating process by providing a concise definition and specification of data, this together with a clear set of instructions pertaining to model maintenance (which ought to be included in the model manuals to be drafted under the next phase of the modeler's assignment).

It is proposed to include in the data dictionary, for each data item, a concise definition, the data format and dimension, the type of variable, the source material (e.g., reference document and agency), reference date, recommended periodicity of undertaking data updates, and the suggested dates for future data updates.

It is proposed that the data dictionary be structured as follows:

a.) Model framework

This section should include all data needed for updating the macro frame of the models such as data related to the Thai economy, population, employment, etc. This part is meant to include all data that is not scheme-specific, for instance the national population figures and related variables such as age-specific mortality and fertility rates (if relevant for the respective scheme model), the national economic parameters such as GDP, employment, price and wage inflation rates, etc.

For the variables mentioned above, it is considered important that a clear and precise definition, source, and updating schedule be agreed upon by all stakeholders in order to ensure consistency between the four models over time. Since the demographic and economic frame is a shared component of the four models, a common understanding and congruent usage by the four institutions is vital.

b.) Scheme-specific data

This second part should comprise the definitions and specifications of data items that relate to the specificities and recent experience of each scheme. This part should notably include the following data elements:

- Scheme coverage and related demographic variables (e.g., dependency ratios),
- Variables reflecting the prevailing benefit package and provider payment mechanism of the scheme
- Data on benefit utilization rates for the covered population,
- Data on scheme expenditure, unit cost structure and levels
- Other scheme-specific variables as relevant for each scheme

It is noted that in principle only model input variables, i.e., exogenous model variables need to be specified in the data dictionary since all variables appearing endogenously in the respective models shall not be modified by the future model operators. However, in order to enhance understanding of the underlying theory and model mechanics, it may be useful to include in the data dictionary a separate description of endogenous model variables *(to be discussed).* It is suggested to specify clearly the nature of each data item or variable in relation to the design of the model (e.g., data input, assumption, endogenous variable, etc).

The proposed draft table of contents, formulated in a generic way is provided in Annex C. It is obvious that a separate data dictionary needs to be developed for each scheme respectively model so as to reflect model specificities (e.g. base year data input format and assumptions) and design. For the common model frame (part 1), the data dictionary will be the same or similar (see TOC, section 1).

With regard to the structure of the data dictionary, a tabular format has been suggested earlier. It is proposed to include in the table the following fields or headings:

➢ *Data/variable name*	this should be the name of the variable as referred to in the manual to be developed.
➢ *Symbol*	The symbol or letter representing the respective variable in the formulas given in the model description
➢ *Data/variable description*	A short definition or description of the variable
➢ *Variable type*	Specification of variable type, i.e., input data, assumption, or endogenous variable
➢ *Data format*	This should specify the statistical representation of the variable, i.e., the dimension, unit of measurement (years, contacts per person per year, million Baht, etc.) and number format (e.g., number of decimals)
➢ *Source document*	stating reference document or publication and the publishing agency (e.g., Labour Force Survey, National Statistical Office)
➢ *Source item*	specifying the designation and location of the respective variable in the reference document

➢ *Last publication date*	specifying the most recent date of publication of the source document
➢ *Periodicity of publication*	specifying the normal periodicity of publication of the reference document
➢ *Next update recommended*	specifying the time when the next variable update is recommended

For illustration, the suggested format for the proposed data dictionary is provided in Annex E.

10. Miscellaneous issues

10.1. The cost of medical benefits to providers

In order to assess the adequacy of the financial compensations offered to providers by the three schemes for the respective packages of medical services purchased, it is relevant to assess the production cost providers incur. However, since no recent and comprehensive hospital costing study is available, the real cost of services is unknown for the different types of providers.[20] It is suspected that cost differentials across providers are significant due to differences in capital cost, level of care provided, technology intensity, provider efficiency, economies of scale, etc.

The unit cost data made available so far relates to provider charges as applied by providers. It is unclear however to what extent these correspond to actual cost. For public providers, fees charged by providers are bound by the fee schedules currently in force, notably circulars 77, and 177. For private providers these do not apply and hence charges reported seem to have an element of arbitrariness.

In light of the above, it was agreed to focus for the time being on current scheme expenditure for the development of the models since the monies disbursed represent the cost of services to the schemes.[21] Hospital charges reported by providers have been used merely for distributing expenditure across the different age/sex cohorts; however their nominal values are believed to be of limited use. The issue of adequacy of provider compensation by the different schemes is beyond the scope of the current assignment and should be dealt with separately and/or at a later stage.

In order to get a glimpse of providers' cost structures, it was suggested in the TORs to analyze financial reports submitted to NHSO by all public providers (the so-called Report nr. 5). It was hoped that this would cast light on the composition of production inputs and on

[20] IHPP is undertaking regular costing studies but only with a few selected providers. However, it is planned by IHPP to scale up this costing effort and cover 30% of providers in the future.

[21] It has been observed that expenditure per unit of service varies considerable among the three schemes; this fact suggests a high level of cross-subsidization between the three schemes.

the structure of providers' cost, although in aggregate only.[22] It is also noted that private providers do not report the same data (report no. 5), which leaves a gap in the analysis.[23] Report no. 5 data for the past years has been made available in the meantime by NHSO and a preliminary analysis was undertaken to determine the nature and share of providers' input cost. A thorough analysis is planned in connection with the development of a composite cost inflation index to be used in the models for inflating unit costs.

10.2. Distribution of unit cost

It was discussed whether the use of the simple [arithmetic] average of unit cost is appropriate for the proposed model since it is based on the assumption that unit cost follow a normal distribution.[24] It was suggested that a lognormal distribution may be a more appropriate model than the normal distribution. No conclusion has yet been reached in this matter and further data analysis is planned.

10.3. Projection of unit cost

The methodology for projecting of unit cost was discussed extensively during the visit of the project coordinator in October/November. It was agreed that the unit cost inflation index, which is yet to be specified, should take into account to the extent possible the composition of unit cost, i.e., its constituent elements (e.g. unit cost of labour, pharmaceuticals, medical supplies, etc.). It was considered initially to use producer prices (i.e., providers' production input factor prices) instead of consumer prices since the latter do not adequately reflect providers' production cost (they include profit margins for instance, particularly for private providers). It is still unclear however, to what extent producer price indices can be made available to project the different cost factors. Further analysis is warranted on this matter in the coming months. The suggested approach is summarized in Annex A for discussion.

In connection with the above, it was also explored whether providers' accounting data could be used to determine the structure and past development of input factor cost. However, it was found that providers' financial reports as submitted to NHSO on a monthly basis (report nr. 5) do not contain information on production cost of different types of services (OP/IP) but only in aggregate. Furthermore they do not contain information on input volumes and unit price but only total expenditure for different factor inputs (e.g., cost of drugs, staff cost, medical supplies, etc.). In order to estimate input volumes, it was suggested to determine proxy data, which could give indications on input volumes (e.g. number of hospital beds) but this possibility needs to be explored further.

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[22] It is noted that providers do not allocate cost to cost centers, hence the financial reports are of limited use; they do not allow for instance to establish a complete picture of service cost by type of service (OP, IP, PP, etc.).

[23] Private providers report to the Ministry of Commerce. Information on the format and scope of their reporting requirements has not been provided yet.

[24] The simple average is an unbiased estimator of the mean of a normal distribution but not necessarily for other distributions.

In light of the above, further data analysis is warranted in order to assess what information can be extracted from the providers' accounting data at hand and to explore alternative options with regard to the construction of an index appropriate for inflating unit cost.

11. Next steps

- Completion and reconciliation of population database based on the revised population data (to be provided);
- Completion of base year data base and model recalibration based on revised data (from MOI and CSMBS);
- Revision of projections for the population, labour force, and employment
- Further development of macroeconomic framework and projections
- Analysis of NHA data and development of IHPP model structure
- Time series analysis of cost inflation rates based on hospital accounting data and identification of cost drivers, and development of a composite cost inflation index
- Further development of spreadsheet design and user interfaces for all models
- Preliminary projections for status quo conditions

ANNEX A

Concept note on unit cost projection

(Proposal for discussion)

a) Basic model structure

It is proposed to model health care benefit expenditure of the three schemes according to the following generic formula:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} + Exp_t^{(other)} \qquad (1)$$

Equation (1) refers to all cost incurring to providers for providing medical treatment to scheme members, this excluding capital costs Is this positively so? , which are supposed to be financed separately (e.g. from the government budget or from a separate budget allocation by the respective scheme, if applicable)

Disaggregation of OP and IP components by age and sex, and break up of cohort-specific expenditure in utilization rate times unit cost:

- $$\begin{aligned} Exp_t^{(OP)} &= \sum_{x,s} Exp_{x,s,t}^{(OP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(OP)} \cdot c_{x,s,t}^{(OP)} \qquad (2) \end{aligned}$$
- $$\begin{aligned} Exp_t^{(IP)} &= \sum_{x,s} Exp_{x,s,t}^{(IP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot c_{x,s,t}^{(IP)} \qquad (3) \end{aligned}$$

b) Base year modelling (t = 0):

Model Calibration → Determine for OP, IP and other components, the matrices PoP, U and C, such that equations (1) – (3) hold, this based on the actual scheme expenditure incurred in year t = 0 and the available data on service utilization, and cost structure.[25]

c) Expenditure projection (t > 0):

Projection of OP and IP expenditure based on model structure displayed in equations (2) and (3) according to the following methodology:

- Entitled population by age/sex cohort: to be projected for each scheme based on the respective demographic model framework.

[25] In the absence of reliable information on unit cost per contact/admission, it is proposed to use charges per contact/admission as reported by hospitals (average) to determine age-specific unit cost.

- Service utilization rate by age/sex cohort: formulate assumption e.g., constant rates over the short to medium term (1 – 5 years).
- Unit cost: inflate base year unit cost per contact/admission (for OP and IP) by the estimated cost inflation rate to be determined as described in point d).

For the projection of other (scheme expenditure?) costs (non OP/IP), it is proposed to determine, separately for each expenditure ? cost item, an appropriate methodology by taking into account the nature of expenditure ? costs (e.g., age-dependency?) and the availability of data.

d) Estimation of cost inflation rate for OP/IP unit cost

It is proposed to consider the disaggregation of unit cost in principal components or cost factors in order to single out as much as possible the main cost drivers:

$$c_t = c_t^{(lab)} + c_t^{(drg)} + c_t^{(meq)} + c_t^{(ut)} + c_t^{(other)} \qquad (4)$$

Where: c_t is the average unit cost per medical treatment as incurred by providers in year t

$c_t^{(lab)}$ is the labour component in unit cost (i.e., excluding capital) for the year t

$c_t^{(drg)}$ is the drug component in unit cost in year t

$c_t^{(meq)}$ is the component reflecting the cost of medical supplies and equipment (excluding fixed assets) in year t

$c_t^{(ut)}$ is the cost component relating to utilities (electricity and water) in year t

$c_t^{(other)}$ is the component relating to costs that are not included in the above categories (e.g., hospital accommodation and other expenses) in year t

Hence we can write:

$$\frac{dc_t}{c_t} = \frac{dc_t^{(lab)}}{c_t} + \frac{dc_t^{(drg)}}{c_t} + \frac{dc_t^{(meq)}}{c_t} + \frac{dc_t^{(ut)}}{c_t} + \frac{dc_t^{(oth)}}{c_t} \qquad (5)$$

$$= \frac{c_t^{(lab)}}{c_t} \cdot \frac{dc_t^{(lab)}}{c_t^{(lab)}} + \frac{c_t^{(drg)}}{c_t} \cdot \frac{dc_t^{(drg)}}{c_t^{(drg)}} + \frac{c_t^{(meq)}}{c_t} \cdot \frac{dc_t^{(meq)}}{c_t^{(meq)}} + \frac{c_t^{(ut)}}{c_t} \cdot \frac{dc_t^{(ut)}}{c_t^{(ut)}} + \frac{c_t^{(oth)}}{c_t} \cdot \frac{dc_t^{(oth)}}{c_t^{(oth)}}$$

$$= \frac{c_t^{(lab)}}{c_t} \cdot d\ln(c_t^{(lab)}) + \frac{c_t^{(drg)}}{c_t} \cdot d\ln(c_t^{(drg)}) + \frac{c_t^{(meq)}}{c_t} \cdot d\ln(c_t^{(meq)}) + \frac{c_t^{(ut)}}{c_t} \cdot d\ln(c_t^{(ut)}) + \frac{c_t^{(oth)}}{c_t} \cdot d\ln\left(c_t^{(oth)}\right)$$

For the projection of unit cost, the following assumptions are proposed:

A.1. Factor input ratios are constant over time, i.e.,:

$$\frac{c_0^{(lab)}}{c_0} = \frac{c_1^{(lab)}}{c_1} =: \alpha^{(lab)}; \quad \frac{c_0^{(drg)}}{c_0} = \frac{c_1^{(drg)}}{c_1} =: \alpha^{(drg)}; \quad etc$$

A.2. Factor input quantities (per unit amount of service) are increasing/decreasing at a constant rate over time:

$$c_t^{(lab)} = q_t^{(lab)} \cdot u_t^{(lab)} = q_0^{(lab)} \left(1 + t \cdot \beta^{(lab)}\right) \cdot u_t^{(lab)} \quad ; \qquad c_t^{(drg)} = \ldots$$

Where: $c_t^{(lab)}$ is the labour component in unit cost (i.e., excluding capital) in the year t

$q_t^{(lab)}$ is the average quantity of labour (e.g. hrs) needed to produce one unit of service (OP/IP) at time t

$u_t^{(lab)}$ is the cost per unit of labour in year t (e.g. gross wage per hour or month of work)

$\beta^{(lab)}$ is the rate of change of labour units (quantity) needed to produce one unit of service in year t

It follows that:

$$d\ln(c_t^{(lab)})/dt = \beta^{(lab)} \cdot d\ln(u_t^{(lab)})/dt$$

Equation (5) thus writes as follows:

$$\frac{d\ln(c_t)}{dt} = \alpha^{(lab)} \cdot \frac{d\ln(c_t^{(lab)})}{dt} + \alpha^{(drg)} \cdot \frac{d\ln(c_t^{(drg)})}{dt} + \alpha^{(med)} \cdot \frac{d\ln(c_t^{(med)})}{dt} + \alpha^{(ut)} \cdot \frac{d\ln(c_t^{(ut)})}{dt} + \alpha^{(oth)} \cdot \frac{d\ln(c_t^{(oth)})}{dt} \qquad (6)$$

$$= \alpha^{(lab)} \cdot \beta^{(lab)} \cdot \frac{d\ln(u_t^{(lab)})}{dt} + \alpha^{(drg)} \cdot \beta^{(drg)} \cdot \frac{d\ln(u_t^{(drg)})}{dt} + \alpha^{(med)} \cdot \beta^{(med)} \cdot \frac{d\ln(u_t^{(med)})}{dt} + \alpha^{(ut)} \cdot \beta^{(ut)} \cdot \frac{d\ln(u_t^{(ut)})}{dt} + \alpha^{(oth)} \cdot \beta^{(oth)} \cdot \frac{d\ln(u_t^{(oth)})}{dt} + \varepsilon$$

The last term "ε" in equation (6) represents an error term, which reflects the change of unit cost that cannot be explained by the combination of the different cost inflation factors singled out.

By applying the expected value operator *E* equation (6) writes as follows:

$$E[d\ln(c_t)/dt] = \alpha^{(lab)} \cdot \beta^{(lab)} \cdot E\left[d\ln(u_t^{(lab)})/dt\right] + \alpha^{(drg)} \cdot \beta^{(drg)} \cdot E\left[d\ln(u_t^{(drg)})/dt\right] + \alpha^{(med)} \cdot \beta^{(med)} \cdot E\left[d\ln(u_t^{(med)})/dt\right]$$
$$+ \alpha^{(ut)} \cdot \beta^{(ut)} \cdot E\left[d\ln(u_t^{(ut)})/dt\right] + \alpha^{(oth)} \cdot \beta^{(oth)} \cdot E\left[d\ln(u_t^{(oth)})/dt\right] + E[\varepsilon] \qquad (7)$$

Estimation of parameters:

- Factor input ratios (alphas)

It is proposed to estimate factor input ratios (the alphas) based on the aggregate hospital cost information to be extracted from the financial reports of providers (report nr. 5 for public providers) in the base year.

- Rate of change of unit factor inputs (betas) and error term "ε"

It is suggested to estimate betas based on historical data (as available) and to formulate a future assumption accordingly. Since it is unlikely that detailed historical financial data can be made available in aggregate (i.e., for all contracted providers), a possible alternative would be to estimate parameters from a sample of selected providers who have maintained detailed and reliable accounting reports in the past years).

(Further technical discussions needed on feasibility and methodology)

- Factor cost inflation rates (wage inflation rate, etc.)

The estimation of the rate of relative cost increase (i.e., inflation rates) for each one of the cost drivers singled out in equation (4) is discussed below:

- Labour cost inflation rate ($du_t^{(lab)}/ u_t^{(lab)}dt$)

  To be estimated based on the projected macroeconomic indicators and assumption on the rate of increase of public sector wages (e.g., in line with the trend observed in the past)

- Drug cost inflation rate ($du_t^{(drg)}/ u_t^{(drg)}dt$)

  To be projected based on the pharmaceutical industry component in the producer price index (PPI) *(further investigation needed here to assess feasibility)*

- Medical equipment and supplies ($du_t^{(meq)}/ u_t^{(meq)}dt$)

  (to be discussed)

- Utilities ($du_t^{(ut)}/ u_t^{(ut)}dt$)

  To be projected based on the projected unit cost of utility costs for public institutions *(further discussion needed here)*

- Other cost ($du_t^{(oth)}/ u_t^{(oth)}dt$)

  (to be discussed)

ANNEX B

Tables and figures

Table A.1. Population as at 1 April 2006 *(preliminary – revision ongoing)*

Age group	Thai population			Non-thai population			Total registered population		
	Males	*Females*	*Total*	*Males*	*Females*	*Total*	*Males*	*Females*	*Total*
0 – 4	1,995,459	1,881,026	3,876,485	15,550	15,012	30,562	2,011,010	1,896,038	3,907,047
5 – 9	2,461,666	2,332,568	4,794,234	15,424	14,748	30,172	2,477,090	2,347,316	4,824,406
10 - 14	2,532,650	2,408,022	4,940,672	22,595	22,089	44,684	2,555,244	2,430,112	4,985,356
15 - 19	2,421,805	2,326,809	4,748,614	31,239	30,893	62,132	2,453,044	2,357,703	4,810,747
20 - 24	2,680,838	2,614,468	5,295,306	25,328	24,893	50,222	2,706,167	2,639,361	5,345,528
25 - 29	2,786,527	2,765,346	5,551,874	29,693	28,016	57,709	2,816,220	2,793,363	5,609,583
30 - 34	2,839,716	2,894,279	5,733,995	35,649	30,932	66,581	2,875,365	2,925,212	5,800,576
35 - 39	2,786,475	2,907,191	5,693,666	32,456	27,481	59,937	2,818,931	2,934,672	5,753,603
40 - 44	2,542,044	2,672,468	5,214,512	27,983	22,529	50,512	2,570,027	2,694,997	5,265,024
45 - 49	2,128,156	2,279,679	4,407,834	22,263	17,830	40,093	2,150,418	2,297,509	4,447,927
50 - 54	1,648,887	1,796,799	3,445,686	16,099	12,870	28,970	1,664,987	1,809,670	3,474,656
55 - 59	1,196,580	1,314,738	2,511,318	12,177	9,767	21,944	1,208,757	1,324,505	2,533,262
60 - 64	926,079	1,034,855	1,960,934	12,217	9,404	21,621	938,297	1,044,258	1,982,555
65 - 69	777,492	910,954	1,688,447	12,437	9,267	21,705	789,929	920,222	1,710,151
70 - 74	559,912	695,163	1,255,076	13,417	7,820	21,237	573,330	702,983	1,276,313
75 - 79	338,587	450,791	789,377	13,829	8,162	21,991	352,416	458,953	811,369
80 - 84	174,781	249,200	423,981	10,477	9,823	20,300	185,259	259,023	444,282
85 - 89	79,237	122,975	202,213	8,174	8,419	16,593	87,412	131,394	218,806
90 - 94	35,521	55,642	91,163	5,934	5,267	11,202	41,455	60,910	102,365
95 - 99	16,426	25,409	41,835	3,682	2,523	6,205	20,108	27,932	48,040
Total	**30,928,840**	**31,738,384**	**62,667,224**	**366,625**	**317,746**	**684,371**	**31,295,465**	**32,056,130**	**63,351,595**

Source: NHSO, from MOI database on registered persons

(For the complete data, see Missionreport 1, EXCEL file 'Population data MOI.xls')

Table A.2. Persons insured under SSS, FY 2006[a]

Age	Article 33 & 38[b]		Article 39[c]		Total
	Male	Female	Male	Female	
15 – 19	166,948	154,380	155	943	322,425
20 – 24	701,082	799,196	2,553	12,727	1,515,558
25 – 29	1,036,716	1,082,873	9,233	26,925	2,155,747
30 – 34	813,603	811,782	13,804	30,185	1,669,374
35 – 39	626,511	626,517	15,680	27,949	1,296,658
40 – 44	446,889	427,402	15,189	23,226	912,706
45 – 49	285,787	251,900	12,374	18,485	568,546
50 – 54	171,592	125,482	10,507	14,474	322,055
55 – 59	88,683	50,878	7,882	8,490	155,934
60 – 64	23,860	11,844	5,943	4,393	46,040
65 – 69	5,575	2,197	2,631	1,376	11,779
70+	3,450	1,039	1,212	432	6,132
Total	4,370,696	4,345,491	97,163	169,605	8,982,955

a. Persons entitled to medical care under the SSS; monthly average for the fiscal year 2006, estimated based on data provided by SSO; b. Insured on a mandatory basis; c. Insured on a voluntary basis.

Source: Estimation of the consultant based on data provided by SSO

(For the complete data, see Missionreport 1, EXCEL file 'SSO basic data.xls')

Table A.3. Persons insured under CSMBS, summary by age group, FY 2006[a]

Age Group	*Actives[b]*		*Pensioners[c]*		*Dependents[d]*		*Total*	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*
0 – 4	0	0	0	0	71,916	68,192	71,916	68,192
5 – 9	0	0	0	0	110,583	103,720	110,583	103,720
10 - 14	0	0	0	0	149,542	141,710	149,542	141,710
15 - 19	33	7	4	0	159,180	151,238	159,217	151,245
20 - 24	10,348	1,554	41	1	1,887	5,755	12,276	7,310
25 - 29	42,212	36,484	313	0	1,798	15,328	44,323	51,812
30 - 34	80,625	77,620	920	39	5,950	33,249	87,495	110,908
35 - 39	120,809	81,837	1,978	160	9,154	56,507	131,941	138,504
40 - 44	139,693	104,635	3,496	379	13,567	81,569	156,756	186,583
45 - 49	204,949	145,453	7,501	1,817	20,791	96,231	233,241	243,501
50 - 54	162,082	112,062	18,328	9,886	35,713	104,155	216,123	226,103
55 - 59	90,606	53,272	27,522	17,157	51,708	104,594	169,836	175,023
60 - 64	11,305	6,192	49,415	26,169	60,340	98,125	121,060	130,486
65 - 69	423	143	40,413	18,595	69,343	114,892	110,179	133,630
70 - 74	106	90	29,468	9,378	72,104	122,133	101,678	131,601
75 - 79	61	53	19,546	5,268	57,987	97,096	77,594	102,417
80 - 84	31	27	10,059	3,420	31,194	54,389	41,284	57,836
85 - 89	10	13	3,141	768	12,384	22,373	15,535	23,154
90 - 94	8	4	671	166	3,690	6,866	4,369	7,036
95+	5	1	112	23	685	1,260	802	1,284
unknown	167	78	2,913	734	220	453	3,300	1,265
Total	863,473	619,525	215,835	93,956	939,736	1,479,835	2,019,044	2,193,316

a. Estimate based on records in CGD database as provided by CSMBS; b. including civil servants and permanent state employees; c. Includes work-injury pensioners; d. including dependent spouses, children, and parents of active insured

Source: Estimation of the consultant based on data provided by CSMBS

(For the complete data, see attached EXCEL file 'CSMBS demographic FY06 REV.xls')

Table A.4. Persons insured under the Universal Coverage Scheme, FY 2006[a]

Age group	*Males*	*Females*	*Total*
0 – 4	1,847,267	1,739,426	3,586,693
5 – 9	2,305,016	2,185,237	4,490,254
10 – 14	2,358,142	2,244,556	4,602,698
15 – 19	1,886,819	1,815,805	3,702,624
20 – 24	1,566,773	1,405,323	2,972,096
25 – 29	1,549,210	1,481,635	3,030,846
30 – 34	1,817,538	1,861,223	3,678,761
35 – 39	1,942,898	2,074,931	4,017,829
40 – 44	1,836,398	2,000,081	3,836,479
45 – 49	1,573,603	1,794,919	3,368,522
50 – 54	1,278,767	1,486,305	2,765,073
55 – 59	948,309	1,110,276	2,058,585
60 – 64	767,721	884,141	1,651,862
65 – 69	644,566	764,465	1,409,031
70 – 74	453,028	574,763	1,027,792
75 – 79	271,774	370,794	642,568
80 – 84	142,021	211,021	353,042
85 – 89	67,466	108,139	175,605
90 – 94	31,284	48,520	79,804
95+	17,118	24,072	41,189
Total	23,305,717	24,185,633	47,491,351

Source: From data provided by NHSO

(For complete data, see Missionreport 1, EXCEL file 'UC demographic FY06.xls')

Table A.5: CSMBS benefit expenditure, 2002 - 2006

	FY 02	*FY 03*	*FY 04*	*FY 05*	*FY 06*
Outpatient care	9,508.9	11,350.5	13,905.3	16,942.8	21,895.5
Public hospitals	9,508.9	11,350.5	13,905.3	16,942.8	21,457.7
Private hospitals	0	0	0	0	437.8
Inpatient care	10,967.1	11,335.4	12,137.6	12,437.3	15,108.9
Public hospitals	9,684.1	10,960.7	11,778.0	12,437.3	14,825.7
Private hospitals	1,283.0	374.7	359.7	0	283.2
TOTAL	20,476.1	22,685.9	26,042.9	29,380.0	37,004.4

Note: In million Baht

Source: The Comptroller General's Department, Ministry of Finance

Table A.6: SSS medical benefit expenditure and contribution income, 2002 – 2006[a]

	2002	*2003*	*2004*	*2005*	*2006*
Contribution income	8,619.72	9,751.55	15,250.88	17,306.69	18,985.70
Benefit expenditure	9,278.16	10,882.18	11,604.22	14,295.14	15,782.28
Basic capitation amount	7,315.83	8,540.76	8,966.92	10,708.10	11,377.81
Utilization incentive (capitation)	372.93	432.21	436.95	488.14	500.19
Risk adjustment (capitation)	997.61	1,164.65	1,222.76	1,756.13	1,865.96
High cost special services	117.81	151.96	184.27	233.34	270.60
Emergency & Accident	146.30	200.31	212.87	283.06	344.71
HIV/AIDS (drugs & diagnostics)	-	-	114.40	284.53	449.45
Bone marrow transplant	16.09	4.25	10.00	7.50	9.75
Hemodialysis (visits)	136.14	178.34	225.32	284.90	353.12
Dental care (pulling, filling & scaling)	175.46	209.69	230.73	245.89	591.65
Kidney transplant	-	-	-	3.55	19.04
Cornea transplant	-	-	-	-	-

Note: a. In million Baht, excluding administration cost; b. Contribution income allocated for medical benefits;

Source: Social Security Office

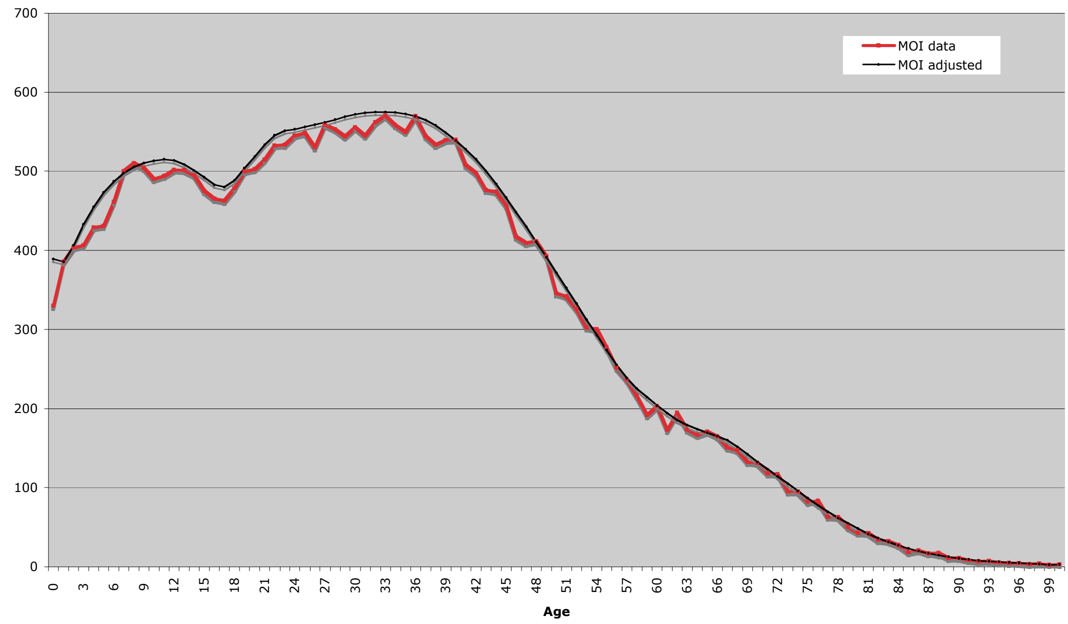
Table A.7: National Health Security Fund, expenditure FY 2006[a]

	Expenditure (million THB)	*Per cent of total*
Outpatient medical care	27,933.93	34.5%
Inpatient medical care	21,931.74	27.1%
Promotion and prevention services	10,610.84	13.1%
High cost care	8,556.81	10.6%
Accident/emergency care	2,460.33	3.0%
Emergency medical services	256.30	0.3%
Disability (prosthesis)	185.89	0.2%
Capital replacement cost	5,821.28	7.2%
Subsidy fund for harsh areas	334.25	0.4%
Compensation for medical malpractice	39.31	0.05%
Medical care for non-registered persons	24.10	0.03%
HIV/AIDS	2,738.92	3.4%
TOTAL	80,893.69	100%

a. Including salary costs

Source: National Health Security Office

Figure A.1. Registered male population as at 1 April 2006, MOI database



Figures A.2: Registered female population as at 1 April 2006, MOI database

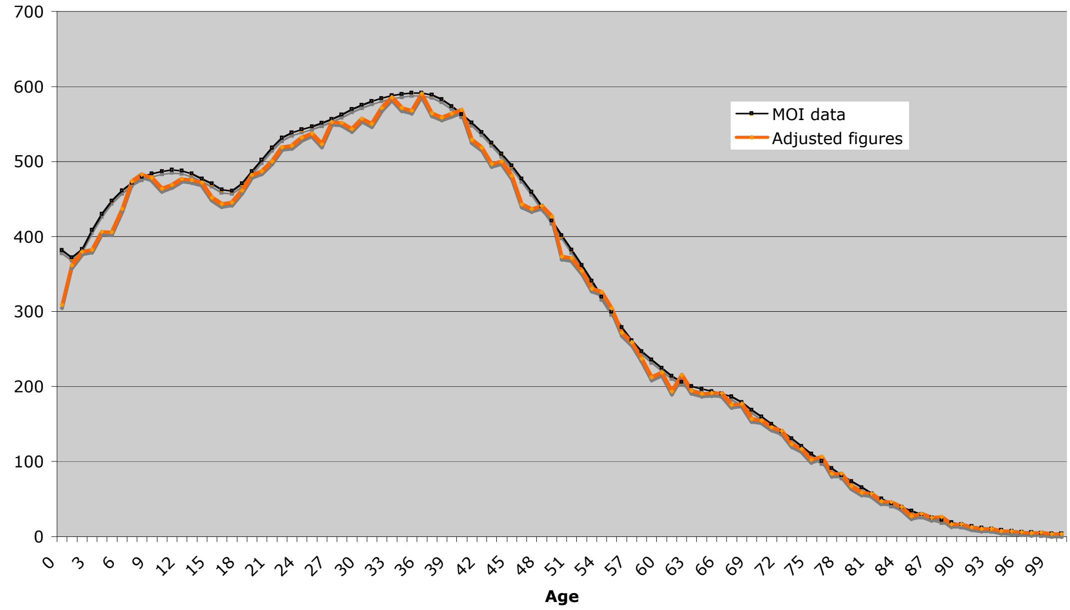


Figure A.3. Fertility rate by age, estimated from MOI data on births during FY 2006

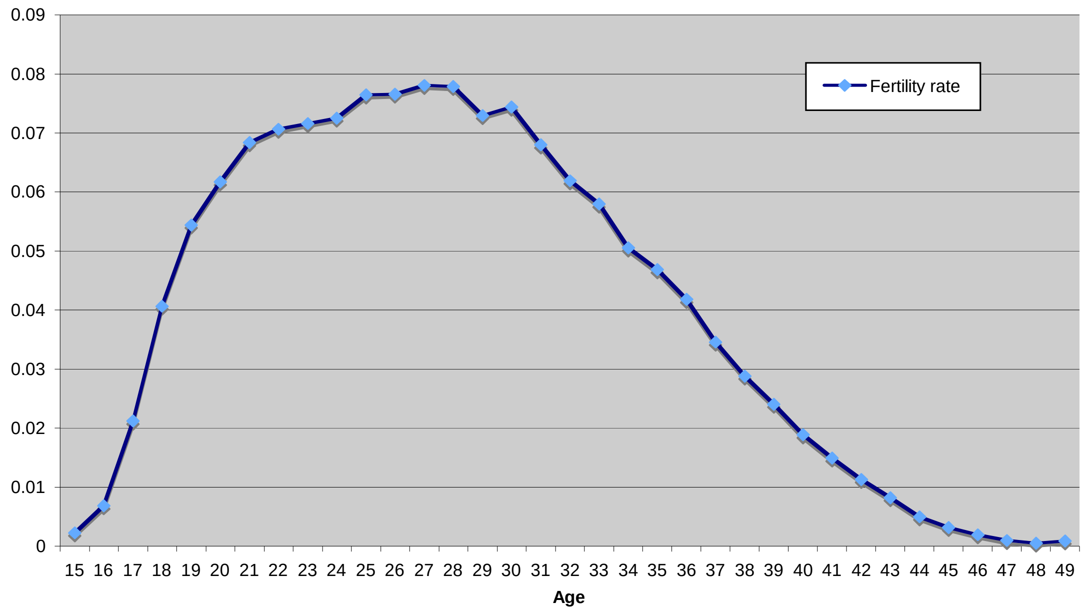


Figure A.4. Estimated labour force participation rates, FY 2006 (from LFS 2006, Q1 & Q2)

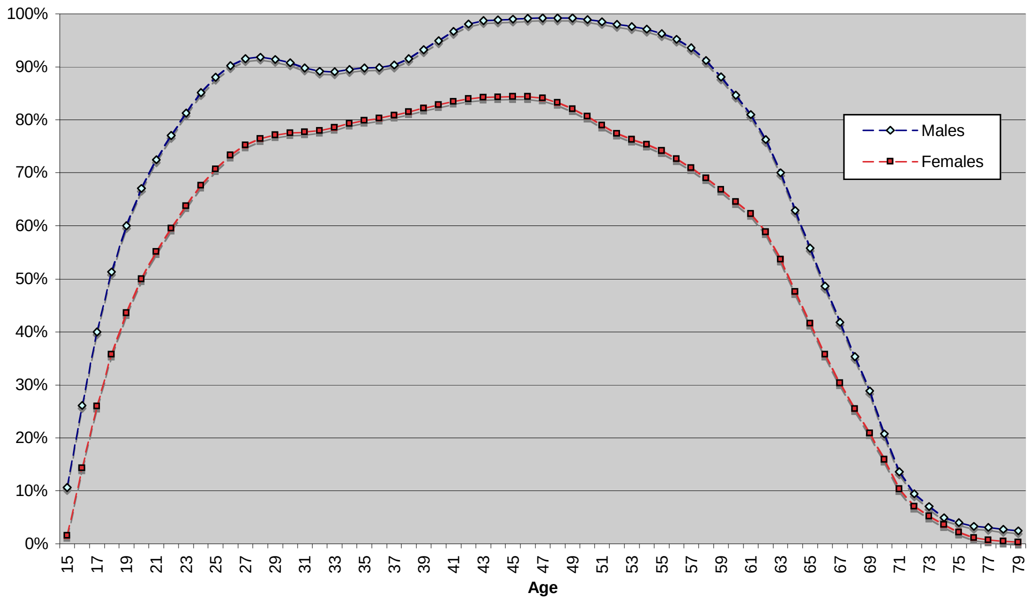
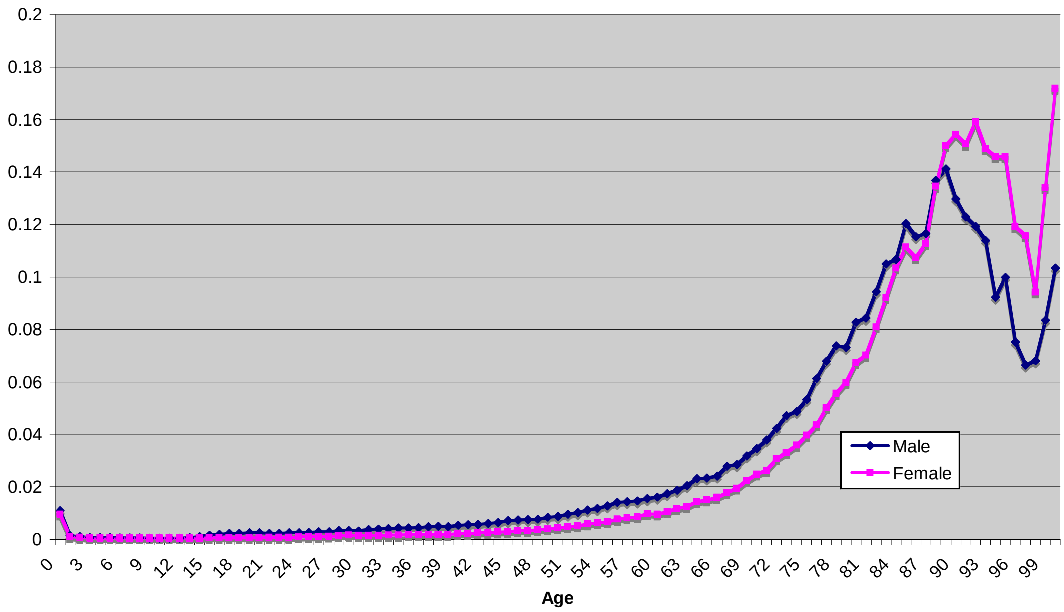


Figure A.5. Death rates as reported to MOI, FY 2006



ANNEX C

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ANNEX D

Development of a Health Care Financing Model

Initial Phase

Terms of reference

ATTACHMENT 1

ILO-SECSOC

Geneva, 26 June 2007

Terms of Reference - Initial Phase (TOR-IP)

(1 July to 30 September 2007)

Attachment: Bangkok Mission Report WS dated 26 June 2007, incl. Annexes I to VI

Development of a health care financing model, and staff capacity building, for

The Civil Servants Medical Benefit Scheme (CSMBS), The Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and The International Health Policy Programme (IHPP)

Thailand

These *Terms of Reference for the Initial Phase* (TOR-IP) specify the activities to be undertaken during the initial phase of the overall modelling process, which stretches into 2008.

They are based on, specify and partially replace, the Draft Terms of Reference (Draft03 dated 02/05/2007). The overall contents of Draft03 remains valid and should be understood as reference for the detailing of further TOR that will follow after the activities of these TOR-IP have been finished. The contractor to these TOR-IP is advised to refer to the Draft03 for putting his / her work into perspective.

The contents of Draft03, as far as not replaced by these TOR-IP, is still valid; the time frame defined in Draft03 is however not fully applicable anymore. For the initial phase of modelling, these TOR-IP replace the time frame of Draft03 (see Attachment 1 to these TOR-IP).

(1) Draft-design of model structures; specify and check data (July 2007)

The *health finance projection and simulation models* to be developed for NHSO, SSO, CSMBS and IHPP will be *described*, in writing, in their core structures (modeling approach).

This includes written description of :

- the legislation (as far as relevant for modelling) of the covered populations;
- the statistical representation of the covered populations (numerical data base);
- the approach of moving the covered populations from t to t+1 (demographic modelling approach);
- the revenue and expenditure (= time series tabulation of fiscal accounts, budgets, and National Health Accounts);
- the costs per health benefits / health services *offered* by health providers, including the rules governing their development ("shadow-fee basis"; adequate time series tabulation);
- the costs per benefits / services *covered* (*reimbursed*) by health purchasers, including the rules governing reimbursements ("reimbursement basis");

for each of the three schemes UC, SSO, and CSMBS, separately (where adequate).

For UC, SSO and CSMBS health expenditure, the modelling approach will be based on similar modelling approaches as follows:

Exp = Pop * g * f * c,

Where

Exp =: Health expenditure of scheme [UC, SSO, CSMBS respectively]

Pop =: covered population of scheme [UC, SSO, CSMBS respectively]

g =: factor representing the ratio between number of patients of scheme and insured of scheme [UC, SSO, CSMBS respectively]

f =: factor representing frequency of contact of patients with scheme [UC, SSO, CSMBS respectively]

c =: costs per patients' contact with health system [UC, SSO, CSMBS respectively]

In the case of SSO and UC information on **c** will be derived from hospitals' reports on charges ("shadow fees"). Support will be provided by SSO and NHSO staff in order to collect and interpret the data.

All variables / parameters will be calculated by *single ages* (0, 1, ..., 100), by *sex*, by *in-patients* and *out-patients*, and by *hospital type*, i.e. public (non-teaching hospitals, public teaching hospitals, others) and private – details to be determined in cooperation with Thai counterparts.

(2) ***Establishment, description and evaluation of a consistent data base (July 2007)***

The data base will be 2006. If incomplete, data of 2005 will be used to estimate, adjust and complete the 2006 statistical data.

It must be made sure that, in 2006, the data base [for UC, SSO, CSMBS respectively] is consistent in the sense that the above equation, i.e.

Exp = Pop * g * f * c,

is being fulfilled for all three schemes, i.e. multiplying and adding up over (single-age) vectors **Exp, Pop, g, f** and **c** provides total expenditure as measured statistically (in the fiscal accounts) in the three schemes [UC, SSO, CSMBS] respectively. *This requires calibration of the data base for 2006.*

The data base, year 2006, will form the basis for model design and model projections over time (moving data-vectors from T to T+1). It is this basis that will have to be updated later, once all models are finished and handed over to the Thai counterparts. *A description of the calibration method is to be included in the deliverable under this point 1) of the TOR-IP.*

In SSO and UC, there are health expenditure items that are not, in the data base, covered by the in-patient and out-patient systematic, but recorded (and projected) separately. Some of these expenses are available by single patients, i.e. can be structured by single ages vectors, by sex, by type of hospital etc. With respect to some items, other structured information is available. The contractor will make adequate use of that information in collaboration with the Thai counterparts for structuring the data base 2006.

When shaping the model design and the data base(s) for UC and SSO it has to be kept in mind that important model outputs in both cases (schemes) are the *capitation rates* for either scheme. The capitation rate calculation should be based on transparent methods such that these can be used, after hand-over of the models to the institutions, for calculating the annual budget proposals to the respective committees.

(3) *Modelling approach for the CSMBS covered population (July 2007)*

It is expected that the contractor pays special attention to an ***adequate modelling approach for moving from* t *to* t+1 *the population covered by the CSMBS***. This special attention is required as there is demographic modelling experience of the ILO with respect to the SSO and the UC, but not with respect to the CSMBS, where the greater part of the covered population is a function of the development of the number and structure of active civil servants, as follows:

Problematique of modelling the CSMBS covered population:

The CSMBS covers

1) Civil servants (most civil servants from 18 (minimum age) to 60 (retirement age; few exemptions);
2) Their parents;
3) Their spouse (if Muslim: their spouses);
4) Maximum of three (3) children per civil servant (idem: couple) until they turn 20 years of age;
5) Permanent employees (incl. their dependents, like for civil servants) from 16 (minimum age) to 60 (retirement age; no exemptions; all receive lump sum at retirement, no pension)

as long as the civil servant maintains his / her status as a civil servant.

By the end of their career, at retirement, *some* opt out – against one time payment of a (high) lump sum – and lose their own CSMBS health coverage and, also, CSMBS health coverage for their dependents.

Permanent employees all loose their status at retirement, i.e. they and their dependents loose CSMBS coverage at retirement of the active.

Unless receiving other health coverage both groups (former actives and their dependents) then refer to UC.

At present, total CSMBS membership is about 5 million persons, of which 1.9 million are active civil servants, 20 thousand permanent employees, and the rest – around 3.1 million persons – dependents.

This totals to a total number of 16 different groups; the information exists by single ages between 0 and 100.

HOWEVER, the CSMBS does not have information about expenditure differentiated by those groups. Accordingly, group-related information does not (yet) exist about allocation of total CSMBS expenditure on in-patients and out-patients.
The only spending information available is TOTAL EXPENDITURE.

Follows preliminary modelling approach for CSMBS-members:

MEMBERS	=	CSm + CSf + CSSPm + CSSPf + CSCHm + CSCHf +
	+	CSPARm + CSPARf +
	+	EMPm + EMPf + EMPSPm + EMPSPf + EMPCHm +
	+	EMPCHf + EMPPARm + EMPPARf

with:

Civil servants

1) CSm	=:	Civil servants, male
2) CSf	=:	Civil servants, female
3) CSSPm	=:	Spouses, male, of civil servants
4) CSSPf	=:	Spouses, female, of civil servants
5) CSCHm	=:	Children, male, of civil servants
6) CSCHf	=:	Children, female, of civil servants
7) CSPARm	=:	Parents, male, of civil servants
8) CSPARf	=:	Parents, female, of civil servants

Permanent employees

9) EMPm	=:	Permanent employees, male
10) EMPf	=:	Permanent employees, female
11) EMPSPm	=:	Spouses, male, of permanent employees
12) EMPSPf	=:	Spouses, female, of permanent employees
13) EMPCHm	=:	Children, male, of permanent employees
14) EMPCHf	=:	Children, female, of permanent employees
15) EMPPARm	=:	Parents, male, of permanent employees
16) EMPPARf	=:	Parents, female, of permanent employees

Modelling problem is mainly to find an algorithm that treats the dependents as a function of the actives. Total actives will have to come from the labour market balance.

See also the file CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

(4) *Calibration of CSMBS expenditure data base by different categories (August 2007)*

A further problem is that TOTAL EXPENDITURE has to be allocated, in the base year, on single ages of the above groups AND on in-patients and on out-patients.

In other words, the contractor will need to establish a hybrid database such that, for the base year, the sum of all sum products equals TOTAL EXPENDITURE. It is only then, that the standard demography-related projection method can be applied.

The CSMBS maintains two detailed lists of prices to be paid for
(1) medical goods and appliances, and
(2) services.

These lists may be tentatively used as indicators for approaching the above problem. Direct coordination with the Thai counterparts is required.

The two lists are agreed upon between CSMBS and health providers; prices are maximum amounts reimbursed. If hospitals charge higher prices the civil servant has to pay the difference out of pocket. The lists only apply to public hospitals. In other words, thus far, if a civil servant [or dependant] goes to a private hospital s/he has to pay the whole bill out of pocket.

Also, CSMBS applies CSMBS-specific DRGs (in-patient classification system) as of July 2007 to Civil Servant cases of treatment of inpatients.
However, for the time being, different RWs are being multiplied with different base amounts, e.g. in

- $\text{Hospital}_1 = \text{RWs} * \text{RW}_{\text{base rate of Hospital}1}$,
- ...,
- $\text{Hospital}_n = \text{RWs} * \text{RW}_{\text{base rate of Hospital}n}$;

it is planned later to group hospitals by categories (e.g. university hospitals, others) and force them within groups to apply identical, hospital-group specific, base rates.

The contractor is expected to explore whether the estimation of an *average general base rate multiplier* $\text{RW}_{\text{base rate}}$ for all hospitals is possible and, if so, whether it is a "reasonable" parameter to be used in CSMBS expenditure modelling.

Specification of data implies: defining (writing down) the complete list of data required for modelling the above schemes.

It was agreed between ILO, CSMBS, and PIU (Dr Thaworn) that data of CSMBS will be provided by CSMBS (Mr Kulasake Limpiyakorn, Financial Analyst: The Comptroller General Department, Min of Finance; sek139@yahoo.com, mobile: (666) 555-3139).
CSMBS population data format is specified in the file
CSMBS HEALTH DATA BLUEPRINT.XLS, to be made available in electronic format.

The discussions between the Thai counterparts and the ILO project manager, undertaken in 2006 and spring 2007, have shown that it might be advisable to disaggregate all base year data by different types of hospitals in all three schemes, i.e. in UC, SSO and CSMBS at least by public-teaching, public-non-teaching (sub-district, district, provincial), private, and possible other categories.

It is expected that the contractor establishes the data base (the data bases for the different schemes) in collaboration with the Thai counterparts such that differentiation of the above kind, by type of hospital, is taken into account.

In many respects, the contractor can refer to prior work undertaken by the ILO – especially for the demographic labour market and macro-economic parts (see below: item *(3)*), in other respects new data terrain will have to be covered.

NHSO, CSMBS, SSO and IHPP will collect and provide the specified data.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

(5) ***Data check and first draft table of contents of data dictionary; (August 2007)***

The activity under *(1)*, above, will be supported by a data collection activity through NHSO, CSMBS, SSO and IHPP.

These data have to undergo the usual actuarial checks, which will be undertaken by the contractor to this contract in cooperation with NHSO, CSMBS, SSO and IHPP.

Data specification and actuarial data check will be used for ***drafting a first table of contents of a data dictionary*** – later to be completed extra these TOR-IP –, containing a statistical description of contents and definitions etc of the data needed for model maintenance.

(6) ***Common demographic, labour market and economic frame for the four models; (September 2007)***

A ***demographic, labour market and economic frame of models*** has to be developed that can be used by CSMBS, NHSO, SSO and IHPP as common input to their respective institutional health models (which are to be developed later, on basis of the work undertaken under these TOR-IP, in detail).

The variables that have to be produced by the above frame-models depend, in detail, on the final design of the institution-specific health models; in other words: the frame-models will be of a preliminary character, and later, extra these TOR-IP, be adjusted, fine-tuned, and finalized.

The contractor, in undertaking his/her work can relate to prior modelling work of the ILO for NHSO and SSO. The ***new approach under these TOR-IP*** is to make sure that the structure of the frame-models is designed such that it equally (simultaneously) satisfies the needs of model-input of *all four institutions' institutional health models*.

The contractor will design the *demographic frame model* such that it calculates the

UC-covered population as a residual of

- total population development,
- SSO-population development,
- CSMBS-population development, and
- "private" population development,

i.e.:

- $Pop_{UC} = Pop - Pop_{SSO} - Pop_{CS} - Pop_{Priv}$

One problem (under this approach) would be to design the model such that "stable", "reasonable" development of Pop_{UC} is guaranteed, allowing for smooth cooperation with all stakeholders of the NHSO, including the Bureau of Budget, over the practice of model application, given the fact that Pop_{Priv} is not explicitly known and a number of statistical inconsistencies between Pop_{UC} and Pop exist and have to be solved.

With respect to Pop the contractor will use the population registration data base of the Ministry of the Interior. (To be provided by the Thai counterparts.)

Labour supply will be designed according to the input needs of the four models for the four institutions.

The labour market balance of the economic sub-module will be designed consistently with labour supply. The ***contractor will explore, and make a respective proposal*** (in writing), to what extent labour supply calculations (by sex and single ages) can be used as input to the demand side of the labour market balance and to which extent, vice versa, labour market demand can function congruently as input for the supply side.

Accordingly, the economic sub-module will have to produce output on costing elements, i.e.

- Price indexes, and
- Average wages
- Productivity,
- Employment of various type,

for each of the four institutions' models.

Consistency between SNA and NHA is to be maintained.

(7) ***Design and data base; specify demographic model for CSMBS; (September 2007)***

The contractor is expected to develop, as a result of his / her work during TOR-IP a decisive view on how the institutional modelling for the revenue and expenditure for NHSO, SSO, CSMBS, IHPP (model design) can best be developed. In other words, the initial draft design must be turned into a concrete proposal for modelling, explaining the structure and, especially, the problems that need to be solved. This is not "the modeling" yet, which follows later in the phase after the work on TOR-IP.

The ***concrete proposal for modelling NHSO, SSO, CSMBS, IHPP should be delivered in writing***; any attachments can be delivered in electronic format (i.e.: Excel and / or Visual Basic program examples).

Further, it is expected that the contractor will have developed, by the end of his / her work, a practical proposal with respect to modelling the population covered under the CSMBS, taking into account the explanations under *(3), above,* section: <u>*Problematique of modelling the CSMBS covered population*</u>. In developing the proposal the contractor will pay special attention to modelling entries and exits into the CSMBS system; this includes exploring possibilities of applying civil service (CSMBS) specific assumptions on fertility and mortality. ***The CSMBS covered population modelling proposal (model) is expected in electronic format; it must be described separately in writing.***

<u>In summary, therefore, the TOR-IP basically stipulate the following:</u>

- Clarification and fine-tuning of modelling designs;
- Depending on the proposed model designs: establishment of the data base, including data calibration, for 2006 (2005); the data base must be complete; Specific care must be taken with respect to the making consistent of *calendar year data* with *fiscal year data*; where data are not available, but necessary for reasonable modelling (example: cost data CSMBS), the contractor provides consistent estimates (to the extent possible: theory based or otherwise "reasonably" constructed, based on established mathematical / statistical estimation procedures or methods of numerical / actuarial mathematics, or on other methods of rational reasoning);
- Development (finalize) of draft modules for the outer framework for the institutional models, i.e. demography, labour supply, labour demand, economy;
- Develop a concrete demographic model, related to the labour market balance of the macro-economic model, for the covered population of CSMBS (incl. computer application);
- And other activities as stipulated in detail above.

All work steps and results will be conceptually tested for their robustness and practicability in a framework of cooperation of modelling between NHSO, SSO, CSMBS, and IHPP to be established and implemented latest as of mid-2008. This comprises questions of routines, during a year, of updating the data base(s), especially.

Schedule

The work is expected to be accomplished over the three months July to September 2007.

A *work flow chart* indicatively stipulating which work should reasonably be done when will be made available in electronic format.

Preconditions and caveats

It is assumed that necessary data bases for the models should be developed in collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff.

In case delays are caused in the data collection process, there could be the delay in delivery of the intermediate and final results und these TOR-IP.

ANNEX E

Data dictionary – proposed template

Nr	*Variable name*	*Description*	*Symbol*	*Variable type*	*Data format*	*Source document*	*Source item*	*Last publication date*	*Periodicity of publication*	*Next update recommended*
1										
1.1	Cohort population	Persons in age/sex cohort	$pop_{x,s,t}$	Data input	Persons	MOI database		n.a.	Daily update (?)	
1.2	Age-specific fertility rate	Probability of giving birth		Assumption	Births per female in cohort					2010/2011 (Pop census)
1.3	Age-specific mortality rate	Probability of death in age/sex cohort		Assumption	Probability of death (0 – 1)					

THAILAND

Development of a Health Care Financing Model

Second Phase

REPORT A

Project Implementation Plan

March 2008

Jean-Claude Hennicot
Consulting Actuary
ILO

CONTENTS

ANNEX

1. Background

This report has been drafted within the framework of the consultancy agreement entered into by the consultant with the International Labour Office (External Collaboration Contract no. 40033646/0 signed on 1 February 2007). The assignment of the consultant is taking place within the wider context of the contribution agreement signed on 9 February 2006 by the International Labour Office (ILO) and the European Commission (EC) with regard to the EC project on Heath Care Reform in Thailand (THA/AID/CO/2002/0411, 2004 – 2009), stipulating that the implementation of the project component 'Financial Management of the Thai Health System' is carried out by ILO.

The consultancy agreement referred to in this report (second phase) was arranged in continuity of an earlier agreement (initial phase), which had been accomplished in December 2007.

The purpose of the present report, drafted shortly after the onset of the consultant's second assignment, is to present his 'project implementation plan', i.e., a plan of activities and time schedule that should enable the delivery of outputs to be produced under the contract within the given timeframe. It is noted that the report draws on the findings and modeling work carried out by the consultant under his previous assignment and on the follow-up work that ensued since the completion of the initial phase.

2. Objectives and work to be accomplished

The main objective of ILO's intervention is to establish a common modeling framework for health care and to develop health care financing models for the three institutions (NHSO, SSO, and CSMBS), which act as the main national health care purchasers in the country. The purpose of the financing models being developed is to enable the projection of health care expenditure to be incurred by the three schemes in the future. The ultimate objective is to support the schemes in developing a sound and transparent mechanism for determining the adequate level of payments made to health care providers (capitation fees and fee-for-service or DRG-based payments respectively) for the services purchased for their members, and thereby to enable the respective institutions in adopting a sound budgeting and resource allocation process. A secondary objective is to develop an overall health care financing model for Thailand, with a view to forecast future national health care costs in aggregate.

The work planned for the second phase assignment is built on the outcomes of the first phase of the modeling process ('Initial Phase'), which comprised the establishment of a consistent data framework and the design of a proposed model structure. The outcomes of the first phase are documented in the final mission report submitted to ILO by the consultant in early December 2007.

The specific objectives of the second phase assignment of the consultant are listed below:

(i) To revise the database, taking into account the newly available data (notably the updated demographic data and the actual expenditure data of the three schemes in the year 2007) and to finalize the common demographic and economic model framework;

(ii) to finalize the design of the health care financing models for the four selected institutions of Thailand, namely the National Health Security Office, the Social Security Office, the Comptroller General's Office (governing the Civil Servants' Medical Benefits' Scheme), and the International Health Policy Programme (IHPP), including for the three health care purchaser institutions a module on budget allocation if relevant;

(iii) to develop user manuals and training material documenting the models;

(iv) to provide training on the handling and maintenance of the models; and

(v) to hand over the final models and supporting documentation to the respective institutions.

Specific activities and related reports to be submitted are stipulated in detail in the attached terms of reference (see Annex).

3. Ongoing activities

Since the completion of work under the initial phase, work has been ongoing and some progress has been achieved, notably the clarification of data inconsistencies discovered on MOI population data (birth rates in particular) and CSMBS beneficiaries in the base year; updated data has been provided in the meantime and the demographic model framework and has been revised.

During the course of the mission of the project coordinator, Mr. Wolfgang Scholz, which took place from 11 February through 8 March, a number of issues were addressed and mostly clarified; these included, among others, the following:

- Demographic and macro-economic model frame: Several issues were addressed including the modeling of the labour force and the projection of economic variables (GDP, etc.);
- Model design: issues discussed included model structure (break-up of model components) and expenditure projections (horizon, etc.).
- Assumptions: these were discussed in detail, notably the assumptions on future coverage of the respective schemes and the projection of utilization patterns.
- Estimation of cost drivers: the composition and drivers of unit cost were discussed thoroughly and a data framework was agreed upon for the analysis of time series on cost developments specific to each scheme.
- Reform options: consultations were undertaken with each scheme regarding reform options being considered, both on scheme financing (e.g., for CSMBS) and provider payment mechanism.
- Budget allocation mechanism: this matter was discussed in detail, notably for the UC scheme in connection with the policy objective of decentralizing primary care, which the EU project is supporting proactively.

4. Next steps

The next steps planned by the consultant are listed below in sequential order:

a. Completion of the demographic and macro-economic framework;

b. Completion of model structure and base-year calibration for all models;

c. Analysis of time series on cost structure history (based on data to be made available) for estimating the relative importance and level of cost pressure of different cost components in the past, and formulation of assumptions on cost drivers for expenditure projections;

d. Status quo projection of expenditure for the three schemes and in aggregate (IHPP model);

e. Consultations with schemes and international experts regarding reform options being considered by each scheme, notably on the capitation allocation mechanism;

f. Development of budget allocation modules for each scheme;

g. Projection of scheme expenditure and budget allocations under alternative reform options considered;

h. Drafting of manuals on model handling and maintenance for each scheme;

i. Development of training materials;

j. Carry out a 3-day introductory training seminar for all institutions involved;

k. Carry out hands-on training sessions with all four institutions;

l. Hand-over of models and supporting documentation (manuals) to all four institutions.

It is noted that the exact sequence of activities as proposed above is subject to change; this will depend notably on the availability of counterparts (and data/information to some extend) and on the pace of progress achieved with the preceding steps.

5. Timetable

The work plan of activities as agreed upon for the second phase assignment (see attachment to the contract) has been revised to incorporate the mission of the ILO coordinator during 11 Feb – 8 March 2008, which comprised a tight schedule of meetings organized by the project component manager, including meetings with management and technical staff of numerous institutions (including NHSO, SSO, CGD, BOB, EU project, IHPP/World Bank project, MOF, etc.), presentations on modeling progress to stakeholders, and internal consultation meetings. The revised workplan is displayed on the next page.

As mentioned above, the work plan should be considered tentative since the progress of work and completion of outputs to be developed is dependent not only on the cooperation and availability of national counterparts but also on the timing of technical inputs on UC budget allocation processes and formulas to be provided by international experts.

Thailand: Health Care Financial Modeling, Phase 2 - Updated workplan

	Activity	Feb 08	March 08	April 08	May 08	June 08	July 08
	Missions of ILO project coordinator						
1.	Develop a common demographic, labour market, and economic frame for the 4 models						
2.1	Develop the health care financing modules for UC, CSMBS, and SSS and a projection model for IHPP (status quo)						
2.2	Develop modules for allocating resources to hospitals for NHSO and SSO, and assess feasibility for CSMBS.(*)						
3.	Consult with UC, CSMBS, and SSS on possible reforms on allocation of funds and formulate alternative scenarios accordingly(*)						
4.	Adjust model design to incorporate allocation scenarios in the most appropriate manner (*)						
5.	Carry out projections for status quo conditions and alternative scenarios and consult with the four schemes on model results and modify scenarios accordingly(*)						
6.	Develop manual on models including procedures for model handling and maintenance						
7.	Develop training materials						
8.	Carry out an introductory workshop on model structure, common features, and handling						
9.	Undertake in-house training with the technical staff of each scheme on model handling and maintenance						
10.	Hand over final models to UC, CSMBS, SSO, IHPP, and document delivery for ILO						

(*): Tentative, depending on the timing of inputs of international experts on budget allocation processes and formulas

ANNEX

Terms of Reference

These Terms of Reference (TOR-SP) refer to the second phase (SP) of the development of a:

Health care financing model, and staff capacity building, for the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and the International Health Policy Programme (IHPP) of Thailand.

With respect to the first (initial) phase (TOR-IP) reference is made to contract PO/Ver No: 40029956, dated 29.06.2007

It is understood that, at the commencement of this contract (TOR-SP), the obligations and works of the contract of the initial phase (TOR-IP) have been fulfilled such that the tasks to be carried out under this contract (TOR-SP) can be fulfilled.

The overall contents of the Draft Terms of Reference (so-called Draft03 dated 02/05/2007, see attachment to contract re TOR-IP) remains valid. The contractor to these TOR-SP is advised to refer to Draft03 for further information.

The contents of Draft03, as far as not replaced by these TOR-SP, is valid; the time frame defined in Draft03 is however not fully applicable anymore. For the second phase of modelling, these TOR-SP replace the time frame of Draft03 (see the attached updated flow chart of activities under TOR-SP).

A. Activities to be carried out

Under the supervision of the Senior Economist of the ILO Social Security Department and the Social Security Specialist of the ILO SRO-Bangkok, the contractor to these TOR-SP will undertake the following tasks:

On the background as provided in Draft 03 (see above), he will develop four (4) health care finance models, which, each, are characterized by the fact that they can be based on a common, coordinated set of assumptions on demography, economy, labour market, health care utilization and unit cost developments.

The models will be designed such that they project expenditure and revenue of Thailand's health system(s); the models are annual, i.e. they are based on annual data and will produce annual (annualised) outputs; their time horizons will range from short (for budgeting purposes) to long-term.

Institutional, legal and behavioural specificities of the three single schemes will be sufficiently mapped; the scope of the data base of the model for the IHPP goes beyond the scope of the data bases of the three schemes but, where possible, the IHPP model will make use of the data bases of the three schemes.

Core technical staff from the three schemes and the International Health Policy Programme (IHPP) in charge of the maintenance of the model(s), will support the model development and be trained (see below) in the usage and future calibration of the models.

Especially the contractor will:

(1) Establish a common demographic, labour market and economic frame for the four models to be developed for CSMBS, NHSO, SSO and IHPP;

(2) Establish the health care financing modules for three schemes CSMBS, NHSO, and SSO as well as the model for the IHPP (NHA);

(2a) Develop modules for allocating the available overall resources (budgets) to the hospitals that have contracted with NHSO and SSO. The contractor will explore the feasibility of the development of such a module for CSMBS, and make proposal(s), accordingly. Technically, the allocation mechanism will be “top-down” for both, NHSO and SSO, and it will, to the extent possible, replicate, as a standard procedure, the present mechanisms applied by NHSO. The allocation mechanism for SSO will be newly developed; where appropriate, the SSO allocation mechanism will draw advantage from the allocation mechanism developed for NHSO;

(3) With a view to most appropriate model design (possible simulation options; see also point (5) below): consult with CSMBS, NHSO, SSO and IHPP staff on possible reform plans of the CSMBS, NHSO and SSS. These might include different allocation formulas, different ways of capitation calculation (for example,. with or without inclusion of capital depreciation), or the possible coverage of dependents and future pensioners (SSO);

(4) Decide on modelling options that most appropriately incorporate any of those mentioned details;

(5) Carry out status-quo projections, and reform simulations in coordination and cooperation with the staff of CSMBS, NHSO, and SSO – in order to validate the significance of the outputs of the established models; consult with the staff of the CSMBS, NHSO, SSO and the IHPP on the projection and simulation results, and modify the models’ structures to the extent that they produce unreasonable results;

(6) Describe, for each institution (CSMBS, NHSO, SSO and IHPP) separately,
   (a) the procedures of model maintenance,
   (b) the handling of the model;

(7) Develop training material;

(8) Carry out a three days common introductory training workshop (proseminar) for the staff of the CSMBS, NHSO, SSO and the IHPP on the purpose and use of the models;

(9) Carry out separately, for the staff of each of the institutions CSMBS, NHSO, SSO and the IHPP, hands-on training at staff work places, on the technical use of their respective models;

(10) Hand out the electronic version, and any accompanying training material, of the models to the staff of the CSMBS, NHSO, SSO and the IHPP;

(11) Provide the above (items (1) to (10)), and all other stipulations contained in this document to the satisfaction of the ILO.

As part of the technical modeling work, in addition to the electronic model to be developed and in order to reflect and document work progress, the contractor writes the following reports on the above items (draft titles – open to adjustments in consensus with ILO-SECSOC):

(A) A common demographic, labour market and economic frame and health care financing modules for CSMBS, NHSO, SSO and IHPP. (This report covers item (1), above.)

(B) Financial projection models for CSMBS, NHSO, SSO and IHPP – core design and technical incorporation of allocation formulae and reform options. (This report covers items (2), (2a), (3) and (4), above.)

(C) Status-quo projections, and reform simulations, for the financial development of CSMBS, NHSO, SSO and under NHA (IHPP). (This report covers item (5), above.)

(D) Model maintenance and practical handling of the models of CSMBS, NHSO, SSO and IHPP. A manual. (This report covers items (6) and – partially - (7), above.)

(E) Introduction to the practical use of the models for CSMBS, NHSO, SSO and IHPP. Seminar training material. (This report covers items (7) – partially –, and the didactical material needed for items (8) and (9), above.)

(F) Note on the formal hand-over of the models and any accompanying material to the staff of CSMBS, NHSO, SSO and IHPP. Formal notes on the delivery of the training activities. (This note covers items (8), (9) and (10), above.)

B. Schedule

The work is expected to be accomplished over a six-months period, starting with the signature of the contract to which these TOR-SP refer.

A work flow chart stipulating which work should reasonably be done when is attached. It contains the proposal for another, deepening, workshop for the Thai counterparts / users of the model, after the completion of the works to be undertaken under these TOR-SP. This deepening workshop is not part of these TOR-SP.

C. Preconditions and caveats

It is assumed that necessary data for the model(s) have been collected in close collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff. This work has provided all involved with an a priori understanding of the actual modeling (model design) to be undertaken.

In case of delays in the data collection process (see TOR-IP), which might "stretch" the process of data collection and of constructing the data base into this second phase (TOR-SP) of the project, there could be a delay in delivery of the results as expected under these TOR-SP.

The budget to this contract is expert fees (including fees for his participation in seminars / training workshops, lecturing fees, if any, including travel required under the TOR-SP). Other cost such as printing cost of the reports, the cost for seminars / training workshops (e.g. cost for the venue, equipments and refreshments) are not included in this budget, and will be covered separately.

THAILAND

Development of a Health Care Financing Model

Second Phase

MISSIONREPORT 1

DRAFT

21 April 2008

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CONTENTS

1. Background

This report was drafted within the framework of the consultancy contract concluded between the consultant and the International Labour Office (External Collaboration Contract no. 40033646/0 signed on 1 February 2008). The assignment of the consultant is taking place within the wider context of the contribution agreement signed between the International Labour Office (ILO) and the European Commission (EC) on 9 February 2006 with regard to the EC project 'Heath Care Reform in Thailand' (THA/AID/CO/2002/0411, 2004 – 2009), stipulating that the implementation of the project component 'Financial Management of the Thai Health System' is to be undertaken by ILO.

The consultancy agreement, which this report relates to, (referred to as 'second phase') was arranged in continuity with an earlier agreement (referred to as 'initial phase'), which had been accomplished in December 2007.

The purpose of the present report is to present outputs nr 1) and nr 2) of the agreement as stipulated in the terms of reference (see Annex A), and which comprise the following:

- To finalize the development of the common demographic, labour market, and economic framework for all (4) models
- To finalize the development of health care financing modules for the UC, CSMBS, and SSS scheme, and for an aggregate expenditure model for IHPP.

It is noted that the report draws on the findings and modeling work carried out by the consultant under his previous assignment (initial phase) and on the follow-up work undertaken since completion of the initial phase.

2. Common demographic, labour market, and economic model frame

The purpose of the demographic and economic module is to establish a coherent framework for modeling the demographic and macro-economic country context. A common module is proposed for all models to ensure consistency of methodology (with regard to demographic and economic modeling) and agreement by all stakeholders on common assumptions.

The demographic and economic model framework had been addressed during the previous assignment and a preliminary version of the respective module was presented earlier (see 'Initial Phase' assignment: 'Missionreport 2' and 'Final Report').

The updated population figures (base year population and projection) and model design as proposed for the Thai economy, labour force, and employment, are presented in the following sections.

2.1. *Population*

2.1.1. Base year (FY 2006) population

As reported earlier the MOI-registered population as at 1 April 2006 is taken as the starting population for the population projection. Inconsistencies with the MOI population data were pointed out in earlier reports; these have been resolved in the meantime to a certain extent and the population projection has been revised accordingly.

Updated population figures relating to the fiscal year 2006 as provided by the NHSO are attached (see EXCEL file *'Pop'*, worksheet *'MOI pop FY06')*). It can be observed that the total registered population is reported at about 62.28 million persons, of which about 30.54 million males and 31.74 million females.

2.1.2. Population projection

The population of Thailand (MOI-registered Thais and foreign residents) has been projected with the ILO population model. The starting population is given by the base year population, i.e., the MOI-registered population in the fiscal year 2006 (see previous section 2.1.1). The assumptions needed in the ILO model for the population projection include the following:

- Age-specific fertility rates for women aged 15 to 49
- The sex ratio (male/female) at birth,
- Life tables for males and females or alternatively their life expectancy at birth[1]

These assumptions are separately discussed below:

Total fertility rate

Age-specific fertility rates have been estimated from the MOI data available on newborns (by sex and by age of mother) and from the adjusted base year population. The resulting age-specific fertility rates are presented in the attached EXCEL file '*Fert*' (see worksheet '*Fert FY06*'). The total fertility rate - the sum of the estimated age-specific fertility rates for the ages 15 to 49 - amounts to 1.599 in the fiscal year 2006. For the population projection carried out it has been assumed that the age-specific fertility rates (and thus the total fertility rate) will remain constant at the same (2006) level over the whole projection period.

Sex ratio of newborns

The sex ratio of newborns has been estimated at 1.0395 newborn males per newborn female based on the MOI data on newborn provided by NHSO for the years 2002 – 2007 (see file '*Data_newborn_MOI*'). It is assumed that sex ratio at birth will remain constant at the same rate over the whole projection period.

Age-specific mortality rates

Mortality rates by age and sex have been estimated from the data on death registered in the MOI database (by age and sex) as provided by the NHSO. For the modeling of mortality rates, the Gompertz mortality model has been fitted using the hazard rates provided for the ages 40 – 85. The life tables obtained in this manner for males and females respectively suggest a life expectancy at birth (LEB) of 71.9 years for males and 79.1 years for females, this in the [fiscal] year 2006. These values are higher than those suggested earlier (see reports 'initial phase') and higher than the LEB suggested in the last Population Census, 2000, where life expectancy at birth was estimated at only 67.1 years for males and 74.8 years for females. The data on death rates observed and the life tables obtained from the fitted mortality model are included in the attached EXCEL file 'mort' (see sheet '*MOI data mort FY06')*.

[1] The model has a feature, which enables the estimation of single-age mortality patterns from input values on life expectancy at birth, this based on the UN model life tables for geographical region.

For the population projection, it has been assumed that the life expectancy at birth will increase gradually over the whole projection period for both males and females to reach, by the year 2051, 76.1 years for males and 82.2 years for females. It is further assumed that the relative pattern of age-specific mortality rates will remain unchanged with mortality rates for different ages decreasing at the same pace so as to result in the assumed target LEB values mentioned earlier.[2]

The assumed future LEB values for males and females are presented in the worksheet *'Assumptions'* (see attached EXCEL file *'Mort'*). The mortality rates by age and sex as estimated for future years from the assumed LEB values are presented in the worksheets *'Mort M'* and *'Mort F' (same EXCEL file).*

Projection results

Based on the assumptions summarized above, the total population (MOI-registered) is projected to increase from a total 62.3 million persons as registered in the fiscal year 2006 to an estimated 68.8 million persons in the fiscal year 2032, when the population will reach its peak, to decrease thereafter steadily to reach an estimated 65.4 million persons in the year 2051.

The demographic assumptions and results of the population projection are attached in electronic format to this report (see EXEL file *'pop'* in the attached electronic folder '*Population*').

2.2. *Labour force and Employment*

2.2.1. Base year data

Data on the Thai labour force and employment by age group and sex is available for the years 2001 - 2006 from the Labour Force Surveys (LFS) carried out by the National Statistical Office on a quarterly basis. Data for the fiscal year 2006 has been obtained by averaging the figures of the respective quarters (Q4/05 – Q3/06). As noted earlier, it was agreed to use for the labour force and employment the nominal figures reported in the LFS. The data is included in the attached EXCEL file '*Labour force TH*'.

2.2.2. Labour force participation rates

Labour force participation rates have been estimated for the base-year from the labour force figures obtained (see section 2.2.1) and from the base-year population data (as per section 2.1). Age-specific labour force participation rates have thus been determined by dividing the FY06 current labour force in each age/sex cohort by the respective cohort population in the base year.[3] The resulting labour force participation rates as estimated for the fiscal year 2006 are shown in worksheet 'LF part 06' (see EXCEL file '*Labour force TH').*

2.2.3. Labour force projection

For the projection of the labour force, age-specific labour force participation rates have been assumed constant over the whole projection period. The projected labour force,

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[2] This has been done by scaling down the whole mortality model curve in order to match the desired/assumed LEB value in each given year.

[3] Minor adjustments were needed to ensure that labour force figure in each age/sex cohort does not exceed the population figure in the respective cohort.

obtained simply by multiplying the projected population in each age/sex cohort by the assumed labour force participation rate for the respective cohort. The projected labour force and assumed age-specific labour force participation rates are included in the EXCEL file '*Labour force TH*' (see worksheets *'LabM'* and '*LabF*').

It can be observed that the projected current labour force is expected to increase gradually from the total number of 36.2 million in the fiscal year 2006 to a maximum of about 40 million in 2021 and to decrease thereafter gradually due to the projected decrease of the population.

2.2.4. Employment

According to the NSO figures on employment, the unemployment rate in the fiscal year 2006 is estimated at only about 1.5% [of the labour force]. The average unemployment rate over the five [fiscal] years 2002 to 2006 is estimated at 2 per cent per annum. For the projection of employment, it is assumed that the unemployment rate will remain constant at the rate of 2% over the whole projection period. The projected total number of employed is obtained by deducting from the projected [current] labour force the projected number of unemployed. The projected number of employed is shown in the worksheets *'EmplM'* and *'Empl F'*, see EXCEL file '*Labour force TH*'.

2.3. Economic module

As noted earlier a common economic module is needed to relate the models to the macroeconomic context within which the schemes operate. This is relevant for the projection of model parameters that do not evolve independently but on the contrary in line with or in a correlated manner with key economic variables such as the overall price or wage level in the economy.

Economic data and model parameters have been included in the EXCEL file 'Econ TH', which contains the following worksheets:

- *'SUMMARY'* - sheet containing the main economic variables of interest for the health care financing models including projected GDP, labour force and employment, labour productivity, prices and wages, and some health sector related variables.
- *'GDP'* – sheet containing time series data on GDP and National Income by composition for the period 1991 – 2006.
- *'Prices & wages'* – sheet containing historical data on prices (CPI and PPI) and average wages.
- *'LF balance'* – sheet containing time series on total population, labour force, and employment by category for the period 1990 – 2006.
- *'Health Sector'* – sheet containing selected data on the health sector, including value added, employment, and wages for the years 2001 - 2006.

The projection of the main economic variables is discussed below:

CPI

According to official figures, the Consumer Price Index is projected to increase by 2.2% in 2007 and by 4% in 2008.[4] It is assumed that as of the year 2009, the CPI will increase

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[4] Figures provided by the Fiscal Policy Office, Ministry of Finance

by 2.8% per annum, which is the average annual rate of increase over the period 2001 – 2008.

Labour productivity

Labour productivity is defined in the given context as GDP at constant (1988) prices per employed. For the years 2007 and 2008, the projected labour productivity can be obtained implicitly from the official GDP projection and the projected number of employed (see section 2.2.4). The implicit rate of labour productivity growth amounts to 3.7% and 3.9% for the years 2007 and 2008 respectively. For the year 2009 and onwards, it is assumed that labour productivity will increase at 3.1% per annum, which is equal to the average annual rate of increase over the period 2001 – 2008.

GDP at 1988 prices

In line with official projections, it is assumed that GDP at constant (1988) prices will grow at 4.5% and 5% respectively in the years 2007 and 2008.[5] For the projection of GDP as of 2009 and onwards, the following formula has been applied:

$$GDP_t^{(P88)} = \tilde{e}_t \cdot \tilde{p}_t$$

Where: $\tilde{e}_t$ refers to employment projected for the year t (see section 2.2.4), and

$\tilde{p}_t$ refers to labour productivity projected for the year t (see above)

Based on projected employment and labour productivity (see above), it can be observed that the rate of real GDP growth is projected at 4.2% for the year 2009, to decrease gradually to about 3.2% in the year 2020.

GDP at market prices

GDP at market prices is obtained by multiplying projected GDP at constant prices by the GDP Deflator. It is assumed that the latter will increase at the same rate than the CPI as of the year 2007. A projection for the GDP at market prices is thus obtained from the projected GDP at constant prices (see above) and the projected GDP deflator.

Wages

For the projection of wages, it is proposed to use the elasticity to overall productivity growth in nominal terms. For the period 2000 to 2005, the elasticity of the national average wage to labour productivity is estimated at 0.72. It is therefore assumed that as of the year 2006 the national average wage is growing annually at 72% of the projected nominal rate of labour productivity growth.

3. Health Care Financing Model for the CSMBS

3.1. Demographic module

Demographic modeling for the CSMBS was discussed under the initial phase assignment. Details on the proposed methodology and model structure were provided in the first report (see 'Missionreport 2', Initial Phase). The demographic module for the CSMBS is included in the attached EXCEL file 'CSMBS CoPop FIN'. The file contains the following worksheets:

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[5] Ibid

- *'SUMMARY'* – this sheet contains a summary of the projection results
- *'CovPop FY06'* – sheet containing the CSMBS-covered population by category (civil servant, permanent employee, spouse, child, mother, father) as at 1 April 2006, i.e., at the mid-year point of the fiscal year 2006
- *'CovPop Male' and 'CovPop Female'* – sheets containing the resulting populations, males and females given by single age, as covered under CSMBS
- *'Active M/F'*, *'Pens M/F'*, *'Spouse M/F'*, *'Children M/F'*, *'Mother of M/F'*, *'Father of M/F'*, – sheets containing the projected population of the different types of insured by sex and single age.
- *'Husband ADIST'*, *'Spouse ADIST'*, *'M/F mother ADIST'*, *'M/F father ADIST'*, *'Mother of M/F'*, *'Father of M/F'*, – sheets containing the dependency ratio and age distributions of dependents by age and sex of actives and pensioners.
- *'Mort M'*, *and 'Mort F'* – sheets containing the projected mortality rates by age for males and females (see population projection, file 'Mort').[6]

The results of the demographic projection for the CSMBS are included in the worksheet 'SUMMARY'. It can be observed that under the given assumptions the population covered under the CSMBS is projected to increase from about 4.3 million as observed in the fiscal year 2006 to about 5 million in the fiscal year 2020.

3.2. Expenditure model

The modeling of expenditure for the CSMBS was discussed extensively under the initial phase assignment and a final draft of the proposed model structure was presented in the final mission report. The expenditure model is provided in the attached EXCEL file '*CSMBS HCF MODEL*'). It can be observed that the file contains the following worksheets:

- *'INPUT data'* – sheet for the input of base year data, including expenditure and utilization by benefit category
- *'INPUT assumptions'* – sheet for specifying assumptions on cost structure and future development of input prices and volumes (for both OP and IP care).
- *'OP utilization'* – sheet containing age-specific utilization rates of males and females for out-patient care (excluding routine examinations), this for the base year and the projection period.
- *'OP examination'* – sheet containing cost structure of the routine medical examination as provided annually to all actives and pensioners.
- *'IP utilization'* – sheet containing age-specific utilization rates of males and females for in-patient care, this for the base year and projection period.
- *'IP charges'* – sheet containing data on cost structure of in-patient care (cost per admission) for males and females, this in the base year and projected.
- *'OP case-mix'* – sheet containing data on case-mix per admission by age and sex (included for potential use in the future in connection with the assessment of reform options).

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[6] Separate mortality tables have been included here so that specific assumptions on the mortality of civil servants and their dependents can be assumed if deemed necessary.

- *‘CovPop Male’* and *‘CovPop Female’* – these sheets contain the data on the projected coverage by age and sex as obtained in the demographic module.
- *‘ActPens Male’* and *‘ActPens Female’* – these sheets contain the demographic data on the projected number of actives and pensioners by age and sex as obtained with the demographic module.
- *‘OUTPUT’* – sheet summarizing the results of the projections, including on coverage, benefit utilization, expenditure, and per capita cost.

The data included in the model is meant for illustration only. Assumptions and projection results will be discussed in the nex report.

4. Health Care Financing Model for the SSS

4.1. Demographic module

Demographic modeling for the SSS was discussed under the initial phase assignment; the details on proposed methodology were included in the final mission report. The demographic module for SSS is provide in the attached EXCEL file ‘SSS CovPop FIN’. The file contains the following worksheets:

- *‘INPUT assumptions’* – this sheet contains assumptions on SSS coverage.
- *‘CovPop Male’ and ‘CovPop Female’* – sheets containing the resulting populations, males and females given by single age, as covered under SSS.
- *‘CovRate Male’ and ‘CovRate Female’* – sheets containing the projected coverage rates for males and females, given by single age.
- *‘SSO Pop FY06’* – sheet containing the data on the SSS-covered population in the fiscal year 2006 (registrations for HI).
- *‘SSO Pop FY07 est’* – sheet containing the data on SSS-covered population as estimated for the fiscal year 2007 (registrations for HI).

A summary of the demographic projection for the SSS is given in the worksheet ‘INPUT assumptions’. It can be observed that under the given assumptions the population covered under the SSS is projected to increase from about 8.98 million as observed in the fiscal year 2006 to about 14.91 million in the fiscal year 2020.

4.2. Expenditure model

Expenditure modeling for the SSS was discussed extensively under the initial phase assignment and a final draft of the proposed model structure was presented in the final mission report. The proposed expenditure model is provided in the attached EXCEL file ‘*SSS HCF MODEL*’. It can be observed that the file contains the following worksheets:

- *‘INPUT data’* – sheet for the input of base year data, including expenditure and utilization by benefit category
- *‘INPUT assumptions’* – sheet for specifying assumptions on cost structure and future development of input prices and volumes (for both OP and IP care).
- *‘OUTPUT’* – sheet summarizing the results of the projections, including on coverage, benefit utilization, expenditure, and per capita cost.

- *'OP utilization'* – sheet containing age-specific utilization rates of males and females for general out-patient care, this for the base year and projection period.
- *'IP utilization'* – sheet containing age-specific utilization rates of males and females for in-patient care, this for the base year and projection period.
- *'IP case-mix'* – sheet containing data on average case-mix (adjusted relative weights) per admission by age and sex.
- *'High cost', 'HIV/AIDS', 'Bone marrow', etc.* – sheets containing age-specific data on average cost per capita and annual benefit expenditure for different benefits provided by SSS on a fee-for-service basis.
- *'CovPop Male'* and *'CovPop Female'* – these sheets contain the data on the projected coverage by age and sex as obtained with the demographic module.
- *'Time series EXP'* – sheet containing historical data on SSS medical benefit expenditure for the years 1991 – 2007.

It is noted that the data included in the model is for illustration only. Assumptions and projection results will be discussed in the following report.

5. Health Care Financing Model for the UC scheme

5.1. Demographic module

Demographic modeling for the UC was discussed under the initial phase assignment. As reported earlier, it is proposed to model the UC population starting from the residual that is obtained through the subtraction of the CSMBS and SSS-covered populations from the projected total population, this by sex and single age. The demographic module for the UC is included in the attached EXCEL file '*UC CovPop FIN*'. The file notably contains the following worksheets:

- *'SUMMARY'* – this sheet contains a summary of the projection results, including the figures on total population and coverage of the respective schemes.
- *'CovPop Male' and 'CovPop Female'* – sheets containing the resulting populations, males and females by single age, as covered under the UC scheme.
- *'TPop Male' and 'TPop Female'* – sheets containing the residual populations, males and females by single age, obtained after subtraction of the CSMBS and SSS-covered populations from the projected total population.
- *'CovRate M', and 'CovRate F'* – sheets containing the assumed coverage rates, i.e., the covered UC population expressed as a percentage of the respective target populations by single age for males and females.
- *'Husband ADIST', 'Spouse ADIST', 'M/F mother ADIST', 'M/F father ADIST', 'Mother of M/F', 'Father of M/F',* – sheets containing the dependency ratio and age distributions of dependents by age and sex of actives and pensioners.
- *'Pop M', and 'Pop F'* – sheets containing the projected Thai population by age for males and females as obtained from the population projection (see file 'Pop').

The results of the demographic projection for the UC scheme are included in the worksheet 'SUMMARY'. It can be observed that under the given assumptions the population covered under the UC scheme is projected to decrease gradually from about 47.5 million in the fiscal year 2006 to about 45.8 million in the fiscal year 2020.

5.2. Expenditure model

Expenditure modeling for the UC scheme was discussed extensively under the initial phase assignment and a final draft of the proposed model structure was presented in the final mission report. The proposed expenditure model for the UC scheme is provided in the attached EXCEL file '*UC HCF MODEL*'. It can be observed that the file contains the following worksheets:

- *'INPUT data'* – sheet for the input of base year data, including expenditure and utilization by benefit category
- *'INPUT assumptions'* – sheet for specifying assumptions on cost structure and future development of input prices and volumes (for both OP and IP care).
- *'OUTPUT'* – sheet summarizing the results of the projections, including on coverage, benefit utilization, expenditure, and per capita cost.
- *'OP utilization'* – sheet containing age-specific utilization rates of males and females for general out-patient care, this for the base year and projection period.
- *'IP utilization'* – sheet containing age-specific utilization rates of males and females for in-patient care, this for the base year and projection period.
- *'IP case-mix'* – sheet containing data on average case-mix (adjusted relative weights) per admission by age and sex.
- *'PP'* – sheet containing data on average cost per capita (age-specific) and total annual expenditure for services provided under the 'Prevention and Promotion' programme.
- *'CovPop Male'* and *'CovPop Female'* – these sheets contain the data on the projected UC coverage by age and sex as obtained with the demographic module (see previous section).
- *'EXP FY06'* – sheet containing input data on UC expenditure in the FY 2006.

It is noted that the data included in the model is for illustration only. Assumptions and projection results will be discussed in the following report.

6. Expenditure model for IHPP

The purpose of the model to be developed for the IHPP is to project total national expenditure on health as compiled in the National Health Accounts (NHA) of Thailand. The data has been provided by the IHPP for the years 1994 – 2005 (Table 1, NHA).

As noted in earlier reports, it is proposed to use the results of the scheme-specific projections for the expenditure of the SSS, UC, and CSMBS, which are being undertaken with the health care financing models developed for each schemes. For the expenditure of other agencies/ministries, it is proposed to undertake separate projections based on the trend of expenditure observed for past years.

For the projections, it is further proposed to break up total expenditure into current and capital expenditure since these two figures display distinctive paths over the past years (1994 – 2005). It can notably be observed that current expenditure in nominal terms has increased consistently over the period 1994 – 2005, except for the crisis years 98 and 99. Total current expenditure in relative terms rose over the same period from about 3.04 per cent of GDP in 1994 to about 3.36 per cent of GDP in the year 2005.

As for capital expenditure in aggregate, a different trend can be observed; the figures for the same period seem to show a decreasing trend starting after the crisis, i.e., from the year 1999 onwards. It can be observed that capital expenditure in relative terms has so far not recovered to pre-crisis levels [of at least 0.5 per cent of GDP]. However, the low level of capital expenditure for health observed in recent year may well have other explanations, which should be explored with IHPP.[7]

The preliminary expenditure model proposed for IHPP is provided in the attached EXCEL file 'IHPP EXP model v.0' (see sheet 'SUMMARY all agencies'). It can be observed that total expenditure has been projected in aggregate, as the sum of projected total current and capital expenditure, this pending availability of the projected expenditure figures for the CSMBS, SSS, and UC schemes.

7. Next steps

The next steps planned by the consultant are listed below in sequential order:

a. Analysis of time series on cost structure history (based on data made available) for estimating the relative importance and level of cost pressures by the different cost components in the past; and formulation of assumptions on cost drivers for expenditure projections;

b. Status quo projection of expenditure for the three schemes and in aggregate (IHPP model);

c. Consultations with schemes and international experts regarding reform options being considered by each scheme, notably on the capitation allocation mechanism;

d. Development of budget allocation modules;

e. Projection of scheme expenditure and budget allocations for alternative reform scenarios under considerations;

f. Drafting of manuals on model handling and maintenance for each scheme;

g. Development of training materials;

h. Carry out a 3-day introductory training seminar for all institutions involved;

i. Carry out hands-on training sessions with all four institutions;

j. Formal hand-over of models and supporting documentation (manuals) to all four institutions.

It is noted that some of the activities listed above are overlapping. The sequence proposed is subject to change; this will depend on the availability of counterparts (and data/information to some extend) and on the pace of progress achieved with the preceding steps.

[7] It is suspected for instance that the change in accounting standards for hospitals from cash to accrual basis as implemented in 2002/2003 has lead to a decrease in capital expenditure reported as of the year 2003.

ANNEX

Terms of Reference:

These Terms of Reference (TOR-SP) refer to the second phase (SP) of the development of a: health care financing model, and staff capacity building, for the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and the International Health Policy Programme (IHPP) of Thailand.

With respect to the first (initial) phase (TOR-IP) reference is made to contract PO/Ver No: 40029956, dated 29.06.2007

It is understood that, at the commencement of this contract (TOR-SP), the obligations and works of the contract of the initial phase (TOR-IP) have been fulfilled such that the tasks to be carried out under this contract (TOR-SP) can be fulfilled.

The overall contents of the Draft Terms of Reference (so-called Draft03 dated 02/05/2007, see attachment to contract re TOR-IP) remains valid. The contractor to these TOR-SP is advised to refer to Draft03 for further information.

The contents of Draft03, as far as not replaced by these TOR-SP, is valid; the time frame defined in Draft03 is however not fully applicable anymore. For the second phase of modelling, these TOR-SP replace the time frame of Draft03 (see the attached updated flow chart of activities under TOR-SP).

A. Activities to be carried out

Under the supervision of the Senior Economist of the ILO Social Security Department and the Social Security Specialist of the ILO SRO-Bangkok, the contractor to these TOR-SP will undertake the following tasks:

On the background as provided in Draft 03 (see above), he will develop four (4) health care finance models, which, each, are characterized by the fact that they can be based on a common, coordinated set of assumptions on demography, economy, labour market, health care utilization and unit cost developments.

The models will be designed such that they project expenditure and revenue of Thailand's health system(s); the models are annual, i.e. they are based on annual data and will produce annual (annualised) outputs; their time horizons will range from short (for budgeting purposes) to long-term.

Institutional, legal and behavioural specificities of the three single schemes will be sufficiently mapped; the scope of the data base of the model for the IHPP goes beyond the scope of the data bases of the three schemes but, where possible, the IHPP model will make use of the data bases of the three schemes.

Core technical staff from the three schemes and the International Health Policy Programme (IHPP) in charge of the maintenance of the model(s), will support the model development and be trained (see below) in the usage and future calibration of the models.

Especially the contractor will:

(1) Establish a common demographic, labour market and economic frame for the four models to be developed for CSMBS, NHSO, SSO and IHPP;

(2) Establish the health care financing modules for three schemes CSMBS, NHSO, and SSO as well as the model for the IHPP (NHA);

(2a) Develop modules for allocating the available overall resources (budgets) to the hospitals that have contracted with NHSO and SSO. The contractor will explore the feasibility of the development of such a module for CSMBS, and make proposal(s), accordingly. Technically, the allocation mechanism will be "top-down" for both, NHSO and SSO, and it will, to the extent possible, replicate, as a standard procedure, the present mechanisms applied by NHSO. The allocation mechanism for SSO will be newly developed; where appropriate, the SSO allocation mechanism will draw advantage from the allocation mechanism developed for NHSO;

(3) With a view to most appropriate model design (possible simulation options; see also point (5) below): consult with CSMBS, NHSO, SSO and IHPP staff on possible reform plans of the CSMBS, NHSO and SSS. These might include different allocation formulas, different ways of capitation calculation (for example,. with or without inclusion of capital depreciation), or the possible coverage of dependents and future pensioners (SSO);

(4) Decide on modelling options that most appropriately incorporate any of those mentioned details;

(5) Carry out status-quo projections, and reform simulations in coordination and cooperation with the staff of CSMBS, NHSO, and SSO – in order to validate the significance of the outputs of the established models; consult with the staff of the CSMBS, NHSO, SSO and the IHPP on the projection and simulation results, and modify the models' structures to the extent that they produce unreasonable results;

(6) Describe, for each institution (CSMBS, NHSO, SSO and IHPP) separately,
   (a) the procedures of model maintenance,
   (b) the handling of the model;

(7) Develop training material;

(8) Carry out a three days common introductory training workshop (proseminar) for the staff of the CSMBS, NHSO, SSO and the IHPP on the purpose and use of the models;

(9) Carry out separately, for the staff of each of the institutions CSMBS, NHSO, SSO and the IHPP, hands-on training at staff work places, on the technical use of their respective models;

(10) Hand out the electronic version, and any accompanying training material, of the models to the staff of the CSMBS, NHSO, SSO and the IHPP;

(11) Provide the above (items (1) to (10)), and all other stipulations contained in this document to the satisfaction of the ILO.

As part of the technical modeling work, in addition to the electronic model to be developed and in order to reflect and document work progress, the contractor writes the following reports on the above items (draft titles – open to adjustments in consensus with ILO-SECSOC):

(A) A common demographic, labour market and economic frame and health care financing modules for CSMBS, NHSO, SSO and IHPP. (This report covers item (1), above.)

(B) Financial projection models for CSMBS, NHSO, SSO and IHPP – core design and technical incorporation of allocation formulae and reform options. (This report covers items (2), (2a), (3) and (4), above.)

(C) Status-quo projections, and reform simulations, for the financial development of CSMBS, NHSO, SSO and under NHA (IHPP). (This report covers item (5), above.)

(D) Model maintenance and practical handling of the models of CSMBS, NHSO, SSO and IHPP. A manual. (This report covers items (6) and – partially - (7), above.)

(E) Introduction to the practical use of the models for CSMBS, NHSO, SSO and IHPP. Seminar training material. (This report covers items (7) – partially –, and the didactical material needed for items (8) and (9), above.)

(F) Note on the formal hand-over of the models and any accompanying material to the staff of CSMBS, NHSO, SSO and IHPP. Formal notes on the delivery of the training activities. (This note covers items (8), (9) and (10), above.)

B. Schedule

The work is expected to be accomplished over a six-months period, starting with the signature of the contract to which these TOR-SP refer.

A work flow chart stipulating which work should reasonably be done when is attached. It contains the proposal for another, deepening, workshop for the Thai counterparts / users of the model, after the completion of the works to be undertaken under these TOR-SP. This deepening workshop is not part of these TOR-SP.

C. Preconditions and caveats

It is assumed that necessary data for the model(s) have been collected in close collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff. This work has provided all involved with an a priori understanding of the actual modeling (model design) to be undertaken.

In case of delays in the data collection process (see TOR-IP), which might “stretch” the process of data collection and of constructing the data base into this second phase (TOR-

SP) of the project, there could be a delay in delivery of the results as expected under these TOR-SP.

The budget to this contract is expert fees (including fees for his participation in seminars / training workshops, lecturing fees, if any, including travel required under the TOR-SP). Other cost such as printing cost of the reports, the cost for seminars / training workshops (e.g. cost for the venue, equipments and refreshments) are not included in this budget, and will be covered separately.

THAILAND

Development of a Health Care Financing Model

Second Phase

REPORT B

9 June 2008

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Consulting Actuary
ILO

CONTENTS

1. Background

The present report was drafted within the framework of the consultancy agreement concluded by the consultant and the International Labour Office (External Collaboration Contract no. 40033646/0 signed on 1 February 2008). The assignment is taking place within the wider context of the cooperation agreement signed by the International Labour Office (ILO) and the European Commission (EC) on 9 February 2006 regarding the EC project 'Heath Care Reform in Thailand' (THA/AID/CO/2002/0411, 2004 – 2009), agreement stipulating that the project component 'Financial Management of the Thai Health Care System' shall be implemented by ILO.

The consultancy assignment mentioned above is referred to in the following as the 'second phase' assignment; it was arranged in continuity with an earlier agreement (referred to as 'initial phase'), which had been completed in December 2007.

The purpose of the present report is to present outputs 2a, 3, and 4 as stipulated in the terms of reference (see Annex A), comprising the following:

- The development of modules for the allocation of scheme budgets earmarked for medical care to contracted providers, this for the UC, SSO, and possibly for the CSMBS scheme.
- To consult with the three schemes regarding reform options under consideration with a view to incorporate reform scenarios in the assumptions used for model calculations.
- To complete the design of HCF models and allocation modules by incorporating as relevant all modeling features required for the financial assessment of reform options.

The report draws on the findings and modeling work carried out under the previous assignment (initial phase) and on the follow-up activities undertaken since. It is structured as follows:

Section 2 contains a description of the resource allocation and provider payment mechanisms currently in place for the UC, SSO, and CSMBS.

Section 3 provides a summary description of the budget allocation modules developed.

Section 4 comprises a description of reform options currently under consideration for the three schemes and a discussion of implications on model design.

Section 5 provides a brief discussion on miscellaneous issues considered of relevance in relation to modelling, and Section 6 contains a list with the next steps planned under the assignment.

The author would like to acknowledge the good cooperation extended by the Thai counterparts from the respective institutions. Special thanks are due to Ms Rangsima, SSO, Mr Kulsek Limpiyakorn, CSMBS, Ms Taweesri Greetong and Ms Kongkran, NHSO, for their continued assistance with data collection and feedback on modeling, and particularly to the national project component manager, Dr. Thaworn Sakunphanit, for his support and overall guidance.

2. Resource allocation and provider payments mechanisms

It was mentioned in earlier reports that the three schemes, UC, SSS, and CSMBS, differ significantly in their features, notably in terms of their respective financing mechanisms. The systems in place at present for allocating funds to service providers who provide medical services to insured members differ between the three schemes in particular. The objectives of this section is to describe the pecularities of the resource allocation and provider payment mechanism of each scheme.

2.1. *The Social Security Scheme (SSS)*

Under the SSS, contracted medical service providers are paid according to the capitation system for both general out-patient and in-patient care. A list of specific treatments is excluded from the capitation system and reimbursed separately, this on a fee-schedule or capped fee-for-service basis (i.e., with a predetermined ceiling). Not included in the package of services provided under the capitation system are the following:

- Accident/emergency care if provided by another provider than the main provider where the insured person is registered
- All treatments classified as high-cost, which include the following:
  - Chemotheraphy and radiotheraphy
  - Open heart surgery
  - Brain surgery
  - Medical implants
  - Corronary bypass
  - Percutaneous balloon valvuloplasty
  - Cryptococcal meningitis
  - Coronary dilatation using balloon or PTCA bypass
  - Atrial septal occluder
  - Sterilization (male & female)
- Dental care
- Bone marrow transplant including related drugs
- Hemodialysis, chronic peritoneal dialysis, and renal failure drugs
- HIV/AIDS drugs and diagnostics
- Kidney transplant
- Cornea transplant

All the benefits listed above are reimbursed separately on a per case basis. The respective payments consist either in a fixed fee or in a variable fee-for-service amount (reimbursement up to a ceiling specific to each treatment). Ceilings on reimbursements are adjusted occasionally although no timetable is set in advance for periodical adjustments.[1]

The capitation fee is negotiated annually by the SSO Medical Committee; it includes a basic amount and two separate increments referred to as ‘Utilization Incentive’ and ‘Risk Adjustment’. The two capitation increments are meant to compensate providers according to the actual service utilization rate observed (for both OP and IP care) and based on the relative risk of the population registered with each provider respectively. The risk adjustment partially compensates providers for higher cost caused by high prevalence of chronic diseases and high frequency of costly IP treatments (measured by the cumulated amount of adjusted relative DRG weights) provided over a certain reference period in the past. The mechanism for calculating risk adjustment and utilization incentive is presented in detail in Annex B.

[1] The ceiling amounts for certain treatments have not been adjusted since the launch of the scheme in 1991.

The capitation system is currently under review by the SSO Medical Committee (see section 3.1). It is notably being assessed whether providers are compensated adequately for risk differentials under the current capitation mechanism.

2.2. *The Civil Servants' Medical Benefits' Scheme*

The CSMBS is different from UC and SSS in that it operates mainly on a fee-for-service basis for the reimbursement of medical benefits provided to its members with the exception of PP care and, to a certain extent, IP care.[2] Medical providers for CSMBS consist exclusively of public hospitals except for emergency cases and accidents.[3] Amounts reimbursable by the scheme for medical services provided are subject to ceilings stipulated in the following reference documents:

- Circular nr. 0417/77 of the Ministry of Finance (15 Feb 05) on the reimbursement of cost for medical devices and artificial organs
- Circular nr. 0417/177 of the Ministry of Finance (1 Dec 2006) on the reimbursement of cost for medical service fees for outpatient and inpatient care

For the payment of outpatient care, eligible members so far had to pay providers first at the point of service and claim the reimbursement subsequently from CSMBS by producing the relevant receipts. Since October 2006 however, providers can submit bills electronically via the computer-based 'Direct Payment System' and CSMBS members no longer have to advance the reimbursable amounts.

For the reimbursement of costs relating to inpatient episodes, CSMBS currently makes use of the DRG system (version 3.3), which was introduced in July 2007. However, the DRG-based payment system as applied by CSMBS excludes the reimbursement of specific service items included under IP care, such as the cost for room and board, medical devices and appliances, specific drugs (for cancer treatments, etc.), and the cost of IP care provided during the non-acute phase of admissions; all these benefits are still reimbursed on a (capped) fee-for-service or fee-schedule basis, as it was the case before the introduction of the DRG system. Furthermore the CSMBS does not apply a universal DRG base rate (payment per unit of adjusted relative weight) across all providers for the payment of IP care but a specific base rate for each hospital.[4]

The benefit expenditure as incurred by CSMBS has soared over the past years, particularly for outpatient care. Due to this, reform options aiming at the containment of cost are currently under consideration. Reform options under discussion include the adoption of a co-payment mechanism for outpatient care, the reform of the provider payment mechanism, and the introduction of a full-fledged health insurance scheme for civil servants and their dependents (see section 4.2).

2.3. *The Universal Coverage Scheme*

With the UC scheme medical providers are paid by the National Health Security Office (NHSO), who acts as the sole and central purchaser of services on behalf of its members.

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[2] This is not the case for PP benefits, which are financed under the UC scheme for the whole population.

[3] For a few other specific treatments (e.g., renal dialysis), CSMBS members can seek care in private hospitals.

[4] Provider specific base-rates are currently determined by the CHI based on IP charges reported by each provider during previous periods.

In a similar manner to SSS, the provider payment mechanism used by NHSO is a mixed system combining capitation and payments by fee schedule (or capped fee-for-service respectively). However, the main difference between SSS and UC is that the UC budget is essentially a closed-end budget, whereas the SSS budget is not.

The budget allocation mechanism used by the NHSO is quite complex; it consists of a series of successive steps. The total budget agreed upon with the Bureau of the Budget (BoB) is first broken down in 7 items, which are the following:

- Disease prevention and health promotion (PP)
- Outpatient care (OP)
- Inpatient care (IP)
- Emergency medical services (EMS)
- Budget for disability benefits (DIS)
- Capital replacement cost (CAP)
- Budget for the compensation of no fault liability claims (NFL)[5]

The break down for the items listed above is determined on the basis of the projected expenditure for the different items respectively (see Annex C for details). The overall allocation for each component is then paid to providers or broken down further and allocated to specific treatments by following the methodology summarized below:

a) Disease prevention and health promotion benefits (PP)

The budget for prevention and promotion is disbursed to providers based on the population in their catchment area and on their age/sex distribution since this determines the number of people in the respective target groups for PP activities. Payment is partly in kind (for vaccines, etc.) and partly in cash for the labour component and other cost.

b) Outpatient care (OP)

The overall OP budget is first divided into general OP care (capitation) and other non-capitation benefits, which include add-on items, disease management items, and medical investigation (laboratory, etc.). To this end, expenditure for non-capitation items has to be projected first (one-by-one) and the corresponding budget allocations set aside. The remaining part of the overall budget, after deduction of all non-capitation items, constitutes the budget for general OP care (GOP); based on the latter the capitation fee is calculated for each province by taking into account the age structure of the population in the province, this based on fixed risk weights for different age groups. The age-adjusted capitation fee is then paid out to individual providers in each province based on the number of registered UC members. OP 'add-on' and 'disease management' benefits are reimbursed to providers on a fee schedule or capped fee-for-service basis. A detailed description of the budget allocation mechanism for UC outpatient care is provided in Annex C.

c) Inpatient care (IP)

For inpatient care, the procedure is similar to OP. The overall budget allocation for IP is divided into general IP care, 'add-on' items, and IP 'disease management'. Expenditure for 'add-on' items and 'disease management' benefits is projected first (one-by-one) and

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[5] In the fiscal year 2008 no budget is allocated for this item since the reserves accrued from earlier years were deemed sufficient to cover expenses incurring during that year.

the corresponding budget set aside. The budget set aside for 'add-on' items is a closed-end budget; it is allocated to providers through a point system where the benefit amount is determined implicitly (ex post) based on the number of claims submitted. Inpatient benefit included under 'disease management' are reimbursed to providers on a fee-schedule basis, ergo the respective budgets can be considered open-end.[6]

The remaining budget, after deducting allocations for add-on items and disease management benefits, is earmarked for general IP care; it is then allocated to providers via the DRG system. Once the overall budget allocation for GIP has been determined, it is allocated to the 13 regions based on the relative share of projected ARWs in each region. The GIP budget allocation for each region is fixed once it has been allocated (close end budget); the base rate per ARW as paid out to providers in each region is determined implicitly (ex post) by dividing the total budget allocated by the total number of ARWs reported by providers in the region for the respective period. A detailed description of the methodology is provided in Annex C.

d) Emergency medical services (EMS)

The budget for emergency medical services (mainly transportation) has been disbursed so far to provincial health offices in each province; these were in charge of allocating budgets to local providers contracted for providing emergency services. As of the year 2009 however, emergency medical services for UC members will be financed from a special fund to be established in conformity with the 'Medical Emergency Act, 2008.

e) Budget for disability benefits (DIS)

The budget for disability benefits is disbursed to providers for benefits (prosthesis, etc.) provided to UC members based on claims submitted to the NHSO. Payment is by fee schedule depending on the benefit provided.

f) Capital replacement cost (CAP)

The budget earmarked for capital replacement and investment is allocated by NHSO to individual providers according to the capital investment plan prepared by MOPH on the national level.

g) Budget for the compensation of no fault liability claims (NFL)

This budget is paid out to providers for cases where compensation has been paid by a provider to a UC member for the settlement of a no-fault liability claim. Payments are disbursed based on the amount of compensation awarded.

3. Budget allocation modules for SSS and UC

According to the terms of reference the project intends to develop resource allocation modules for the UC and SSS schemes and to explore the feasibility of developing a similar module for the CSMBS (see Annex A). The respective allocation modules shall be integrated in the health care financing models of each scheme as an addendum to the existing cost projection models. Their purpose is to enable the allocation of the overall budget resources that will be made available (upon agreement between NHSO, BoB and providers, or between SSO and providers respectively) to the contracted providers in different provinces and/or regions.

[6] For some of these benefits (open heart surgery, cataract surgery, diabetes mellitus, and tuberculosis drugs) quota have been adopted in an attempt to contain cost within the limits of the allocated budget.

The allocation modules developed for SSS and UC reflect the mechanisms currently in use by the two schemes for the allocation of capitation budgets. A description of the two modules is provided below. The modules consist of EXCEL spreadsheets with input and output fields (files attached to the electronic version of the report).

3.1. SSS Capitation Allocation Module

The allocation module designed for SSS consists of a single worksheet, which allows the allocation of the overall SSS budgets for basic capitation, risk adjustment, and utilization incentive to the contracted providers based on specific variables, which include the following: population registered with each provider respectively, chronic disease score, and relevant data on actual utilization (OP visits and DRG relative weights) during the period in question. The SSS allocation module is based on annual data (summary) although in practice the capitation fee is paid on a monthly basis. It is also noted that, according to the current practice, 75 per cent of the capitation budget is paid prospectively at the beginning of each month while the remaining 25 per cent are paid retrospectively at the end of the month, allowing thereby for the adjustment of the total payment based on the actual number of persons registered on average during each month.[7] The budget allocated for the 'utilization incentive' and 'risk adjustment' portions are paid quarterly; prospective payments are based on projected utilization and ARWs respectively, but they are adjusted ex post based on actual utilization experienced. In the SSS allocation module proposed, only the final amount due each year is shown but not so the amounts paid prospectively (CHECK).

The spreadsheet-based SSS allocation module comprises the following input fields (highlighted in grey colour):

- Capitation fee (flat rate) for the period
- Risk adjustment (average amount) for the period
- Utilization incentive for the respective percentile ranges for the period
- Average number of insured persons registered during the period
- Total score for chronic disease patients registered during the period
- Aggregate number of outpatient visits during the period (actual data)
- Aggregate number of bed days during the period (actual data)
- Aggregate number of adjusted relative weights (as per DRG system)

Output fields in the module (as highlighted in light blue) are the following:

- Total amount of basic capitation due for the period
- Total amount of utilization incentive due
- Total amount of risk adjustment due for OP
- Total amount of risk adjustment due for IP
- Aggregate amount due for GOP and GIP care for the respective period

The allocation module for the SSS is attached to the electronic version of this report (see EXCEL file 'SSO allocation module').

3.2. UC Capitation Allocation Module

[7] The number of registered is determined by taking the average number of registered at the beginning and end of the month.

The allocation module as proposed for the UC scheme comprises two spreadsheets named 'OP' and 'IP' and allows for the allocation of the UC capitation budget for general OP and general IP care. The two spreadsheets are described below.

In the sheet 'OP', the overall capitation budget for General OP care is allocated to provinces based on age structure of the UC population as registered in each province, and cost weights predetermined by age group. After weighting for age, the provincial capitation fees are adjusted if necessary to ensure the values obtained for all provinces are within 10 per cent (plus or minus) of the overall average capitation fee. The spreadsheet 'OP' contains the following input fields:

- Amount of overall budget allocation for general OP care
- Registered population by age group for all (76) provinces

The sheet contains the following output fields:

- Total number of cost weights by province
- Preliminary budget allocation
- Preliminary amount of capitation fee for each province
- Capitation fees adjusted for the 10 per cent rule for each province
- Final capitation fees by province

The spreadsheet 'IP' allows for the allocation of the General IP budget to the (13) different regions based on the projected regional utilization rate for IP care and average case-mix index (the latter is assumed constant from the previous year in each region). Distinction is made between IP care sought within the zone and IP care sought outside the zone where the patient is registered initially. The budget is allocated based on the number of ARWs projected for each zone and base rate adopted. Regarding the latter, a distinction is made by NHSO between IP care provided within and outside of each zone; hence different base rates have to be set.[8] The spreadsheet contains the following input fields:

- Capitation fee for GIP care
- UC population registered in each zone and total
- IP utilization rate projected for each zone
- Percentage of care sought out of zone for each zone respectively
- Average case-mix index per admission for care sought both in and out of zone
- Base rate for IP care sought out-of-zone

The output fields of the sheet 'IP' are the following:

- Projected number of admissions for in zone and out-of-zone IP care
- Projected number of ARWs for in zone and out-of-zone IP care
- Base rate for IP care provided within each zone
- Budget allocated for each zone, both for in zone and out-of-zone IP care

The UC capitation allocation module is attached to the electronic version of the report (see file 'UC allocation module').

3.3. Allocation module for CSMBS

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[8] It is noted that one of the two base rates can be set freely, whereas the other one is given endogenously.

At present the CSMBS predominantly uses the 'fee-for-service' payment system for the reimbursement of providers. The total amount of the funds paid eventually to providers is not fixed in advance but on the contrary 'open end'. In the absence of an obligation or need to contain expenditure within a fixed boundary, the budget allocation issue becomes pointless, particularly in the context of a fee-for-service payment system.

However, in light of the reforms under consideration by CSMBS (see section 4.2 below), particularly those aiming at containing costs in the future, a budget allocation module may be useful to CSMBS at some point in the future. This should notably be the case if CSMBS were to adopt the capitation system for outpatient care as it has been suggested.

The relevance of designing a HC resource allocation module for CSMBS at some point in the future thus depends on the direction of the aforementioned reforms, particularly those pertaining to the provider payment arrangements used by CSMBS. But since reform options are still in a preliminary stage of discussion, the development of a budget allocation module for CSMBS is not considered necessary at this stage.

4. Reform options under consideration and implications on model design

The main purpose of this section is to summarize the reform options under discussion for each scheme with regard to its financial arrangements. Of particular relevance in this context are the reform options considered for the provider payment mechanisms in place, since such reforms may have implications on model design, notably for the proposed allocation module.

4.1. The Social Security Scheme

The Social Security Office is currently considering to reform its mechanism for allocating capitation monies to providers. To that effect, a study is currently being undertaken by an SSO expert in order to assess the existing capitation allocation mechanism and to work out a concrete reform proposal for the allocation of capitation monies to providers.[9]

A reform has been considered following disagreements with certain providers who argue that the current allocation method does not account sufficiently for risk differentials borne by different types of providers. There are indications for instance that some types of providers (such as teaching hospitals) are treating a disproportionate number of high-risk patients (e.g., those diagnosed with chronic diseases) but without financial compensation deemed commensurate.[10] In order to ensure an equitable allocation of capitation funds, it is sensible to reconsider provider payment arrangements of SSO.

The reform options currently under discussion comprise several measures, which include the following:

- The introduction of the DRG system for the payment of IP care and chronic disease patients
- The increase of the share of risk-adjusted portion of the capitation fee
- The increase of the share of utilization-adjusted portion of the capitation fee

[9] Dr Sontaya, SSO, has been entrusted with this assignment.

[10] This adverse selection bias can be explained by the fact that SSO members are free to chose their provider; now since the generally sick tend to favor high-end providers (e.g., university hospitals), the latter incur higher cost.

- The adjustment of the OP capitation fee for individual risk factors (e.g., age)
- Any combination of these measures.

In case SSO were to adopt the DRG system for the payment of IP care, it may also be relevant to consider including other IP benefits currently paid for on a fee-for-service basis under the DRG system.

With regard to model design and cost projections for SSS, it is not considered necessary at this point to formulate alternative scenarios reflecting reform options under consideration since the latter relate exclusively to the provider payment mechanism and will therefore not affect benefit expenditure of the scheme (this is projected already under status quo conditions). It may be useful nevertheless to develop in the future an alternative module for the allocation of resources to SSS providers, this in order to illustrate the impact of reforms under consideration on budget allocation to individual providers. However, this is only sensible after a concrete reform proposal has been formulated, which is unlikely to occur before the end of the assignment.

4.2. The Civil Servants' Medical Benefits' Scheme

The reform options under discussion for the financial arrangements of CSMBS are wide-ranging and go beyond the provider payment mechanism. CSMBS has witnessed a steep and persistent increase of expenditure in recent years, and the per capita cost of the scheme exceed by far those of UC and SSS. The main objective of the reforms under consideration is therefore the containment of cost to ensure the financial sustainability of the scheme. It is also being considered whether the introduction of a co-financing mechanism (via co-payment of hospital bills or through insurance contributions) could help to contain cost and how such a mechanism could ideally be designed.

Specific reform options suggested by the CSMBS include the following:

a. To establish a health insurance system for CSMBS members

b. To introduce capitation as the provider payment mechanism for outpatient care

c. To introduce a co-payment mechanism for out-patient care, for instance:

   - A co-payment for non-essential drugs at 20% of the cost

   - A co-payment at 25% of total hospital bills

With regard to the projection of CSMBS expenditure under alternative scenarios (meant to reflect reform options), it is proposed to assess the cost of medical benefits in relative terms to wages in order to assess the feasibility of the insurance and co-payment options. However, this is subject to availability of aggregate salary data for civil servants before the end of the assignment.[11]

4.3. The Universal Coverage Scheme

Reform options are also under discussion for the provider payment mechanism of the UC scheme. Objectives intended with these reforms are (1) to increase, in the budget allocation mechanism and formulae, the weight attached to 'health needs' of the UC target population and (2) to support the national policy aiming at the development of primary health care and family medicine at community level, through the gradual reallocation of resources away from hospitals towards Primary Care Units (PCUs) and Community Medical Units (CMUs).

[11] This data has not yet been made available so far.

A consultant has been assigned by the EU project to provide inputs on resource allocation and to work out a concrete reform proposal (including concrete budget allocation formulae) for consideration by NHSO.[12] It is planned that once this proposal has been made available (by end of June?), a projection reflecting the new allocation formula will be carried out.

5. Other issues

- *Conceptual framework for modeling unit cost*

  Following some cogitation, a conceptual framework for modeling unit cost has finally been proposed by the consultant. This after some hesitation due to the concern about feasibility (i.e., availability of data) on the one hand, and the desire to see a conceptually sound approach that goes beyond the ordinary labour cost / non-labour cost approach. However, it still remains to be seen whether the proposed approach is feasible for application and whether the required data can be made available. A draft concept note on unit cost modelling was prepared to present the proposed approach (see Annex D).

- *Base year for projections*

  It was discussed whether the base year for the projections should be FY 2007 instead of FY 2006 as proposed initially. Given that the MOI population data for the fiscal year 2007 does not present inconsistencies (see next point) and the database for the year 2007 is more or less complete, it was agreed to switch to FY 07 as the base year for the projections for all three schemes. It is noted though that for IHPP projections the base year will remain 2005 since no data (NHA) has been made available by IHPP for the years 2006 and 2007.

- *Demographic modelling*

  Given the remaining inconsistencies of the MOI population data, notably in comparison to the official labour force figures, it was suggested to use as the starting population the MOI data for the fiscal year 2007, given that the data does not present any apparent inconsistencies (it satisfies in particular the inequality: labour force < population for all age/sex cohorts). A complete set of population data as of March 2007, broken down by scheme, was provided by NHSO.

  For demographic assumptions on mortality and fertility, it is proposed to adopt the same assumptions as used by NESDB in its revised population projection (published in 2008), this in order to avoid any potential controversies on demographic assumptions that could undermine the credibility of results to be produced with HCF models.[13]

- *IHPP Model*

  The modeling approach for IHPP (i.e., the NHA) was subject to some brainstorming. It was notably discussed whether an aggregate supply side model (including both public and private providers) should be used for modeling aggregate national expenditure instead of the simple and straightforward elasticity model proposed earlier. A data framework was developed by the consultant to explore the feasibility of

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[12] Prof. Roy Carr-Hill, University of York, has been appointed for this job; he is expected to produce his findings by the end of June 2008.

[13] A thorough description of demographic assumptions (final version) will be part of the forthcoming report on the status quo projections for the three schemes.

the supply-side approach and a data request submitted via NHSO. The issue has been pending since and needs further discussion.

- *Data issues*

  Further data has been requested from the three schemes aiming at:

  (a) completing the data frame for the base year 2007 with the necessary demographic, expenditure, and utilization data,

  (b) making use of the proposed unit cost modelling framework (see Annex D),

  (c) exploring the feasibility of the supply side approach for modeling aggregate national expenditure on health (see preceding paragraph).

  It is hoped that the data still missing will be provided shortly so that cost projections can be finalized and all training activities completed according to plan.

6. Next steps

The next steps planned by the consultant are listed below:

a. Finalization of HCF models (including design of interfaces and output sheets as needed) for all schemes.

b. Drafting of manuals on model structure, handling and maintenance for each scheme;

c. Development of training materials;

d. Undertake introductory and hands-on training sessions on model handling with all four institutions;

e. Carry out status quo projections for the expenditure of the three schemes and for aggregate national health expenditure (IHPP model);

f. Consultations with international experts regarding reform options being considered by each scheme, notably on the UC capitation allocation mechanism;

g. Projection of scheme expenditure and resource allocation (as relevant) for alternative scenarios based on reform options under consideration for UC, SSS, and CSMBS;

h. Formal hand-over of models and supporting documentation (manuals) to all four institutions.

Some of the activities listed above are overlapping. The timing will depend on the availability of counterparts and data/information (to some extend) and on the pace of progress achieved. It is planned tentatively to complete all training activities by end of July and all reports due by mid-August 2008.

ANNEX A

Terms of Reference:

These Terms of Reference (TOR-SP) refer to the second phase (SP) of the development of a: health care financing model, and staff capacity building, for the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and the International Health Policy Programme (IHPP) of Thailand.

With respect to the first (initial) phase (TOR-IP) reference is made to contract PO/Ver No: 40029956, dated 29.06.2007

It is understood that, at the commencement of this contract (TOR-SP), the obligations and works of the contract of the initial phase (TOR-IP) have been fulfilled such that the tasks to be carried out under this contract (TOR-SP) can be fulfilled.

The overall contents of the Draft Terms of Reference (so-called Draft03 dated 02/05/2007, see attachment to contract re TOR-IP) remains valid. The contractor to these TOR-SP is advised to refer to Draft03 for further information.

The contents of Draft03, as far as not replaced by these TOR-SP, is valid; the time frame defined in Draft03 is however not fully applicable anymore. For the second phase of modelling, these TOR-SP replace the time frame of Draft03 (see the attached updated flow chart of activities under TOR-SP).

A. Activities to be carried out

Under the supervision of the Senior Economist of the ILO Social Security Department and the Social Security Specialist of the ILO SRO-Bangkok, the contractor to these TOR-SP will undertake the following tasks:

On the background as provided in Draft 03 (see above), he will develop four (4) health care finance models, which, each, are characterized by the fact that they can be based on a common, coordinated set of assumptions on demography, economy, labour market, health care utilization and unit cost developments.

The models will be designed such that they project expenditure and revenue of Thailand's health system(s); the models are annual, i.e. they are based on annual data and will produce annual (annualised) outputs; their time horizons will range from short (for budgeting purposes) to long-term.

Institutional, legal and behavioural specificities of the three single schemes will be sufficiently mapped; the scope of the data base of the model for the IHPP goes beyond the scope of the data bases of the three schemes but, where possible, the IHPP model will make use of the data bases of the three schemes.

Core technical staff from the three schemes and the International Health Policy Programme (IHPP) in charge of the maintenance of the model(s), will support the model development and be trained (see below) in the usage and future calibration of the models.

Especially the contractor will:

(1) Establish a common demographic, labour market and economic frame for the four models to be developed for CSMBS, NHSO, SSO and IHPP;

(2) Establish the health care financing modules for three schemes CSMBS, NHSO, and SSO as well as the model for the IHPP (NHA);

(2a) Develop modules for allocating the available overall resources (budgets) to the hospitals that have contracted with NHSO and SSO. The contractor will explore the feasibility of the development of such a module for CSMBS, and make proposal(s), accordingly. Technically, the allocation mechanism will be "top-down" for both, NHSO and SSO, and it will, to the extent possible, replicate, as a standard procedure, the present mechanisms applied by NHSO. The allocation mechanism for SSO will be newly developed; where appropriate, the SSO allocation mechanism will draw advantage from the allocation mechanism developed for NHSO;

(3) With a view to most appropriate model design (possible simulation options; see also point (5) below): consult with CSMBS, NHSO, SSO and IHPP staff on possible reform plans of the CSMBS, NHSO and SSS. These might include different allocation formulas, different ways of capitation calculation (for example,. with or without inclusion of capital depreciation), or the possible coverage of dependents and future pensioners (SSO);

(4) Decide on modelling options that most appropriately incorporate any of those mentioned details;

(5) Carry out status-quo projections, and reform simulations in coordination and cooperation with the staff of CSMBS, NHSO, and SSO – in order to validate the significance of the outputs of the established models; consult with the staff of the CSMBS, NHSO, SSO and the IHPP on the projection and simulation results, and modify the models' structures to the extent that they produce unreasonable results;

(6) Describe, for each institution (CSMBS, NHSO, SSO and IHPP) separately,

  (a) the procedures of model maintenance,

  (b) the handling of the model;

(7) Develop training material;

(8) Carry out a three days common introductory training workshop (proseminar) for the staff of the CSMBS, NHSO, SSO and the IHPP on the purpose and use of the models;

(9) Carry out separately, for the staff of each of the institutions CSMBS, NHSO, SSO and the IHPP, hands-on training at staff work places, on the technical use of their respective models;

(10) Hand out the electronic version, and any accompanying training material, of the models to the staff of the CSMBS, NHSO, SSO and the IHPP;

(11) Provide the above (items (1) to (10)), and all other stipulations contained in this document to the satisfaction of the ILO.

As part of the technical modeling work, in addition to the electronic model to be developed and in order to reflect and document work progress, the contractor writes the following reports on the above items (draft titles – open to adjustments in consensus with ILO-SECSOC):

(A) A common demographic, labour market and economic frame and health care financing modules for CSMBS, NHSO, SSO and IHPP. (This report covers item (1), above.)

(B) Financial projection models for CSMBS, NHSO, SSO and IHPP – core design and technical incorporation of allocation formulae and reform options. (This report covers items (2), (2a), (3) and (4), above.)

(C) Status-quo projections, and reform simulations, for the financial development of CSMBS, NHSO, SSO and under NHA (IHPP). (This report covers item (5), above.)

(D) Model maintenance and practical handling of the models of CSMBS, NHSO, SSO and IHPP. A manual. (This report covers items (6) and – partially - (7), above.)

(E) Introduction to the practical use of the models for CSMBS, NHSO, SSO and IHPP. Seminar training material. (This report covers items (7) – partially –, and the didactical material needed for items (8) and (9), above.)

(F) Note on the formal hand-over of the models and any accompanying material to the staff of CSMBS, NHSO, SSO and IHPP. Formal notes on the delivery of the training activities. (This note covers items (8), (9) and (10), above.)

B. Schedule

The work is expected to be accomplished over a six-months period, starting with the signature of the contract to which these TOR-SP refer.

A work flow chart stipulating which work should reasonably be done when is attached. It contains the proposal for another, deepening, workshop for the Thai counterparts / users of the model, after the completion of the works to be undertaken under these TOR-SP. This deepening workshop is not part of these TOR-SP.

C. Preconditions and caveats

It is assumed that necessary data for the model(s) have been collected in close collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff. This work has provided all involved with an a priori understanding of the actual modeling (model design) to be undertaken.

In case of delays in the data collection process (see TOR-IP), which might “stretch” the process of data collection and of constructing the data base into this second phase (TOR-SP) of the project, there could be a delay in delivery of the results as expected under these TOR-SP.

The budget to this contract is expert fees (including fees for his participation in seminars / training workshops, lecturing fees, if any, including travel required under the TOR-SP). Other cost such as printing cost of the reports, the cost for seminars / training workshops (e.g. cost for the venue, equipments and refreshments) are not included in this budget, and will be covered separately.

ANNEX B

SSS budget allocation mechanism

The capitation fee is negotiated annually with providers by the SSO Medical Committee; it includes a basic amount and two separate increments reflecting service utilization (for both OP and IP care) and high risk / high cost patients respectively. The risk adjustment is meant to compensate providers for higher cost caused by higher than average incidence rates of chronic diseases, and high cost IP treatments (as measure by DRG adjusted relative weights). It is based on the actual care provided by the provider over a fixed period in the past.

The utilization increment of the capitation fee referred to as 'utilization incentive' is based on a combined annual OP/IP utilization rate index calculated for each provider as follows:

$$^{k}i_t^{(UT)} = \sum_{i=1}^{12} \left(\frac{n_{t,i}^{(OP)} + (n_{t,i}^{(IP)} \cdot d_{t,i}^{(IP)} \cdot 4.97)}{^{k}pop_{t,i}} \right)$$

Where: $^{k}i_t^{(UT)}$ is the value of the combined utilization index for provider k in year t

$n_{t,i}^{(OP)}$ is the number of OP visits in month i of year t

$n_{t,i}^{(IP)}$ is the number of IP admissions in month i of year t

$d_{t,i}^{(IP)}$ is the average length of stay in month i of year t

$^{k}pop_{t,i}$ is the number of persons registered with provider k in month i of year t

The utilization index is calculated for all providers separately and then divided in percentiles. In 2006 the amount of utilization incentive disbursed was calculated as follows:

THB 30/person/year for providers with UI in the percentiles 1 – 3 (lowest 30% of UI)

THB 40/person/year for the 4th percentile

…

THB 100/person/year for 10th percentile (highest 10% of UI)

Hence in 2006:

$$^{k}U_t = Min\left(30\,,\ ^{k}\pi_t \cdot 10\right)$$

Where: $^{k}U_t$ denotes the amount of utilization incentive paid to provider k in year t

$^{k}\pi_t$ refers to the percentile of the utilization index

The average amount of utilization incentive disbursed in 2006 thus amounted to 55 THB.

The risk adjustment component of the capitation fee is divided into two parts: an OP portion fixed at 55 per cent of the total amount and an IP portion fixed at 45 per cent of the total amount [of risk adjustment]. The OP portion is paid based on actual treatments provided to chronic disease patients over a fixed period in the past (6 months). It is calculated based on the cumulative risk score index as allocated to treatments provided to chronic disease patients. The OP risk adjustment for provider *i* is thus given by:

$$ {}^{k}RA_{t}^{(OP)} = \left({}^{k}cds_{t} / \sum_{k} {}^{k}cds_{t} \right) \cdot pop_{t} \cdot 205 \cdot 0.55 $$

Where: ${}^{k}RA_{t}^{(OP)}$ is the OP risk adjustment for provider *k* in the period *t*

${}^{k}cds_{t}$ is the cumulative chronic disease score reported by provider *k* in the year t

pop_{t} is the total number of persons registered with all providers in the year *t*

The IP portion of the risk adjustment is based on the actual cumulative DRG case-mix index reported by the provider over a fixed period in the past (6 months in general). The IP risk adjustment is calculated as follows:

$$ {}^{k}RA_{t}^{(IP)} = \left({}^{k}cw_{t} / \sum_{k} {}^{k}cw_{t} \right) \cdot pop_{t} \cdot 205 \cdot 0.45 $$

Where: ${}^{k}RA_{t}^{(IP)}$ is the IP risk adjustment paid to provider k in year t

${}^{k}cw_{t}$ is the cumulative amount of adjusted relative DRG weights reported by provider *k* in year t

pop_{t} is the total number of persons registered with all providers in the period t

In summary, the payment of medical service providers writes as follows:

$$ {}^{k}P_{t} = {}^{k}pop_{t} \cdot C_{t} + {}^{k}U_{t} + {}^{k}RA_{t} + P^{(NC)} $$

Where $P^{(NC)}$ denotes the aggregate payment for benefits not included under the capitation system.

ANNEX C

UC budget allocation mechanism

1. The overall UC budget as approved by BoB is first broken down as follows:

   Where a separate budget is allocated for the following types of care:

   - Prevention and promotion (PP)
   - Outpatient care (OP)
   - Inpatient care (IP)
   - Emergency medical services (EMS)
   - Budget for disability benefits (DIS)
   - Capital replacement cost (CAP)
   - Budget for the compensation of no fault liability claims[14] (NFL)

2. Break-up of the budgets allocated to OP and IP into the following categories:

   (a) General OP and IP care (GOP/GIP), which comprises all OP/IP care not included under the special categories (b) – (d) listed below (provided such care is included in the UC benefit package).

   (b) 'Add-on' benefits, which include the following services:

   - Chemotherapy and radiotherapy (OP)
   - Treatment against opportunistic infections for HIV+/Aids patients (OP)
   - Medical instruments (OP & IP)
   - Accident/emergency care provided outside the province (OP & IP)
   - Accident/emergency care provided in the province by a provider other than the main provider (cf. Article 7 of the National Health Security Act) (OP)
   - Medical care provided during childbirth to female SSO members if they do not yet qualify for such benefits under SSS[15] (OP & IP)
   - Transport between hospitals of patients who need emergency care (OP)
   - OP care provided to victims of traffic accidents (top-up of the medical services provided by the 'Traffic Accident Insurance Fund'). (OP & IP)
   - Quarantine of suspected carriers of the avian influenza virus (OP & IP)

   (c) 'Disease management' benefits, which include the following:

   - Treatment against Leukemia (OP & IP?)
   - Treatment against Lymphoma (OP & IP?)
   - Treatment against Tuberculosis (OP?)

[14] In the fiscal year 2008 no budget is allocated for this item since the reserves accrued from earlier years were deemed sufficient to cover expenses incurring during that year.

[15] For medical care related to childbirth, a qualifying period of 9 month of membership applies for SSO

- Treatment against Hemophilia (OP)
- Treatment against Diabetes Mellitus (OP)
- Open heart surgery (IP)
- Cataract surgery (IP)
- Stroke fast track care (?) (IP)

(d) ‘OP investigation’, which includes the cost for all laboratory and other medical investigation cost (Xrays, CTscan, etc.).

The process for breaking down the total budget allocation in the above categories is summarized below:

3. Calculation of OP and IP budget allocations for ‘add-on’ benefits, ‘disease management’ benefits, and OP ‘investigation‘ (laboratory) services:

a. Estimation of the trend in the annual change of the utilization rate (in relative terms) for each item separately based on frequency data from the past 3 years (if available) and trend analysis, for example by calculating the average annual rate of increase occurred over the whole period[16]:

$$\bar{\delta}_{t-1}^{(OP/B_i)} = \frac{\Delta u_t^{(OP/B_i)}}{u_t^{(OP/B_i)}} = \left(u_{t-1}^{(OP/B_i)} - u_{t-4}^{(OP/B_i)} \right)^{1/3} - 1$$

b. Projection of the utilization rate for each item for the year t+1, for instance:

$$\tilde{u}_{t+1}^{(OP/B_i)} = (1 + \bar{\delta}_{t-1}^{(OP/B_i)})^2 \cdot u_{t-1}^{(OP/B_i)}$$

c. Projection of unit amount per case in the year t+1 for each benefit item, e.g., by applying the expected rate of cost increase to the average benefit amount (charge) reported in the year t-1, this for each benefit separately[17]:

$$\tilde{c}_{t+1}^{(OP/B_i)} = (1 + {}^{(2)}\tilde{r}_{t+1}^{(OP/B_i)})^2 \cdot c_{t-1}^{(OP/B_i)}$$

Where:

$\tilde{c}_{t+1}^{(OP/B_i)}$ is the projected unit cost for OP benefit B_i for the year t + 1

$c_{t-1}^{(OP/B_i)}$ is the average charge for OP benefit B_i reported in the year t - 1

${}^{(2)}\tilde{r}_{t+1}^{(OP/B_i)}$ is the projected annual average rate of increase (in relative terms) of the average amount payable for item B_i (from year t-1 to year t+1).

d. Projection of expenditure is obtained by multiplying projected population by the projected utilization rate and benefit amount:

$$E\tilde{x}p_{t+1}^{(OP/B_i)} = p\tilde{o}p_{t+1} \cdot \tilde{u}_{t+1}^{(OP/B_i)} \cdot \tilde{c}_{t+1}^{(OP/B_i)}$$, and

[16] The estimate is determined by taking into account the data available and the trend observed; no specific estimation method has been adopted.

[17] In general no increase is assumed for the average amount of add-on benefit unless an increase in fee schedule benefit amounts is about to enter into effect or in the process of being adopted.

$$E\tilde{x}p_{t+1}^{(IP/B_i)} = \quad p\tilde{o}p_{t+1} \cdot \tilde{u}_{t+1}^{(IP/B_i)} \cdot \tilde{c}_{t+1}^{(IP/B_i)}$$

e. A budget is allocated accordingly for 'add-on' items, 'disease management', and 'OP investigation' services, this based on the expenditure projected for each item respectively, hence for both OP and IP:

$$B_{t+1}^{(OP/B_i)} = E\tilde{x}p_{t+1}^{(OP/B_i)} \quad \text{, and} \quad B_{t+1}^{(IP/B_i)} = E\tilde{x}p_{t+1}^{(IP/B_i)}$$

4. Calculation of the total budget for GOP (capitation) and GIP care (DRG).

Global budget for general OP care is obtained by deducting from the total allocated OP budget the budgets allocated (as per 4.1.1 and 4.1.2) for OP add-on items, disease management, and OP investigation:

$$B_{t+1}^{(GOP)} = B_{t+1}^{(OP)} - \sum_i B_{t+1}^{(OP/B_i)} - B_{t+1}^{(OP/inv)}$$

Global budget for general IP care is obtained by deducting from the total allocated IP budget the total budget estimated (as per 4.1.1 and 4.1.2) for IP add-on items and IP disease management benefits:

$$B_{t+1}^{(GIP)} = B_{t+1}^{(IP)} - \sum_i B_{t+1}^{(IP/B_i)}$$

5. Allocation of global GOP budget to provinces based on:

a. Age structure in each province (for 90% of total GOP budget) by applying cost weights w_i to the following age groups:

Age group	0 - 4	5 – 9	10 – 14	15 - 24	25 - 44	45 - 59	60 - 69	70+
Weight	0.954	0.518	0.386	0.293	0.805	1.525	3.102	4.774

Provincial budgets are determined as follows:

$${}_{j}^{(age)}B_{t+1}^{(GOP)} = 0.9 \cdot B_{t+1}^{(GOP)} \cdot \left(\sum_i w_i \cdot {}^{i}p\tilde{o}p_{t+1}^{(j)} / \sum_i w_i \cdot {}^{i}p\tilde{o}p_{t+1}^{(tot)} \right)$$

Where:

${}_{j}^{(age)}B_{t+1}^{(GOP)}$ is the budget for GOP care allocated based on age structure to the province j for the year t+1

${}^{i}p\tilde{o}p_{t+1}^{(j)}$ is the covered UC population in the age group *i* as projected for the province *j* in year t+1

The budgets obtained with the formula above are adjusted for provinces where the per capita amount of budget deviates by more than 10% of the average, hence we have:

$${}_{j}^{(age)}c\hat{a}p_{t+1}^{(GOP)} := 0.9 \cdot {}^{(age)}c\bar{a}p_{t+1}^{(GOP)} \quad \text{if} \quad {}_{j}^{(age)}cap_{t+1}^{(GOP)} < 0.9 \cdot {}^{(age)}c\bar{a}p_{t+1}^{(GOP)}, \quad \text{and}$$

$${}_{j}^{(age)}c\hat{a}p_{t+1}^{(GOP)} := 1.1 \cdot {}^{(age)}c\bar{a}p_{t+1}^{(GOP)} \quad \text{if} \quad {}_{j}^{(age)}cap_{t+1}^{(GOP)} > 1.1 \cdot {}^{(age)}c\bar{a}p_{t+1}^{(GOP)}$$

With:

$${}_{j}^{(age)}cap_{t+1}^{(GOP)} = {}_{j}^{(age)}B_{t+1}^{(GOP)} / {}_{j}pop_{t+1}$$

Where

${}^{(age)}_{j}cap^{(GOP)}_{t+1}$ is the per capita budget in province j

${}^{(age)}_{j}c\bar{a}p^{(GOP)}_{t+1}$ is the average per capita budget for all provinces

${}^{(age)}_{j}c\hat{a}p^{(GOP)}_{t+1}$ is the adjusted amount of per capita budget in province j

In case the sum of the adjusted budgets does not add up to the total amount allocated overall, all per capita amounts are scaled up/down as needed by the same rate.

b. Actual utilization experienced in each province in year t (for the remaining 10% of total GOP budget), this on a simple pro rata basis:

$${}^{(ut)}_{j}B^{(GOP)}_{t+1} = 0.1 \cdot B^{(GOP)}_{t+1} \cdot \left({}^{(j)}n^{(GOP)}_{t} / {}^{(tot)}n^{(GOP)}_{t}\right)$$

Where:

${}^{j}_{(ut)}B^{(GOP)}_{t+1}$ is the budget for GOP care allocated based on utilization to the province j for the year t+1

${}^{(j)}n^{(GOP)}_{t}$ is the number of GOP contacts reported for province j in the year t

${}^{(tot)}n^{(GOP)}_{t}$ is the total number of GOP contacts reported in year t in all provinces

The total GOP budget allocated to province *j* thus writes as follows:

$${}^{j}B^{(GOP)}_{t+1} = {}^{j}_{(age)}B^{(GOP)}_{t+1} + {}^{j}_{(ut)}B^{(GOP)}_{t+1}$$

The capitation fee for province *j* is thus given as follows:

$${}^{j}cap^{(GOP)}_{t+1} = {}^{j}B^{(GOP)}_{t+1} / p\tilde{o}p^{(j)}_{t+1}$$

Where ${}^{j}cap^{(GOP)}_{t+1}$ is the GOP capitation fee for province *j* in year t+1

6. Allocation of the overall budget for GIP care (allocated via DRG system)

   Overall GIP budget is allocated to regions as follows:

   a. Projection of IP utilization rates for each one of the 14(?) regions via trend analysis (same methodology as described in section 2.1).

   b. Projection of ARWs for each region for the year t+1:

$${}^{(R_i)}n^{(arw)}_{t+1} = {}^{(R_i)}p\tilde{o}p_{t+1} \cdot {}^{(R_i)}\tilde{u}^{(GIP)}_{t+1} \cdot {}^{(R_i)}c\tilde{m}i_{t+1}$$

   c. Allocation of GIP budget to regions in proportion to projected ARWs:

$${}^{(R_i)}B^{(GIP)}_{t+1} = B^{(GIP)}_{t+1} \cdot \left({}^{(R_i)}n^{(arw)}_{t+1} / \sum_{i} {}^{(R_i)}n^{(arw)}_{t+1} \right)$$

   GIP budgets allocated to regions are closed-end; hence the region-specific DRG base rates are determined implicitly at the end of the year.

7. Allocation of budget for ‘add-on’ items

Budgets allocated for add-on items are closed-end; hence the amount payable per case shall be determined implicitly at the end of the year.[18]

8. Allocation of budget of 'disease management' items

   Budgets allocated for disease management items are open-end and benefit amounts payable are fixed in advance (fee schedule).[19] However, in order to contain costs within certain limits, there is a quota for some benefits, i.e., a ceiling on the number of cases reimbursable to each provider in a given year. This is notably the case for open-heart surgery, cataract surgery, diabetes mellitus, and tuberculosis drugs.

9. Allocation of budget for 'OP investigation' items

   The budget allocated for medical investigation is also open-end; providers are paid based on fee schedule, no quota is in existence for this benefit.

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[18] NHSO currently makes use of a point system where points are allocated to providers depending on severity of illness and treatment provided. The budget is then allocated by dividing the amount of budget allocated by the number of points available.

[19] Fees for treatments falling under the 'disease management' category are generally determined based on the cost of the services proscribed in the standard treatment protocols relating to these diseases.

ANNEX D

Concept note on unit cost modelling

a) Proposed modelling approach:

It was suggested earlier to model the recurrent expenditure of the three schemes by disaggregating total expenditure as follows:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} + \dots$$
$$= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(OP)} \cdot c_t^{(OP)} + \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot cmi_{x,s,t}^{(DRG)} \cdot c_t^{(IP)} + \dots \qquad (1)$$

Where:

$Exp_t^{(TOT)}$ is the total recurrent expenditure of the respective scheme in year t

$pop_{x,s,t}$ is the covered population cohort of age x and sex s in year t

$u_{x,s,t}^{(OP)}$ is the OP utilisation rate for the cohort of age x and sex s in year t

$c_t^{(OP)}$ is the unit cost per OP contact in year t

$u_{x,s,t}^{(IP)}$ is the IP utilisation rate for the cohort of age x and sex s in year t

$cmi_{x,s,t}^{(DRG)}$ is the average case-mix index (number of relative weights per admission) for the cohort of age x and sex s in year t

$c_t^{(IP)}$ is the unit cost per adjusted relative weight, i.e., the DRG base-rate in year t

For the projection of unit cost (cost per OP contact and cost per DRG ARW), it was suggested to disaggregate as follows:

$$c_t = c_t^{(lab)} + c_t^{(drg)} + c_t^{(meq)} + c_t^{(oth)} \qquad (2)$$

Where:

Where:	c_t	is the average unit cost per medical service (OP contact, IP relative weight, etc.) as incurred by providers in year t
	$c_t^{(lab)}$	is the labour component in unit cost in year t
	$c_t^{(drg)}$	is the drug component in unit cost in year t
	$c_t^{(meq)}$	is the component reflecting the cost of medical material (non-durables) other then drugs as supplied in year t
	$c_t^{(oth)}$	is the component relating to other recurrent costs (e.g., laboratory, room and board, etc.) in year t

The input cost factors listed above are selected with the idea that each factor represents a different cost driver and develops independently of other factors.

Hence we can write:

$$\frac{dc_t}{c_t} = \frac{dc_t^{(lab)}}{c_t} + \frac{dc_t^{(drg)}}{c_t} + \frac{dc_t^{(meq)}}{c_t} + \frac{dc_t^{(oth)}}{c_t}$$

$$= \frac{c_t^{(lab)}}{c_t} \cdot \frac{dc_t^{(lab)}}{c_t^{(lab)}} + \frac{c_t^{(drg)}}{c_t} \cdot \frac{dc_t^{(drg)}}{c_t^{(drg)}} + \frac{c_t^{(meq)}}{c_t} \cdot \frac{dc_t^{(meq)}}{c_t^{(meq)}} + \frac{c_t^{(oth)}}{c_t} \cdot \frac{dc_t^{(oth)}}{c_t^{(oth)}}$$

$$= \frac{c_t^{(lab)}}{c_t} \cdot d\ln(c_t^{(lab)}) + \frac{c_t^{(drg)}}{c_t} \cdot d\ln(c_t^{(drg)}) + \frac{c_t^{(meq)}}{c_t} \cdot d\ln(c_t^{(meq)}) + \frac{c_t^{(oth)}}{c_t} \cdot d\ln\left(c_t^{(oth)}\right) \qquad (3)$$

Since we cannot assume the relative share of factor inputs to be identical for out-patient and in-patient care, we need to distinguish, hence:

$$c_t^{(OP)} = c_t^{(OP/lab)} + c_t^{(OP/drg)} + c_t^{(OP/meq)} + c_t^{(OP/other)} = \ldots \quad \text{, and:}$$

$$c_t^{(IP)} = c_t^{(IP/lab)} + c_t^{(IP/drg)} + c_t^{(IP/meq)} + c_t^{(IP/other)} = \ldots \qquad (4)$$

For modelling the change in factor inputs, it is suggested to disaggregate into cost and volume dimensions, hence for instance:

$$c_t^{(OP/lab)} = \lambda_t^{(OP/lab)} \cdot c_t^{(lab)}$$

Where: $c_t^{(OP/lab)}$ is the labour cost component in OP unit cost in year t

$c_t^{(lab)}$ is the weighted average unit cost of labour in year t[20]

$\lambda_t^{(OP/lab)}$ is the input intensity of labour per outpatient contact, i.e., the weighted average amount (time) of labour input per OP contact in year t[21]

Consequently:

$$dc_t^{(OP/lab)} = \lambda_t^{(OP/lab)} \cdot dc_t^{(lab)} + c_t^{(lab)} \cdot d\lambda_t^{(OP/lab)}$$

And thus:

$$\frac{dc_t^{(OP/lab)}}{c_t^{(OP/lab)}} = \frac{\lambda_t^{(OP/lab)} \cdot dc_t^{(lab)}}{\lambda_t^{(OP/lab)} \cdot c_t^{(lab)}} + \frac{c_t^{(lab)} \cdot d\lambda_t^{(OP/lab)}}{\lambda_t^{(OP/lab)} \cdot c_t^{(lab)}} = d\ln(c_t^{(lab)}) + d\ln(\lambda_t^{(OP/lab)}) \qquad (5)$$

Equation (3) becomes:

$$\frac{dc_t^{(OP)}}{c_t^{(OP)}} = \frac{dc_t^{(OP/lab)}}{c_t^{(OP)}} + \frac{dc_t^{(OP/drg)}}{c_t^{(OP)}} + \frac{dc_t^{(OP/meq)}}{c_t^{(OP)}} + \frac{dc_t^{(OP/ut)}}{c_t^{(OP)}} + \frac{dc_t^{(OP/oth)}}{c_t^{(OP)}}$$

$$= \frac{c_t^{(OP/lab)}}{c_t^{(OP)}} \cdot \frac{dc_t^{(OP/lab)}}{c_t^{(OP/lab)}} + \frac{c_t^{(OP/drg)}}{c_t^{(OP)}} \cdot \frac{dc_t^{(OP/drg)}}{c_t^{(OP/drg)}} + \frac{c_t^{(OP/meq)}}{c_t^{(OP)}} \cdot \frac{dc_t^{(OP/meq)}}{c_t^{(OP/meq)}} + \ldots$$

$$= \frac{c_t^{(OP/lab)}}{c_t^{(OP)}} \cdot \left(d\ln(\lambda_t^{(OP/lab)}) + d\ln(c_t^{(lab)})\right) + \frac{c_t^{(OP/drg)}}{c_t^{(OP)}} \cdot \left(d\ln(\lambda_t^{(OP/drg)}) + d\ln(c_t^{(drg)})\right) + \ldots \qquad (6)$$

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[20] Weighting based on the relative cost of the different labour categories (i.e., doctors, nurses, dentists, pharmacists, etc.)

[21] Ibid

Since expenditure and unit cost are projected on an annual basis, we can write:

$$\tilde{c}_{t+1}^{(OP)} = \quad c_t^{(OP)} \cdot \left(1 + \tilde{i}_{t+1}^{(OP)}\right)$$

With:

$$\tilde{i}_{t+1}^{(OP)} = \left[\frac{c_t^{(OP/lab)}}{c_t^{(OP)}} \cdot \left(\frac{\Delta\tilde{\lambda}_{t+1}^{(OP/lab)}}{\lambda_t^{(OP/lab)}} + \frac{\Delta\tilde{c}_{t+1}^{(lab)}}{c_t^{(lab)}} \right) + \frac{c_t^{(OP/drg)}}{c_t^{(OP)}} \cdot \left(\frac{\Delta\tilde{\lambda}_{t+1}^{(OP/drg)}}{\lambda_t^{(OP/drg)}} + \frac{\Delta\tilde{c}_{t+1}^{(drg)}}{c_t^{(drg)}} \right) + \quad \ldots \quad \right] \qquad (7)$$

Where:
- $\tilde{c}_{t+1}^{(OP)}$ is the unit cost for OP care as projected for the year t+1
- $\tilde{i}_{t+1}^{(OP)}$ is the projected rate of cost increase (in %) for OP care for the year t+1 (from the previous year t)
- $\Delta\tilde{\lambda}_{t+1}^{(OP/lab)}$ is the change in the intensity of labour inputs per outpatient contact as projected for the year t+1 (from the previous year t)
- $\Delta\tilde{c}_{t+1}^{(lab)}$ is the projected change of unit labour cost for the year t+1 (from the previous year t)
- $\Delta\tilde{\lambda}_{t+1}^{(OP/drg)}$ is the change in the intensity of drug inputs per outpatient contact as projected for the year t+1 (from the previous year t)
- $\Delta\tilde{c}_{t+1}^{(drg)}$ is the projected change of unit drug cost as projected for the year t+1 (from the previous year t)

<u>In summary, the proposed method consists of the following steps in practice:</u>

1. Calculation of unit cost per service type (output): $c^{(OP)}$ and $c^{(IP)}$ for the year t
2. Allocation of input factor cost $c^{(lab)}$, $c^{(drg)}$, … to OP and IP to obtain factor input cost $c^{(OP/lab)}$, $c^{(IP/lab)}$, $c^{(OP/lab)}$, ... in unit cost (see equation 4 above)
3. Formulate assumptions on unit cost increase (for input factors) and intensities (input volumes for all factors) based on past trends and/or target values (benchmarks?).
4. Projection of factor input costs $c^{(OP/lab)}$, $c^{(IP/lab)}$,… by applying assumptions in (3)
5. Calculation of projected unit cost by adding up factor input costs projected for the years t+1, t+2, etc..

THAILAND

Development of a Health Care Financing Model

Second Phase

REPORT C

25 November 2008

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CONTENTS

1. Background

The present report was drafted within the framework of the consultancy agreement concluded by the consultant and the International Labour Office (External Collaboration Contract no. 40033646/0 signed on 1 February 2008). The assignment is taking place within the wider context of the cooperation agreement signed by the International Labour Office (ILO) and the European Commission (EC) on 9 February 2006 pertaining to the EC project 'Heath Care Reform in Thailand' (THA/AID/CO/2002/0411, 2004 – 2009), agreement stipulating that the project component 'Financial Management of the Thai Health Care System' shall be implemented by ILO.

The consultancy assignment mentioned above is referred to in the following as the 'second phase' assignment; it was arranged in continuity with an earlier agreement (referred to as 'initial phase'), which had been completed in December 2007.

The purpose of the present report is to present output as stipulated in the terms of reference (see Annex A). The report builds on the reports produced earlier (i.e., reports A, B, D, and E), in which the methodology and model structure are presented. The present report is mainly focused on projection results for the UC, SSS, and CSMBS schemes, and for the National Health Accounts ('IHPP model').

The report is structured as follows:

Section 2 presents the results of the demographic and macro-economic projections.

Section 3 presents the results of the coverage projections for the SS, CSMBS, and UC schemes.

Section 4 presents the results of the status quo expenditure projections for the three schemes.

Section 5 presents the results of the projections relating to reform options under consideration for the SSS, CSMBS, and UC schemes.

Section 6 presents the results of the status quo projections for National Health Accounts.

All data tables containing assumptions and projection results are provided in the annex of the report together with the terms of reference. It should be kept in mind that the projection results presented in this report are based on the data available at the time of writing and on the economic outlook prevailing at that time (October 2008). Since the economic outlook is highly uncertain at the time of writing, the projection results should be considered preliminary; they should be revised in case the economic situation should further deteriorate (as seems to be the case).

For a thorough description of model structure and projection methodology, the reader should refer to the 'user manual' (see *'User Manual HCF Model version 1.0'*) as provided to the national stakeholders together with the electronic model files.

The author would like to acknowledge the good cooperation extended by the Thai counterparts from the respective institutions. Special thanks are due to Ms Rangsima, SSO, Mr Kulsek Limpiyakorn, CSMBS, Ms Taweesri Greetong and Ms Kongkran, NHSO, for their continued assistance with data collection and feedback on modeling, to Dr. Thaworn Sakunphanit, national EU project component manager, for his feedback and support, to Hiroshi Yamabana, ILO Social Security Specialist, for his technical feedback, and to Wolfgang Scholz, ILO project coordinator, for his technical inputs and overall guidance.

2. Demographic and macro-economic projections

The demographic and macro-economic framework constitutes the backbone of the projection models for the three schemes and of the IHPP model on National Health Accounts. The purpose of the demographic and economic modules is to establish a coherent framework for modeling the demographic and macro-economic country context. A common module has been established for all models to ensure consistency of methodology (with regard to demographic and economic modeling) and agreement by all stakeholders on assumptions.

The results of the demographic and economic projections are presented below.

2.1. Demographic projections

The demographic frame comprises population, labour force, and employment for the base year and projection period.

2.1.1. Population

Base year population

The population basis for the projection consists of the MOI-registered population (Thais and registered foreigners) as at 1 April 2007, i.e. the mid-year population stock in the fiscal year 2007. The revised figures as provided by the NHSO are attached to the electronic version of this report (see EXCEL file *'Pop'*, worksheet *'MOI pop FY07'*). It can be observed that the total registered population is reported at about 63.43 million persons, of which about 31.29 million males and 32.13 million females.

Population projection

The population has been projected with the ILO population model. As mentioned in earlier reports, the assumptions needed in the ILO model for the population projection include the following:

- Age-specific fertility rates for women aged 15 to 49
- The sex ratio (male/female) at birth,
- Life tables for males and females or alternatively life expectancy at birth[1]

These assumptions are discussed below:

Fertility rate

Age-specific fertility rates have been estimated from the MOI data available on newborns (by sex and by age of mother) and from the adjusted base year population. The resulting age-specific fertility rates are presented in the attached EXCEL file '*Fert*' (see worksheet '*Fert FY07*'). The total fertility rate given by the sum of the estimated age-specific fertility rates for ages 15 to 49, amounts to 1.61 in the fiscal year 2007. It is assumed, in line with NESDB assumptions, that the total fertility rate will decrease in a linear manner to 1.35 in the year 2027.

Sex ratio of newborns

[1] The model has a feature, which enables the estimation of single-age mortality patterns from input values on life expectancy at birth, this based on the UN model life tables by geographical region.

The sex ratio of newborns has been estimated at 1.0395 newborn males per newborn female based on the MOI data on newborn for the years 2002 – 2007. It is assumed that sex ratio at birth will remain constant at the same rate over the whole projection period.

Mortality rates

The mortality rates have been taken from the Coale and Demeny 'WEST' pattern, this in line with NESDB assumptions. The selected rates for the base year yield a life expectancy at birth (LEB) of 70.6 years for males and 77.5 years for females.

For the population projection, it is assumed, in line with NESDB assumptions, that the life expectancy at birth will increase gradually for both males and females over the whole projection period to reach, by the year 2027, 76 years for males and 82.6 years for females. It is further assumed that the life expectancy at birth will increase to 79.1 years for males and 85.2 years for females in the year 2052.

The assumed future LEB values for males and females are included in the sheet *workmort'* (see EXCEL file *'Mort'*). The mortality rates by age and sex that correspond to the assumed LEB values are presented in the worksheets *'Mort M'* and *'Mort F' (same file).*

Projection results

Based on the assumptions summarized above, the total population (MOI-registered) is projected to increase from a total 63.43 million persons registered in April 2007 to an estimated 67.90 million persons in the year 2030, when the population will reach its peak, to decrease thereafter steadily to reach an estimated 62.75 million persons in the year 2050. The assumptions and results of the population projection are summarized in table B.1 (see Annex B). For the detailed data and assumptions see the respective electronic files as provided separately to this report (see files in the folder '*Population*').

2.1.2. Labour Force and Employment

Base year data

Data on the Thai labour force and employment by age group and sex for the years 2001 - 2007 has been taken from the Labour Force Surveys (LFS) carried out by the National Statistical Office on a quarterly basis. The data for the fiscal year 2007 has been obtained by averaging the figures of the respective quarters (Q4/06 – Q3/07). As noted earlier, it was agreed to use for the labour force and employment the nominal figures reported in the LFS. The data is provided in the file '*Labour force TH*'.

Labour force participation rates

Labour force participation rates have been estimated for the base-year from the labour force data and from the base-year population data (as per section 2.1.1). Age-specific labour force participation rates have been determined by dividing the FY07 current labour force in each age/sex cohort by the respective cohort population in the base year. The resulting labour force participation rates as estimated for the fiscal year 2007 are shown in worksheet 'LF part 07' (see EXCEL file '*Labour force TH').*

Labour force projection

For the projection of the labour force, age-specific labour force participation rates have been assumed constant over the whole projection period.[2] The projected labour force, obtained simply by multiplying the projected population in each age/sex cohort by the assumed labour force participation rate for the respective cohort. The projected labour force and assumed age-specific labour force participation rates are included in the EXCEL file '*Labour force TH*' (see worksheets *'LabM'* and '*LabF*').

It can be observed that the projected labour force is expected to increase gradually from the total number of 36.8 million in the year 2007 to a maximum of about 40.45 million in 2024 and to decrease gradually thereafter as a result of the decreasing population.

Employment

According to NSO figures the number of employed totaled 36.1 million in the fiscal year 2007, of which 19.6 million males and 17.5 million females. The unemployment rate (including the seasonally inactive) is estimated at 1.92% (of the labour force) for males and 1.94% for females. For the projection of employment, it is assumed that the unemployment rate will remain constant at the same rates for the whole projection period. The projected total number of employed is obtained by deducting from the projected labour force the projected number of unemployed.

The resulting figures are displayed in the worksheets *'Empl M'* and *'Empl F'*, see file '*Labour force TH*'. It can be observed that the projected number of employed is projected to increase gradually to about 39.6 million by the year 2020.

2.2. Macro-economic projections

The structure and methodology as used in the economic module are presented in the user manual. The economic module consists of the EXCEL file '*Econ TH*', which is attached to the electronic version of the present report.

Economic projections were discussed and agreed upon by the national counterparts during the final training workshop that took place in October 2008. The figures agreed upon are presented in table B.2 (see Annex B). The economic assumptions should be revised if needed to reflect any changes in the economic outlook that may occur in the near future. The projection of the main economic variables is summarized below.

GDP at constant (1988) prices

In line with official projections, it has been assumed that GDP at constant (1988) prices will grow at 5.3% p.a. and 5.1% p.a. respectively in the years 2007 and 2008.[3] For the following years, real GDP growth is projected to decrease gradually from 4% p.a. in 2009 to 3.2% p.a. in the year 2019.

GDP at market prices

GDP at market prices is obtained by multiplying projected GDP at constant prices by the GDP Deflator. It is assumed here that the GDP deflator will increase at the same rate than the CPI (see below) over the whole projection period. It can be observed that the GDP at market prices is projected to increase by 12.6% p.a. and 11.1% p.a. in the years 2007 and

[2] It is noted that for the purpose intended here, i.e., the short-term expenditure projection for the three schemes, this assumption is considered acceptable.

[3] Figures as at October 2008. These should be revised in due course if needed.

2008 respectively. For the following years, nominal GDP growth is projected to decrease gradually from 8.9% p.a. in the year 2009 to 5.8% p.a. in the year 2019.

CPI

According to official figures, the Consumer Price Index is projected to increase by 6.9% and 5.8% p.a. in the years 2007 and 2008 respectively.[4] For the following years, the CPI increase is projected to decrease gradually from 4.7% p.a. in the year 2009 to 2.5% in the year 2011 and to remain constant at the same level thereafter.

Real GDP per employed

For the years 2007 and 2008, GDP per employed is obtained implicitly from the official GDP projection and the projected number of employed. It can be observed from the table in Annex C that the implicit rate of growth of real GDP per employed in the years 2007 and 2008 amounts to 4.2% and 4.0% respectively. For the year 2009 and onwards, it is assumed that real GDP per employed will increase at the constant rate of 3% per annum.

Wages

For the projection of the national average wage, and the average wage in the public and private sectors, it has been agreed to assume that over the long term wages increase in line with nominal GDP per employed, i.e. that the elasticity of wage growth to the growth of GDP per employed equals 1.[5] For the short term, specific assumptions have been agreed upon based on the information made available by the national counterparts (see Table B.2 in Annex B).

3. Coverage projection for the SSS, CSMBS, and UC schemes

For the projection of the coverage of the SSS, CSMBS, and UC schemes, specific modules have been developed; the methodology used in the coverage modules are described in detail in the user manual. The results of the coverage projection for the three schemes are described in the following sections.

3.1. Coverage projection for the SSS

The coverage of the SSS in the year 2007 is shown in Table C.1 (see Annex C).[6] It can observed that in 2007 the total number of persons covered under the SSS health insurance branch totaled 9.56 million, of which about 4.74 million males and 4.82 million females.[7] The coverage projection for the Social Security Scheme has been done independently from the other schemes. The methodology used in the respective module (file '*CovPop SSS*') is explained in the user manual. The assumptions and projection results are presented below.

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[4] Figures according to the Bureau of the Budget, Ministry of Finance

[5] This means implicitly that the share of wage income in national income is assumed constant over the longer term.

[6] The SSS figures relate to calendar years since SSO reports financial data on a calendar-year basis. Where necessary, fiscal year data has been estimated from calendar year data.

[7] Data provided by the Social Security Office.

3.1.1. Assumptions for the projection

For the projection of the SSS coverage the following assumptions have been adopted:

- It is assumed that with the observed trend of formalization of employment, the ratio of private sector employees in total employed (see section 2.1.2) will increase gradually from 37.1 per cent as observed in 2007 to 45 per cent in 2020.
- It is further assumed that the ratio of non-agricultural private sector employees in total private sector employees will remain constant over the whole projection period at 82.7 per cent for males and 80.1 per cent for females.
- It is further assumed that the ratio of SSO HI beneficiaries to non-agricultural private sector employees will remain constant over the whole projection period at 78.8 per cent for males and 98.5 per cent for females.

3.1.2. Projected coverage of the SSS

The projection results for the SSS coverage are shown in table C.1. It can be observed that based on the assumptions outlined above, the total number of SSS HI beneficiaries is projected to increase gradually over the whole projection period, this due to the assumed increase in formal employment. The total coverage is projected to increase from 9.56 million as reported in 2007 to 12.71 million in the year 2020.

3.2. Coverage projection for the CSMBS

The estimated coverage of the CSMBS in the base year (fiscal year 2007) is shown in table C.2 (see Annex C). It can observed that in the FY 2007 the total number of persons covered under the scheme is estimated at 4.24 million, of which about 1.50 million actives, 317,617 pensioners, 444,579 dependent spouses, 958,586 dependent children, and about 1.02 million dependent parents.[8]

The coverage projection for the Civil Servants' Medical Benefits Scheme has been done independently from the other schemes. The methodology used in the respective module (file '*CovPop CSMBS*') is explained in the user manual. The assumptions and results are presented below

3.2.1. Assumptions

For the projection of the CSMBS coverage the following assumptions have been adopted:

- The total number of active civil servants and permanent state employees is assumed constant in nominal terms during the period 2007 – 2012. It is further that thereafter the total number of actives will fluctuate in line with the total population.
- It is assumed that age-specific dependency ratios for actives and pensioners will be constant over the whole projection period.[9]
- It is further assumed that actives retire on average at the age of 60.

3.2.2. Projection results

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[8] Data provided by the Comptroller General's Office based on CSMBS database registrations.

[9] This means for instance that the average number of dependent children for an active male of age x is assumed constant at the same (2007) rate over the whole projection period.

The projection results of the CSMBS coverage are shown in table C.2. It can be observed that based on the assumptions outlined above, the total number of CSMBS beneficiaries is projected to increase gradually but steadily over the whole projection period, this due to the increasing number of pensioners. The total coverage is projected to increase from 4.24 million in 2007 to 4.97 million in 2020.

3.3. Coverage projection for the UC scheme

The coverage of the UC scheme in the fiscal year 2007 is shown in Table C.3 (see Annex C).[10] It can observed that in 2007 the total number of persons registered under the UC scheme totaled 46.71 million, of which about 23.02 million males and 23.70 million females. The future coverage of the UC Scheme depends on the future coverage of the SSS and CSMBS, since their members are excluded from potential UC coverage. The coverage projection for the UC scheme is based on the residual population obtained by deducting the projected coverage of SSS and CSMBS from the projected total population. The methodology used in the respective module (file '*CovPop SSS*') is explained in detail in the user manual. The assumptions and projection results are presented below.

3.3.1. Assumptions for the projection

For the projection of the UC coverage it is assumed that the ratio of UC-registered to the 'residual' population (see above) will increase gradually over the whole projection period. For males it is assumed to increase from 93.6 per cent as observed in 2007 to 96 per cent in 2020. For females the ratio is assumed to increase from 94.1 per cent as observed in 2007 to 96.5 per cent in 2020.

3.3.2. Projected coverage of the UC scheme

The projection results for the UC coverage are shown in table C.3. It can be observed that based on the assumption outlined above, the total number of UC registered is projected to increase slightly over in future years to reach about 47.65 million by the year 2018 and to decrease thereafter to 47.63 million by the year 2020. The decline in UC coverage at some point in the future can be explained by the ongoing decline of the population growth out-weighted by the projected increase in the coverage of SSS and CSMBS.

4. Status quo expenditure projections for the SSS, CSMBS, and UC schemes

For the projection of the expenditure of the SSS, CSMBS, and UC schemes, specific modules have been developed under the project; the methodology used in the expenditure modules is described in detail in the user manual. The results of the expenditure projections for the three schemes are summarized in the following sections. It is noted that all results presented under this section (4) have been generated under the assumption of status quo conditions, i.e. assuming no change in benefit provisions and/or financing arrangements of each scheme.[11]

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[10] Data provided by the National Health Security Office.

[11] This however does not exclude any changes in benefit provisions or financing arrangements that have already been adopted but where implementation is yet to occur.

4.1. Expenditure projection for the SSS

The expenditure of the SSS sickness branch in the base year (calendar year 2007) is shown in Table D.1 (see Annex D).[12] It can observed that in 2007 total expenditure amounted to 17.63 billion THB, of which 16.98 billion THB for in-kind (medical) benefits, 198.6 million THB for sickness cash benefits (income replacement during sickness), and 455 million THB for administration cost.[13] It can further be observed that the total expenditure for general outpatient benefits (GOP) amounted to about 8.59 billion THB whereas the total expenditure for general inpatient benefits (GIP) amounted to about 6.10 billion THB. This corresponds to an annual per capita cost of 899.1 THB for general outpatient benefits and 638.6 THB for general inpatient benefits. The total cost of other in-kind benefits (excluded from the capitation fee) amounted to about 2.28 billion THB. The total annual cost per capita for general outpatient and inpatient care (capitation fee) amounted to 1,272.91 THB in the year 2007.

The expenditure of the SSS sickness branch has been projected with the model file '*HCF Model SSS'*. The methodology used for projecting the annual expenditure relating to the different benefits is explained in the user manual. The assumptions and projection results are presented in the following sections. Projection results are shown for the period 2007 – 2012 only.[14]

4.1.1. Assumptions for the SSS expenditure projection

The assumptions used for the projection of the expenditure of the SSS sickness branch are summarized in table E.1.a. (see Annex E).[15] It is noted that the assumed rate of increase of unit cost for GOP and GIP benefits is obtained from the aggregate of all cost factors, taking into account both unit cost and volume increases of input factors. It is further noted that for non-GOP/GIP benefits, which are paid for to providers based on fee schedules, no increase has been assumed for the years 2008 and 2009.

For sickness cash benefits, it has been assumed that the incidence rate will remain constant at the level observed in 2007 (0.0141 cases/insured/year), and that the average benefit amount per case will increase in line with average insured earnings. For administrations cost, it is assumed that the total amount will increase by 10 per cent per year in nominal terms.

4.1.2. Projected expenditure of the SSS sickness branch

The projection results for the SSS sickness branch are shown in table D.1. It can be observed that based on the assumptions outlined above, the total expenditure for SSS sickness benefits is projected to increase gradually over the whole projection period, this due to the assumed increase in coverage, utilization rates, case-mix index per admission (for GIP care), and volume of factor inputs.[16] The total expenditure is thus projected to

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[12] The SSS expenditure figures relate to calendar years since SSO reports financial data on a calendar-year basis.

[13] Data provided by the Social Security Office.

[14] Medium and long-term projections can be generated with the model by mechanically extending the short-term projections; the main purpose of the models however lies with short term budgeting.

[15] Assumptions were discussed and agreed upon with the national counterparts during the final training workshop that took place in October 2008.

[16] The volume increase of input factors can be considered as the 'technology' factor commonly referred to in connection with unit cost increases in health.

increase from 17.63 billion THB in 2007 to 36.44 billion THB by the year 2012. The PAYG cost rate for sickness benefits is projected to increase from 2.26 per cent of insured earnings in 2007 to 2.91 per cent in 2012.

The total cost per capita for GOP and GIP benefits (capitation benefits) is projected to increase for 1,537.7 THB per annum in 2007 to 2,703.5 THB per annum in 2012.

4.2. Expenditure projection for the Civil Servants' Medical Benefits Scheme

The expenditure of the CSMBS in the base year (fiscal year 2007) is shown in Table D.2 (see Annex D). It can observed that in 2007 total expenditure amounted to 46.52 billion THB, of which 30.83 billion THB for outpatient benefits, 15.65 billion THB for inpatient benefits, and 35 million THB for administration cost.[17] The total annual cost per capita in the year 2007 amounted to 6,942.2 THB for outpatient care and 3,689.8 THB for inpatient care.

The expenditure of the CSMBS has been projected with the model file '*HCF Model CSMBS'*. The methodology used for projecting the annual expenditure relating to the different benefits is explained in the user manual. The assumptions and projection results are presented in the following sections. Projection results are shown for the period 2007 – 2012 only.[18]

4.2.1. Assumptions for CSMBS expenditure projection

The assumptions used for the projection of the expenditure of the CSMBS are summarized in table E.2. (see Annex E).[19] It is noted that the assumed rate of increase of unit cost for OP and IP benefits is obtained from the aggregate of all cost factors, taking into account both unit cost and volume increases of input factors. It is further noted that for non-OP/IP benefits, which are paid for to providers according to fee schedule, no increase has been assumed over the period 2008 - 2010. For administrations cost, it is assumed that the total amount will increase by 6 per cent per year in nominal terms, this in line with wage increases in the public sector.

4.2.2. Projected expenditure of the CSMBS

The projection results for the SSS coverage are shown in table D.1. It can be observed that based on the assumptions outlined above, the total expenditure for CSMBS benefits is projected to increase gradually over the whole projection period, this due to the assumed increase in coverage, utilization rates, case-mix index per admission (for GIP care), and volume of factor inputs.[20] The total expenditure is thus projected to increase from 46.48 billion THB in 2007 to 83.69 billion THB by the year 2012. The PAYG cost rate for all benefits and administration cost of the scheme is projected to increase from 10.1 per cent

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[17] Data provided by the Comprtoller General's Office, CGD. Administration costs exclude salaries of CSMBS administrative staff.

[18] Medium and long-term projections can be generated with the model by mechanically extending the short-term projections; the main purpose of the models however lies with short term budgeting.

[19] Assumptions were discussed and agreed upon with the national counterparts during the final training workshop that took place in October 2008.

[20] The volume increase of input factors can be considered as the 'technology' factor commonly referred to in connection with unit cost increases in health.

of insurable earnings (here estimated total wages and pensions) in 2007 to 12.2 per cent by the year 2012.

The total annual cost per capita for all medical benefits provided to CSMBS beneficiaries is projected to increase from 10,631 THB in 2007 to 18,681 THB in 2012.

4.3. Expenditure projection for the Universal Coverage Scheme

The expenditure of the UC scheme in the base year (fiscal year 2007) is shown in Table D.3 (see Annex D). It can observed that in 2007 total expenditure amounted to 92.18 billion THB, of which 30.96 billion THB for general outpatient benefits, 37.89 billion THB for general inpatient benefits, 11.43 billion THB for prevention and promotion activities, 6.57 billion THB for capital replacement cost, 3,85 billion for HIV/Aids benefits, 669 million THB for other benefits, and 811 million THB for administration cost.[21] The annual per capita cost for general outpatient benefits (GOP) amounted to about 662.7 THB/person whereas the annual per capita cost for general inpatient benefits (GIP) amounted to about 811.1 THB/person. The total annual cost per capita for all benefits including administration cost and salaries amounted to 1,955.9 THB/person in the year 2007.

The expenditure of the UC has been projected with the model file '*HCF Model UC*'. The methodology used for projecting the annual expenditure relating to the different benefits is explained in the user manual. The assumptions and projection results are presented in the following sections. Projection results are shown for the period 2007 – 2012 only.[22]

4.3.1. Assumptions for the UC scheme

The assumptions used for the projection of the expenditure of the UC scheme are summarized in table E.3. (see Annex E).[23] It is noted that the assumed rate of increase of unit cost for GOP and GIP benefits is obtained from the aggregate of all cost factors, taking into account both unit cost and volume increases of input factors. It is further noted that for the year 2008, the figures highlighted in grey have been derived implicitly from actual figures. For administrations cost, it is assumed that the total amount will increase by 10 per cent per year in nominal terms.

4.3.2. Projected expenditure of the UC scheme

The projection results for UC expenditure are shown in table D.3. It can be observed that based on the assumptions outlined above, the total expenditure for UC benefits is projected to increase gradually over the whole projection period, this mainly due to the assumed increase in utilization rates, case-mix index per admission (for GIP care), unit cost and volume of factor inputs.[24] The total expenditure of the UC scheme is thus projected to increase from 92.18 billion THB in 2007 to 154.44 billion THB by the year 2012. The total cost per capita of the scheme (including administration cost and salaries)

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[21] Data provided by the National Health Security Office.

[22] Medium and long-term projections can be generated with the model by mechanically extending the short-term projections; the main purpose of the models however lies with short term budgeting.

[23] Assumptions were discussed and agreed upon with the national counterparts during the final training workshop that took place in October 2008.

[24] The volume increase of input factors can be considered as the 'technology' factor commonly referred to in connection with unit cost increases in health.

is projected to increase for 1,955.9 THB per annum in 2007 to 3,191.2 THB per annum in 2012. The details of the projection are displayed in table D.3 (see Annex D).

5. Reform options and related projections

The following sections deal with reform option under consideration by the SSS, CSMBS, and UC schemes and their financial implications on fiscal burden and allocation of resources respectively.

5.1. Reform options for the Social Security Scheme

No major reforms are currently being considered for the financing of medical expenditure under the sickness branch of Social Security Scheme. However, the current provider payment mechanism is under review and reform options are being discussed. The discussions relate to the adequacy of the current capitation system, which comprises only minor components (referred to by SSO as 'Risk adjustment' and 'Utilization Incentive')[25] that compensate providers facing higher-than-average cost of care due to adverse selection by insured members.[26]

Table 1. Allocation of SSS capitation fee, status quo and reform option

	BASE YEAR	*PROJECTION*	
Expenditure per capita (THB/person/year)	***2007***	***2008***	***2009***
GOP cost per capita	899.1	1,015.0	1,129.0
GIP cost per capita	638.6	752.8	866.0
Capitation fee (implicit)	1,537.66	1,767.75	1,995.01
Allocation (status quo)			
Basic capitation fee (implicit) [1]	1,272.91	1,360.26	1,579.46
Utilization incentive	55.71	55.71	55.71
Risk adjustment	209.04	351.78	359.85
Allocation (Reform proposal)			
Basic capitation fee (GOP, implicit)	714.57	724.61	832.03
Utilization incentive (for GOP only) [2]	30.64	30.64	30.64
Risk adjustment (for chronic diseases) [3]	153.86	259.70	266.34
DRG payments for GIP care	638.59	752.80	866.00

Notes:
1. Residual amount of per capita cost
2. Excluding the status quo share (45%) for GIP care
3. Excluding the status quo share for GIP care (calculated from hospital days)

The reform option considered below relates to the provider payment mechanism for general inpatient care. It is being proposed that provider payments for general inpatient care be based entirely on the DRG-system as implemented already by all providers contracted under SSO. It is notably proposed that providers be paid for inpatient care based on the number of Adjusted Relative Weights (ARWs) as allocated in the DRG system for all general inpatient benefits provided to SSS patients. The monies currently paid for inpatient care consist of a flat-rate amount (part of the basic capitation fee), an

[25] For a detailed description of the SSS capitation allocation system see Report B, section 3.

[26] It is noted here that since SSS beneficiaries are free to choose their provider, adverse selection seems to occur, with high-risk patients (e.g. those with chronic diseases) giving preference in their provider choice to certain hospitals, in particular to university hospitals.

adjustment for the number of in-patient hospital days (part of the utilization incentive component), and an adjustment for the number of ARWs (part of the risk adjustment component).

The proposed reform for the years 2007 – 2009 is illustrated in Table 1. based on the projected per capita expenditure for GOP and GIP benefits (see table D.1).

5.2. Reform options for the Civil Servants' Medical Benefits Scheme

For the CSMBS, the following reform options are considered in the following:[27]

A. To introduce an insurance mechanism for the financing of CSMBS medical benefits, with one third of the contribution rate necessary to be born by active beneficiaries and pensioners.

B. To introduce a patient co-payment for non-essential drugs

The purpose and financial implications of these two reform proposals are discussed in the following sections.

5.2.1. Reform option A: introduction of an insurance mechanism for CSMBS

The purpose of this reform measure would be to alleviate the fiscal burden of the CSMBS by forcing active beneficiaries (and pensioners) to contribute to the financing of the scheme from their salaries. It could also be assumed that the implementation of this measure would create incentives for members to contain the cost of the scheme, this indirectly only though through an increased awareness of civil servants on the cost of medical benefits.

Table 2. Reform option A, CSMBS

	BASE YEAR	*PROJECTION*				
BENEFIT EXPENDITURE (mio THB)	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
Outpatient care	30,832.5	38,803.4	46,355.4	52,041.5	57,383.5	61,632.1
Inpatient care	15,648.6	16,105.2	17,262.3	18,481.8	20,378.7	22,061.7
Total Benefit Expenditure	46,481.1	54,908.7	63,617.7	70,523.3	77,762.2	83,693.8
Administration cost	35.0	37.1	39.3	41.7	44.2	46.8
TOTAL EXPENDITURE	***46,516.1***	***54,945.8***	***63,657.0***	***70,564.9***	***77,806.4***	***83,740.6***
Insurable earnings and pensions (mio THB, estimate)	460,349.4	516,086.9	555,672.2	597,146.5	641,249.2	688,646.8
PAYG cost ratio	**10.1%**	**10.6%**	**11.4%**	**11.8%**	**12.1%**	**12.2%**
Reform Option A						
Contribution rate for members (actives and pensioners)	3.4%	3.5%	3.8%	3.9%	4.0%	4.1%
Contribution rate for the state budget	6.7%	7.1%	7.6%	7.9%	8.1%	8.1%
Members' contributions (mio THB)			21,219.0	23,521.6	25,935.5	27,913.5
State Budget liability (mio THB)			42,438.0	47,043.3	51,870.9	55,827.1

Financial implications are illustrated in table 2. It is assumed that civil servants, permanent state employees, and pensioners would contribute indiscriminately for one third of the total cost of the scheme. Since no data on the wage distribution was available, it is assumed that contributions are levied on the whole salary (i.e., that no contribution ceiling would be put in place). Expenditure projections are based on the status quo projection for CSMBS as presented in section 4.2. (see also table D.2 in Annex D).

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[27] These were suggested by the technical counterparts of CSMBS during the final training workshop on model development.

It can be observed that under the assumptions outlined above, the projected total contribution rate of the scheme for the year 2009 amounts to 11.4 per cent, of which on third or 3.8 per cent would be borne by active members and pensioners. Their total contribution would amount to about 21.22 billion THB in the year 2009. The total contribution rate is projected to increase to 12.2 per cent by the year 2012, or 4.1 per cent for contributing members.

5.2.2. Reform option B: patient co-payment for non-essential drugs

The main purpose of this reform measure would be to contain the cost for non-essential drugs as prescribed to CSMBS beneficiaries. There are indications that the cost born by the scheme for non-essential drugs has been escalating in the recent past and accounts for a main part for the high cost increase for outpatient benefits.[28]

It is assumed in the following that non-essential drugs would be subject to a co-payment by beneficiaries of 20 per cent of cost. Since it is mere speculation as to how this measure would affect demand and supply of non-essential drugs, it is assumed in the following that the volume of non-essential drugs prescribed would not be affected. Expenditure projections for different cost components are based on the status quo projection presented in section 4.2. It is noted that in the status quo projection it has been assumed that the increase of unit cost and volume of non-essential drugs prescribed under CSMBS will gradually decrease in the coming years (see table E.2 for assumptions).

Table 3. Reform option B, CSMBS

	BASE YEAR	*PROJECTION*				
BENEFIT EXPENDITURE (mio THB)	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
Outpatient care	30,832.5	38,803.4	46,355.4	52,041.5	57,383.5	61,632.1
Essential drugs	10,830.9	13,865.3	15,952.2	17,534.6	18,843.6	19,990.9
Non-essential drugs	7,469.4	11,491.5	15,800.9	18,940.8	21,481.9	23,579.6
Other benefits	12,532.2	13,446.7	14,602.2	15,566.0	17,058.0	18,061.5
Inpatient care	15,648.6	16,105.2	17,262.3	18,481.8	20,378.7	22,061.7
Total Benefit Expenditure	46,481.1	54,908.7	63,617.7	70,523.3	77,762.2	83,693.8
Administration cost	35.0	37.1	39.3	41.7	44.2	46.8
TOTAL EXPENDITURE	***46,516.1***	***54,945.8***	***63,657.0***	***70,564.9***	***77,806.4***	***83,740.6***
Reform Option B						
Co-payment share for non-essential drugs (assumption)			20.0%	20.0%	20.0%	20.0%
Total co-payments (mio THB)			3,160.2	3,788.2	4,296.4	4,715.9
State Budget liability (mio THB)			60,496.8	66,776.8	73,510.0	79,024.7

The projected expenditure for outpatient benefits and non-essential drugs is presented in table 3. It is assumed that the co-payment would be introduced in the year 2009. It can be observed that based on the assumptions summarized above, the cost for non-essential drugs borne by scheme beneficiaries is projected at 3.16 billion for the fiscal year 2009. It is further projected to increase gradually to 4.72 billion by the year 2012.

5.3. Reform options for the Universal Coverage Scheme

For the UC scheme the reform proposal considered below relates to the introduction of a separate budget allocation for primary care. Financial resources for primary care benefits

[28] The sample data gathered from three public hospitals suggests that the cost for non-essential drugs increased by about 70 per cent from the fiscal year 06 to 07 and accounted for 27 per cent of outpatient expenditure in the fiscal year 07.

are currently allocated through the capitation fee, i.e. together with the funds allocated for non-primary outpatient care (i.e., for secondary and specialist services). The NHSO is currently considering to break up the budget allocation for OP care into primary and non-primary care, this in order to shift more resources towards primary care and to strengthen the network of primary care providers (e.g. Provincial Care Units (PCUs) and local health centers). This measure is in line with the prevailing policy of decentralization of primary care away from hospitals to primary care providers.

The financial implications are illustrated in table 4. It is assumed here that primary care accounts for 80 per cent of all outpatient visit and 60 per cent of the cost of general outpatient care benefits (working hypothesis).[29] The projected budget for Prevention and Promotion activities is allocated in full to the assumed new budget line for primary care.

Table 4. Reform option for the UC scheme

	BASE YEAR	*PROJECTION*				
BENEFIT EXPENDITURE (mio THB)	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
Outpatient care benefits	30,958.3	27,923.5	30,174.2	32,621.7	36,092.9	38,990.6
Inpatient care benefits	37,890.6	50,588.4	56,214.6	62,650.3	71,584.5	79,935.6
Prevention and promotion (PP)	11,426.2	11,759.1	12,656.6	13,643.6	15,031.5	16,181.0
Other items	11,091.6	11,713.1	13,798.7	14,964.0	16,618.4	18,031.2
TOTAL BENEFIT EXPENDITURE	**91,366.7**	**101,984.1**	**112,844.1**	**123,879.6**	**139,327.4**	**153,138.4**
Reform option						
Total allocation for OP care (incl. PP)			42,830.8	46,265.3	51,124.4	55,171.6
Allocation for Primary Care*			30,761.1	33,216.6	36,687.2	39,575.4
Allocation for non-primary care**			12,069.7	13,048.7	14,437.2	15,596.2

*** It is a**ssumed that 60% of the current OP budget is spent on primary care; PP budget is fully allocated to primary care*

*** It is assumed that the remaining 40% of the current budget for OP care is spent on non-primary care*

It can be observed that under the assumptions outlined above, the budget allocation for primary care would amount to 30.76 billion THB in the year 2009, including 12.66 billion THB for Prevention and Promotion activities and 18.10 billion THB for primary care benefits. Based on the results of the status quo projections (see section 4.3), the allocation for primary care would increase to 39.58 billion by 2012.

6. Projection of National Expenditure on Health (National Health Accounts)

The total Thai national expenditure on health as compiled in the National Health Accounts has been projected with the model file '*NHA model*' as provided to the national counterparts together with the other model files. The methodology and projection results are described below.

6.1. Methodology

For the projection, distinction is made between current and capital expenditure as given in the NHA. For current expenditure, total expenditure is broken up by agency (table XYZ in the NHA) and projected separately for each agency. For the three main national health insurance schemes, the UC, CSMBS, and SSS, the current expenditure is obtained with

[29] No data is currently available on primary care benefits provided under the UC scheme. An exact definition of what primary care should comprise in the Thai context needs to be adopted before any data on primary care can be compiled.

the institutional models (status quo case) as described in section 4 above.[30] For all other agencies, current expenditure has been projected in relative terms to GDP, taking into account the past development and any trend observed. For most items no marked trend can been observed and expenditure has therefore been projected as a constant share of GDP. For other items, for which the relative share of expenditure to GDP shows a marked trend over the years preceding the base year, use has been made of the average elasticity of increase of expenditure to GDP growth. For the projection of GDP,

Capital expenditure has been projected in aggregate by using the average annual expenditure observed over the past 10 years (1996 – 2005), this in relative terms to GDP (0.33 per cent).

6.2. Base year and historical data

The base year selected for the projection is 2005, since this is the most recent year for which a complete set of NHA data is available. Historical data of total current expenditure by agency as compiled in the NHA for the years 1994 – 2005 is displayed in table F.1. (see Annex F).[31] The figures are shown in nominal amounts and in relative terms to GDP. It can be observed that in the year 2005, total national expenditure on health amounted to 248.08 billion THB, of which 238.36 billion for current expenditure and 9.72 billion for capital expenditure. In relative terms, total expenditure on health in the year 2005 amounted to 3.5 per cent of GDP, of which 3.36 per cent for current expenditure, and 0.14 per cent for capital expenditure.

6.3. Projection results

The national expenditure on health, projected over the period 2006 – 2020 according to the methodology outlined above, is displayed in table F.2. (see Annex F). It can be observed that total current expenditure on health is projected to increase from 238.36 billion THB as observed in 2005 to 919.18 billion THB by the year 2020. In relative terms, total current expenditure is projected to increase from 3.36 per cent of GDP as observed in the year 2005 to 4.47 per cent of GDP by the year 2020. Since capital expenditure is assumed constant in relative terms to GDP at 0.33%, the total expenditure on health is projected to increase from 3.5 per cent of GDP as observed in 2005 to 4.8 per cent of GDP in 2020. The detailed results of the projection are displayed in table F.2. (see Annex F).

[30] Some adjustments are necessary to ensure methodological consistency with the figures reported in the NHA.

[31] Data provided by the International Health Policy Programme (IHPP).

ANNEX A

Terms of Reference:

These Terms of Reference (TOR-SP) refer to the second phase (SP) of the development of a: health care financing model, and staff capacity building, for the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and the International Health Policy Programme (IHPP) of Thailand.

With respect to the first (initial) phase (TOR-IP) reference is made to contract PO/Ver No: 40029956, dated 29.06.2007

It is understood that, at the commencement of this contract (TOR-SP), the obligations and works of the contract of the initial phase (TOR-IP) have been fulfilled such that the tasks to be carried out under this contract (TOR-SP) can be fulfilled.

The overall contents of the Draft Terms of Reference (so-called Draft03 dated 02/05/2007, see attachment to contract re TOR-IP) remains valid. The contractor to these TOR-SP is advised to refer to Draft03 for further information.

The contents of Draft03, as far as not replaced by these TOR-SP, is valid; the time frame defined in Draft03 is however not fully applicable anymore. For the second phase of modelling, these TOR-SP replace the time frame of Draft03 (see the attached updated flow chart of activities under TOR-SP).

A. Activities to be carried out

Under the supervision of the Senior Economist of the ILO Social Security Department and the Social Security Specialist of the ILO SRO-Bangkok, the contractor to these TOR-SP will undertake the following tasks:

On the background as provided in Draft 03 (see above), he will develop four (4) health care finance models, which, each, are characterized by the fact that they can be based on a common, coordinated set of assumptions on demography, economy, labour market, health care utilization and unit cost developments.

The models will be designed such that they project expenditure and revenue of Thailand's health system(s); the models are annual, i.e. they are based on annual data and will produce annual (annualised) outputs; their time horizons will range from short (for budgeting purposes) to long-term.

Institutional, legal and behavioural specificities of the three single schemes will be sufficiently mapped; the scope of the data base of the model for the IHPP goes beyond the scope of the data bases of the three schemes but, where possible, the IHPP model will make use of the data bases of the three schemes.

Core technical staff from the three schemes and the International Health Policy Programme (IHPP) in charge of the maintenance of the model(s), will support the model development and be trained (see below) in the usage and future calibration of the models.

Especially the contractor will:

(1) Establish a common demographic, labour market and economic frame for the four models to be developed for CSMBS, NHSO, SSO and IHPP;

(2) Establish the health care financing modules for three schemes CSMBS, NHSO, and SSO as well as the model for the IHPP (NHA);

(2a) Develop modules for allocating the available overall resources (budgets) to the hospitals that have contracted with NHSO and SSO. The contractor will explore the feasibility of the development of such a module for CSMBS, and make proposal(s), accordingly. Technically, the allocation mechanism will be "top-down" for both, NHSO and SSO, and it will, to the extent possible, replicate, as a standard procedure, the present mechanisms applied by NHSO. The allocation mechanism for SSO will be newly developed; where appropriate, the SSO allocation mechanism will draw advantage from the allocation mechanism developed for NHSO;

(3) With a view to most appropriate model design (possible simulation options; see also point (5) below): consult with CSMBS, NHSO, SSO and IHPP staff on possible reform plans of the CSMBS, NHSO and SSS. These might include different allocation formulas, different ways of capitation calculation (for example,. with or without inclusion of capital depreciation), or the possible coverage of dependents and future pensioners (SSO);

(4) Decide on modelling options that most appropriately incorporate any of those mentioned details;

(5) Carry out status-quo projections, and reform simulations in coordination and cooperation with the staff of CSMBS, NHSO, and SSO – in order to validate the significance of the outputs of the established models; consult with the staff of the CSMBS, NHSO, SSO and the IHPP on the projection and simulation results, and modify the models' structures to the extent that they produce unreasonable results;

(6) Describe, for each institution (CSMBS, NHSO, SSO and IHPP) separately,

   (a) the procedures of model maintenance,

   (b) the handling of the model;

(7) Develop training material;

(8) Carry out a three days common introductory training workshop (proseminar) for the staff of the CSMBS, NHSO, SSO and the IHPP on the purpose and use of the models;

(9) Carry out separately, for the staff of each of the institutions CSMBS, NHSO, SSO and the IHPP, hands-on training at staff work places, on the technical use of their respective models;

(10) Hand out the electronic version, and any accompanying training material, of the models to the staff of the CSMBS, NHSO, SSO and the IHPP;

(11) Provide the above (items (1) to (10)), and all other stipulations contained in this document to the satisfaction of the ILO.

As part of the technical modeling work, in addition to the electronic model to be developed and in order to reflect and document work progress, the contractor writes the following reports on the above items (draft titles – open to adjustments in consensus with ILO-SECSOC):

(A) A common demographic, labour market and economic frame and health care financing modules for CSMBS, NHSO, SSO and IHPP. (This report covers item (1), above.)

(B) Financial projection models for CSMBS, NHSO, SSO and IHPP – core design and technical incorporation of allocation formulae and reform options. (This report covers items (2), (2a), (3) and (4), above.)

(C) Status-quo projections, and reform simulations, for the financial development of CSMBS, NHSO, SSO and under NHA (IHPP). (This report covers item (5), above.)

(D) Model maintenance and practical handling of the models of CSMBS, NHSO, SSO and IHPP. A manual. (This report covers items (6) and – partially - (7), above.)

(E) Introduction to the practical use of the models for CSMBS, NHSO, SSO and IHPP. Seminar training material. (This report covers items (7) – partially –, and the didactical material needed for items (8) and (9), above.)

(F) Note on the formal hand-over of the models and any accompanying material to the staff of CSMBS, NHSO, SSO and IHPP. Formal notes on the delivery of the training activities. (This note covers items (8), (9) and (10), above.)

B. Schedule

The work is expected to be accomplished over a six-months period, starting with the signature of the contract to which these TOR-SP refer.

A work flow chart stipulating which work should reasonably be done when is attached. It contains the proposal for another, deepening, workshop for the Thai counterparts / users of the model, after the completion of the works to be undertaken under these TOR-SP. This deepening workshop is not part of these TOR-SP.

C. Preconditions and caveats

It is assumed that necessary data for the model(s) have been collected in close collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff. This work has provided all involved with an a priori understanding of the actual modeling (model design) to be undertaken.

In case of delays in the data collection process (see TOR-IP), which might “stretch” the process of data collection and of constructing the data base into this second phase (TOR-SP) of the project, there could be a delay in delivery of the results as expected under these TOR-SP.

The budget to this contract is expert fees (including fees for his participation in seminars / training workshops, lecturing fees, if any, including travel required under the TOR-SP). Other cost such as printing cost of the reports, the cost for seminars / training workshops (e.g. cost for the venue, equipments and refreshments) are not included in this budget, and will be covered separately.

ANNEX B

Table B.1. Population projection, Thailand, 2007 - 2027

	2007	2012	2017	2022	2027
		ASSUMPTIONS (NESDB)			
Total fertility rate	1.609	1.539	1.469	1.369	1.350
Life expectancy at birth					
male	70.59	71.93	73.28	74.62	75.96
female	77.54	78.82	80.1	81.38	82.66
		PROJECTION RESULTS			
Population (million)	63.43	65.10	66.49	67.41	67.83
male	31.30	31.98	32.56	32.92	33.03
female	32.13	33.12	33.93	34.49	34.80

Tabel B.2. Economic projection

	Base year	*Projection*				
	2007	*2008*	*2009*	*2010*	*2011*	*2012*
GDP						
GDP nominal	8,469,060	9,533,257	10,595,538	11,536,553	12,424,415	13,233,785
Change (in % p.a.)	8.2%	12.6%	11.1%	8.9%	7.7%	6.5%
GDP at 1988 prices	4,244,585	4,469,548	4,695,260	4,882,767	5,075,819	5,274,611
Change (% p.a.)	4.8%	5.3%	5.1%	4.0%	4.0%	3.9%
GDP deflator	1.9953	2.1329	2.2566	2.3627	2.4478	2.5090
Change (% p.a.)	3.2%	6.9%	5.8%	4.7%	3.6%	2.5%
LF & Employment						
Total Labour Force	36,902	37,291	37,667	38,030	38,382	38,724
Employment	36,192	36,573	36,942	37,298	37,643	37,978
Change (% p.a.)		1.1%	1.0%	1.0%	0.9%	0.9%
GDP per employed						
GDP (at '88 price) per empl.	117.28	122.21	127.10	130.91	134.84	138.89
Change (% p.a.)		4.2%	4.0%	3.0%	3.0%	3.0%
GDP (nominal) per empl.	234.01	260.67	286.82	309.31	330.06	348.46
Change (% p.a.)		11.4%	10.0%	7.8%	6.7%	5.6%
Prices						
CPI Headline	188.60	201.61	213.30	223.33	231.37	237.15
Change in % p.a.	3.5%	6.9%	5.8%	4.7%	3.6%	2.5%
		7.9%	11.2%	9.0%	7.8%	6.7%
Wages (from National Income data)		9.6%	10.6%	8.4%	7.3%	6.1%
National average wage (Employees)	12,392	13,384	14,391	15,519	16,560	17,483
Change (% p.a.)		8.0%	7.5%	7.8%	6.7%	5.6%
Elasticity to labour prod. growth		0.6	0.75	1.0	1.0	1.0
Average wage (public sector)	19,505	21,651	22,950	24,327	25,786	27,334
Change (% p.a.)		11.0%	6.0%	6.0%	6.0%	6.0%
Elasticity to labour prod. Gr.		1.0	0.6	0.8	0.9	1.1
Average wage (private sector)	10,719	11,470	12,333	13,300	14,193	14,984
Change (% p.a.)		7.0%	7.5%	7.8%	6.7%	5.6%
Elasticity to labour prod. Gr.		0.6	0.75	1.0	1.0	1.0

Annex C

Table C.1. Coverage projection for the SSS

Calendar year	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Labour force	37,195,886	37,575,393	37,941,617	38,296,279	38,640,861	38,973,123	39,281,183	39,556,244	39,792,076	39,990,938	40,151,909	40,276,908	40,371,771	40,435,097
Male	20,240,974	20,461,041	20,676,427	20,888,628	21,098,686	21,304,137	21,497,033	21,672,142	21,825,179	21,959,318	22,073,991	22,170,410	22,252,681	22,316,613
Female	16,954,912	17,114,353	17,265,190	17,407,651	17,542,175	17,668,986	17,784,149	17,884,101	17,966,897	18,031,620	18,077,918	18,106,499	18,119,089	18,118,484
Employed	36,095,613	36,479,547	36,851,748	37,210,922	37,558,758	37,896,709	38,222,578	38,524,711	38,794,480	39,025,775	39,220,814	39,378,691	39,501,289	39,594,332
Male	19,634,188	19,853,219	20,069,070	20,280,330	20,488,466	20,694,499	20,896,014	21,085,216	21,256,970	21,407,075	21,538,645	21,651,121	21,745,692	21,826,388
Female	16,461,425	16,626,328	16,782,679	16,930,592	17,070,293	17,202,210	17,326,564	17,439,495	17,537,510	17,618,701	17,682,169	17,727,570	17,755,597	17,767,944
Private employees (PEEs)	13,357,480	13,700,554	14,043,629	14,386,703	14,729,778	15,072,853	15,415,927	15,759,002	16,102,076	16,445,151	16,788,225	17,131,300	17,474,375	17,817,449
% of employed	37.1%	37.7%	38.3%	38.9%	39.5%	40.1%	40.7%	41.3%	42.0%	42.6%	43.2%	43.8%	44.4%	45.0%
Male	7,280,161	7,482,343	7,685,976	7,890,453	8,096,270	8,303,780	8,511,960	8,717,504	8,918,035	9,111,444	9,298,680	9,479,161	9,653,063	9,821,875
Female	6,103,732	6,266,182	6,427,366	6,587,173	6,745,537	6,902,480	7,057,949	7,210,212	7,357,593	7,499,007	7,633,760	7,761,376	7,881,833	7,995,575
PEEs (non agriculture)	10,909,346	11,206,664	11,504,168	11,801,268	12,098,321	12,395,637	12,692,328	12,984,272	13,268,159	13,541,377	13,804,156	14,055,632	14,295,935	14,526,650
Male	6,022,639	6,189,897	6,358,356	6,527,513	6,697,779	6,869,445	7,041,665	7,211,706	7,377,598	7,537,599	7,692,494	7,841,799	7,985,663	8,125,315
	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%	82.7%
Female	4,886,708	5,016,766	5,145,812	5,273,755	5,400,542	5,526,192	5,650,663	5,772,566	5,890,560	6,003,778	6,111,662	6,213,833	6,310,272	6,401,335
	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%	80.1%
SSO population (HI)	9,558,918	9,818,814	10,078,657	10,337,963	10,597,004	10,856,027	11,114,324	11,368,373	11,615,305	11,852,889	12,081,195	12,299,469	12,507,809	12,707,535
Male	4,743,303	4,875,033	5,007,707	5,140,932	5,275,030	5,410,230	5,545,867	5,679,788	5,810,441	5,936,454	6,058,446	6,176,036	6,289,340	6,399,327
Female	4,815,615	4,943,782	5,070,950	5,197,031	5,321,974	5,445,797	5,568,456	5,688,586	5,804,864	5,916,434	6,022,749	6,123,433	6,218,469	6,308,207
SSO insured / PEEs (non-agr.)	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.6%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%
Male	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%
Female	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%

Table C.2. Coverage projection for the CSMBS

Fiscal year:	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Population (total)	63,431,859	63,767,375	64,108,236	64,445,975	64,776,145	65,096,026	65,404,188	65,699,294	65,979,556	66,243,365	66,489,373	66,716,607	66,924,363	67,112,486
Males	31,296,863	31,428,792	31,567,874	31,708,126	31,846,408	31,980,916	32,110,588	32,234,595	32,351,924	32,461,606	32,562,925	32,655,262	32,738,191	32,811,543
Females	32,134,996	32,338,584	32,540,362	32,737,849	32,929,737	33,115,110	33,293,600	33,464,699	33,627,632	33,781,759	33,926,448	34,061,344	34,186,172	34,300,943
% change (total)		0.53%	0.53%	0.53%	0.51%	0.49%	0.47%	0.45%	0.43%	0.40%	0.37%	0.34%	0.31%	0.28%
Males		0.42%	0.44%	0.44%	0.44%	0.42%	0.41%	0.39%	0.36%	0.34%	0.31%	0.28%	0.25%	0.22%
Females		0.63%	0.62%	0.61%	0.59%	0.56%	0.54%	0.51%	0.49%	0.46%	0.43%	0.40%	0.37%	0.34%
ASSUMPTIONS														
Nr. of actives, increase in % p.a.	0%	0%	0%	0%	0%	0%	0.47%	0.45%	0.43%	0.40%	0.37%	0.34%	0.31%	0.28%
Males		0%	0%	0%	0%	0%	0.47%	0.45%	0.43%	0.40%	0.37%	0.34%	0.31%	0.28%
Females		0%	0%	0%	0%	0%	0.47%	0.45%	0.43%	0.40%	0.37%	0.34%	0.31%	0.28%
Civil Servants & PEEs (Actives)	1,499,833	1,499,833	1,499,833	1,499,833	1,499,833	1,499,833	1,506,933	1,513,732	1,520,190	1,526,268	1,531,936	1,537,172	1,541,958	1,546,293
Males	872,476	872,476	872,476	872,476	872,476	872,476	876,606	880,562	884,318	887,854	891,151	894,196	896,981	899,502
% of total	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%	58.2%
Females	627,357	627,357	627,357	627,357	627,357	627,357	630,327	633,171	635,872	638,414	640,785	642,975	644,977	646,790
% of total	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%	41.8%
RESULTS														
MALE INSURED	2,031,245	2,040,021	2,043,325	2,047,971	2,055,573	2,067,397	2,092,496	2,122,492	2,157,552	2,196,568	2,238,663	2,283,050	2,328,065	2,371,714
Actives	872,476	872,476	872,476	872,476	872,476	872,476	876,606	880,562	884,318	887,854	891,152	894,196	896,981	899,502
Pensioners	219,658	235,774	251,705	267,668	284,194	301,646	320,198	340,101	361,432	383,703	406,523	429,642	452,414	474,069
Spouses (husbands)	80,077	81,917	83,002	84,092	85,217	86,443	87,927	89,467	91,038	92,628	94,232	95,756	97,238	98,564
Children (boys)	491,647	500,716	489,367	478,615	468,995	461,007	456,030	453,171	452,605	454,266	458,080	463,965	471,553	480,397
Dep fathers of male	212,504	202,887	202,908	203,143	203,838	205,236	209,187	213,832	219,199	224,967	230,955	237,015	242,835	248,045
Dep fathers of female	154,883	146,251	143,868	141,977	140,852	140,590	142,548	145,360	148,961	153,150	157,721	162,474	167,043	171,137
FEMALE INSURED	2,209,831	2,237,070	2,240,644	2,245,669	2,254,191	2,267,475	2,294,837	2,327,589	2,365,613	2,408,359	2,454,667	2,503,685	2,553,574	2,602,093
Actives	627,357	627,357	627,357	627,357	627,357	627,357	630,327	633,171	635,872	638,414	640,786	642,975	644,978	646,790
Pensioners	97,959	111,121	124,586	138,622	153,601	169,748	187,170	206,026	226,326	247,735	269,911	292,490	314,820	336,290
Spouses (wifes)	364,502	392,713	395,859	398,917	402,253	406,084	410,698	415,497	420,280	425,317	430,442	435,652	440,912	445,914
Children (daughters)	466,939	474,419	463,666	453,479	444,364	436,795	432,080	429,371	428,834	430,409	434,022	439,599	446,788	455,167
Dep mothers of male	373,148	360,853	360,953	361,074	361,656	362,907	367,501	372,954	379,269	386,208	393,459	400,885	408,115	414,646
Dep mothers of female	279,926	270,608	268,224	266,221	264,960	264,584	267,061	270,570	275,032	280,276	286,047	292,084	297,962	303,285
TOTAL INSURED	4,241,076	4,277,091	4,283,969	4,293,640	4,309,764	4,334,872	4,387,333	4,450,081	4,523,165	4,604,927	4,693,330	4,786,735	4,881,639	4,973,807
Actives	1,499,833	1,499,833	1,499,833	1,499,833	1,499,833	1,499,833	1,506,933	1,513,732	1,520,191	1,526,268	1,531,938	1,537,172	1,541,959	1,546,293
Pensioners	317,617	346,895	376,291	406,290	437,795	471,394	507,367	546,127	587,757	631,438	676,434	722,132	767,235	810,360
Spouses	444,579	474,630	478,861	483,009	487,470	492,526	498,625	504,964	511,318	517,945	524,673	531,409	538,150	544,478
Children	958,586	975,135	953,032	932,094	913,360	897,802	888,110	882,542	881,439	884,675	892,103	903,564	918,342	935,564
Dependent fathers	367,387	349,138	346,776	345,120	344,690	345,826	351,735	359,192	368,160	378,117	388,676	399,489	409,878	419,182
Dependent mothers	653,074	631,461	629,177	627,294	626,616	627,491	634,562	643,524	654,301	666,484	679,506	692,970	706,077	717,931

Table C.3. Coverage projection for the UC scheme

Fiscal Year:	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Population (total)	63,431,859	63,767,375	64,108,236	64,445,975	64,776,145	65,096,026	65,404,188	65,699,294	65,979,556	66,243,365	66,489,373	66,716,607	66,924,363	67,112,486
Males	31,296,863	31,428,792	31,567,874	31,708,126	31,846,408	31,980,916	32,110,588	32,234,595	32,351,924	32,461,606	32,562,925	32,655,262	32,738,191	32,811,543
Females	32,134,996	32,338,584	32,540,362	32,737,849	32,929,737	33,115,110	33,293,600	33,464,699	33,627,632	33,781,759	33,926,448	34,061,344	34,186,172	34,300,943
% change (total pop.)		0.53%	0.53%	0.53%	0.51%	0.49%	0.47%	0.45%	0.43%	0.40%	0.37%	0.34%	0.31%	0.28%
Males		0.42%	0.44%	0.44%	0.44%	0.42%	0.41%	0.39%	0.36%	0.34%	0.31%	0.28%	0.25%	0.22%
Females		0.63%	0.62%	0.61%	0.59%	0.56%	0.54%	0.51%	0.49%	0.46%	0.43%	0.40%	0.37%	0.34%
CSMBS population	4,241,076	4,277,091	4,283,969	4,293,640	4,309,764	4,334,872	4,387,333	4,450,081	4,523,165	4,604,927	4,693,330	4,786,735	4,881,639	4,973,807
Males	2,031,245	2,040,021	2,043,325	2,047,971	2,055,573	2,067,397	2,092,496	2,122,492	2,157,552	2,196,568	2,238,663	2,283,050	2,328,065	2,371,714
Females	2,209,831	2,237,070	2,240,644	2,245,669	2,254,191	2,267,475	2,294,837	2,327,589	2,365,613	2,408,359	2,454,667	2,503,685	2,553,574	2,602,093
SSO population*	9,414,517	9,753,840	10,013,696	10,273,137	10,532,244	10,791,271	11,049,750	11,304,861	11,553,572	11,793,493	12,024,119	12,244,901	12,455,724	12,657,603
Males	4,674,140	4,842,100	4,974,539	5,107,626	5,241,505	5,376,430	5,511,958	5,646,308	5,777,778	5,904,951	6,027,948	6,146,638	6,261,014	6,371,830
Females	4,740,377	4,911,740	5,039,158	5,165,511	5,290,739	5,414,841	5,537,791	5,658,553	5,775,794	5,888,542	5,996,170	6,098,262	6,194,710	6,285,773
Residual population	49,776,266	49,736,444	49,810,570	49,879,198	49,934,137	49,969,883	49,967,106	49,944,352	49,902,819	49,844,945	49,771,924	49,684,971	49,587,000	49,481,075
Males	24,591,478	24,546,670	24,550,010	24,552,529	24,549,329	24,537,089	24,506,134	24,465,796	24,416,595	24,360,087	24,296,314	24,225,574	24,149,112	24,067,998
Females	25,184,788	25,189,773	25,260,560	25,326,668	25,384,807	25,432,794	25,460,971	25,478,556	25,486,225	25,484,858	25,475,610	25,459,397	25,437,887	25,413,077
	74%	73%	73%	73%	73%	73%	73%	72%	72%	72%	72%	71%	71%	71%
UC-registered population	46,713,341	46,837,374	46,993,777	47,145,230	47,283,952	47,404,655	47,488,866	47,554,045	47,601,228	47,632,648	47,649,364	47,652,464	47,644,677	47,628,898
Males	23,017,138	23,051,211	23,097,153	23,142,332	23,182,120	23,213,344	23,226,788	23,231,214	23,227,068	23,215,787	23,197,373	23,172,072	23,141,041	23,105,279
Females	23,696,203	23,786,163	23,896,625	24,002,897	24,101,832	24,191,311	24,262,078	24,322,831	24,374,160	24,416,861	24,451,991	24,480,392	24,503,636	24,523,619
UC pop. / Res. Pop.	93.8%	94.2%	94.3%	94.5%	94.7%	94.9%	95.0%	95.2%	95.4%	95.6%	95.7%	95.9%	96.1%	96.3%
Males	93.6%	93.9%	94.1%	94.3%	94.4%	94.6%	94.8%	95.0%	95.1%	95.3%	95.5%	95.7%	95.8%	96.0%
Females	94.1%	94.4%	94.6%	94.8%	94.9%	95.1%	95.3%	95.5%	95.6%	95.8%	96.0%	96.2%	96.3%	96.5%

** The fiscal year data has been estimated from the calendar year data via interpolation*

Annex D

Table D.1. Expenditure projection for the SSS

	BASE YEAR	*PROJECTION*				
BENEFIT EXPENDITURE (mio THB)	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
General outpatient care	8,594.15	10,100.27	11,529.29	13,090.09	14,738.91	16,435.72
General inpatient care	6,104.25	7,491.45	8,843.52	10,283.97	11,742.73	13,279.95
High cost special services	333.88	422.98	483.43	562.17	633.26	706.15
Accident	147.14	169.19	181.80	208.76	232.20	255.76
Emergency	206.06	236.69	255.90	295.26	329.74	364.90
Medical Instruments	21.31	27.33	31.58	38.21	43.51	49.07
Hemodialysis (HD)	414.72	551.12	646.26	776.18	877.11	980.43
Chronic peritoneal dialysis (CPD)	2.56	3.35	3.86	4.58	5.09	5.61
Renal failure drugs	75.30	100.04	117.29	140.87	159.11	177.79
HIV/AIDS (drugs and lab.)	625.18	918.31	1,135.58	1,412.83	1,621.61	1,788.82
Bone marrow transplant	18.00	27.90	35.78	44.38	50.79	55.96
Kidney transplant	73.90	155.28	240.62	341.60	422.97	481.29
Cornea transplant*	-	0.40	0.42	0.49	0.54	0.60
Dental care	317.61	363.36	392.19	451.69	502.86	554.14
Artificial teeth	38.08	79.52	123.93	176.24	218.05	249.84
Care for nonregistered	3.82	3.97	4.15	4.78	5.31	5.86
Other ben 1						
Other ben 2	-	-	-	-	-	-
SUBTOTAL	16,975.96	20,651.17	24,025.62	27,832.08	31,583.81	35,391.88
CASH BENEFITS	198.62	221.27	244.15	270.00	295.27	319.26
Other	-	-	-	-	-	-
TOTAL BENEFIT EXPENDITURE	**17,174.58**	**20,872.44**	**24,269.77**	**28,102.08**	**31,879.08**	**35,711.15**
Administration Cost	455.00	506.87	559.27	618.49	676.38	731.35
TOTAL EXPENDITURE	17,629.58	21,379.31	24,829.04	28,720.57	32,555.46	36,442.50
PAYG cost ratios						
Sickness benefit (in-kind)	2.175%	2.375%	2.504%	2.623%	2.722%	2.821%
Sickness cash benefit	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%
TOTAL (incl. admin.)	**2.259%**	**2.459%**	**2.588%**	**2.707%**	**2.806%**	**2.905%**
Total insurable earnings (mio THB)	780,531	869,522	959,415	1,061,003	1,160,300	1,254,602
COVERAGE						
Registered persons	9,558,918	9,951,489	10,211,882	10,472,061	10,732,205	10,991,664
Male	4,743,303	5,007,707	5,140,932	5,275,030	5,410,230	5,545,867
Female	4,815,615	4,943,782	5,070,950	5,197,031	5,321,974	5,445,797
UTILIZATION						
General OP visits	24,765,729	26,637,846	28,235,344	29,876,056	31,614,694	33,414,415
IP admissions	491,020	522,085	548,034	574,806	602,867	631,826
IP adjusted relative DRG weights (ARWs)	449,351	504,706	553,039	599,468	643,539	690,168
Total hospital days	1,787,196	1,900,266	1,994,715	2,092,159	2,194,293	2,299,697
OP contacts/person (avg)	2.59	2.68	2.76	2.85	2.95	3.04
Increase (% p.a.)		*3.3%*	*3.3%*	*3.2%*	*3.3%*	*3.2%*
IP admissions/person (avg)	0.051	0.052	0.054	0.055	0.056	0.057
Increase (% p.a.)		*2.1%*	*2.3%*	*2.3%*	*2.3%*	*2.3%*
Average case-mix index (ARWs/adm)	0.915	0.967	1.009	1.043	1.067	1.092
Increase (% p.a.)		*5.6%*	*4.4%*	*3.3%*	*2.4%*	*2.3%*
Length of stay (Hdays per admission)	3.640	3.640	3.640	3.640	3.640	3.640
CAPITATION FEE						
Expenditure per capita (THB/person/year)						
GOP cost per capita	899.1	1,015.0	1,129.0	1,250.0	1,373.3	1,495.3
GIP cost per capita	638.6	752.8	866.0	982.0	1,094.2	1,208.2
Capitation fee (GOP + GIP)	1,537.66	1,767.75	1,995.01	2,232.04	2,467.49	2,703.47
Basic capitation fee (implicit)	1,272.91	1,360.26	1,579.46			
Utilization incentive	55.71	55.71	55.71			
Risk adjustment	209.04	351.78	359.85			

Table D.2. Expenditure projection for the CSMBS

	BASE YEAR	PROJECTION				
BENEFIT EXPENDITURE (mio THB)	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
Outpatient care	30,832.50	38,803.45	46,355.37	52,041.49	57,383.49	61,632.05
Annual checkups	1,314.92	1,334.71	1,354.98	1,376.47	1,538.19	1,603.50
Hemodialysis	1,390.24	1,752.56	2,018.68	2,225.56	2,580.18	2,713.29
High cost cancer drugs	-	-	-	-	-	-
Medical instruments OP	-	-	-	-	-	-
HIV/AIDS (drugs & diagnostics)	-	-	-	-	-	-
General OP care	28,127.34	35,716.18	42,981.71	48,439.46	53,265.13	57,315.26
Other benefit OP (if any)	-	-	-	-	-	-
Inpatient care	15,648.55	16,105.20	17,262.32	18,481.77	20,378.69	22,061.72
Room and board (per diems)	2,207.70	2,309.53	2,347.89	2,388.12	2,717.03	2,885.43
Medical instruments IP	1,386.99	1,386.99	1,440.89	1,496.67	1,710.26	1,820.19
Non actue and sub-acute care (per diems)	-	-	-	-	-	-
General inpatient care (DRG payments)	12,053.86	12,408.69	13,473.54	14,596.98	15,951.39	17,356.10
Other benefit IP (if any)	-	-	-	-	-	-
TOTAL BENEFIT EXPENDITURE	46,481.05	54,908.65	63,617.69	70,523.26	77,762.18	83,693.77
Administration cost	35.00	37.10	39.33	41.69	44.19	46.84
Other cost	-	-	-	-	-	-
TOTAL EXPENDITURE	***46,516.05***	***54,945.75***	***63,657.01***	***70,564.94***	***77,806.37***	***83,740.61***
Increase (% p.a.)		*18.1%*	*15.9%*	*10.9%*	*10.3%*	*7.6%*
% of GDP	*0.55%*	*0.58%*	*0.60%*	*0.61%*	*0.63%*	*0.63%*
PAYG cost ratio						
Benefit expenditure	10.1%	10.6%	11.4%	11.8%	12.1%	12.2%
Insurable earnings and pensions (mio THB, estimate)	460,349	516,087	555,672	597,146	641,249	688,647
COVERAGE						
Registered persons	4,241,076	4,277,091	4,283,969	4,293,640	4,309,764	4,334,872
Male	2,031,245	2,040,021	2,043,325	2,047,971	2,055,573	2,067,397
Female	2,209,831	2,237,070	2,240,644	2,245,669	2,254,191	2,267,475
UTILIZATION						
Outpatient visits	20,000,000	20,786,173	21,324,159	21,856,324	22,382,606	22,926,818
Annual checkups	1,453,960	1,477,383	1,500,899	1,524,899	1,550,102	1,576,981
Hemodialysis cases	726,087	915,316	1,054,306	1,162,355	1,225,056	1,256,837
General OP contacts	17,819,953	18,393,474	18,768,953	19,169,070	19,607,448	20,093,000
IP admissions	693,206	725,179	737,224	749,856	764,038	779,960
IP adjusted relative DRG weights (ARWs)	873,388	899,098	935,545	973,952	1,015,572	1,060,626
Total hospital days	4,486,368	4,693,291	4,771,247	4,853,003	4,944,785	5,047,835
GOP contacts/person (avg)	4.20	4.30	4.38	4.46	4.55	4.64
IP admissions/person (avg)	0.163	0.170	0.172	0.175	0.177	0.180
Average case-mix index (ARWs/adm)	1.260	1.240	1.269	1.299	1.329	1.360
Length of stay (Hdays per admission)	6.472	6.472	6.472	6.472	6.472	6.472
COST PER CAPITA (THB per person)						
Outpatient care (total)	6,942.2	8,662.6	10,349.4	11,602.3	12,716.1	13,591.8
Annual medical checkups	310.0	312.1	316.3	320.6	356.9	369.9
Hemodialysis	0.0	0.0	0.0	0.0	0.0	0.0
General OP care	6,632.1	8,350.6	10,033.1	11,281.7	12,359.2	13,221.9
Inpatient care	3,689.8	3,765.5	4,029.5	4,304.5	4,728.5	5,089.4
Other benefits	-	-	-	-	-	-
SUBTOTAL	10,631.9	12,428.1	14,379.0	15,906.7	17,444.6	18,681.2
Administration cost	8.3	8.7	9.2	9.7	10.3	10.8
TOTAL	***10,640.2***	***12,436.8***	***14,388.1***	***15,916.4***	***17,454.8***	***18,692.0***

Table D.3. Expenditure projection for the UC scheme

	BASE YEAR	*PROJECTION*				
BENEFIT EXPENDITURE (mio THB)	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
Outpatient care benefits	30,958.31	27,923.47	30,174.21	32,621.75	36,092.92	38,990.56
Inpatient care benefits	37,890.56	50,588.39	56,214.63	62,650.34	71,584.53	79,935.63
Prevention and promotion (PP)	11,426.21	11,759.12	12,656.57	13,643.59	15,031.48	16,181.01
Emergency medical care (paramedics)	460.66	464.77	-	-	-	-
Disability care (prosthesis)	184.26	185.91	198.20	211.42	230.71	245.73
Capital replacement cost	6,566.71	6,680.05	7,428.41	8,168.68	9,203.17	10,133.04
Compensation malpractice	24.41	-	-	-	-	-
Care for non-registered	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-
SUBTOTAL	87,511.12	97,601.70	106,672.01	117,295.78	132,142.81	145,485.98
HIV/AIDS	3,855.60	4,382.40	4,672.09	4,983.79	5,438.49	5,792.68
Chronic Renal Failure	-	-	1,500.00	1,600.07	1,746.06	1,859.77
Other	-	-	-	-	-	-
TOTAL BENEFIT EXPENDITURE	**91,366.7**	**101,984.1**	**112,844.1**	**123,879.6**	**139,327.4**	**153,138.4**
Administration cost	811.20	892.32	981.55	1,079.71	1,187.68	1,306.45
TOTAL EXPENDITURE	92,177.92	102,876.42	113,825.65	124,959.35	140,515.04	154,444.87
COVERAGE						
Registered persons	46,713,341	46,837,374	46,993,777	47,145,230	47,283,952	47,404,655
Male	23,017,138	23,051,211	23,097,153	23,142,332	23,182,120	23,213,344
Female	23,696,203	23,786,163	23,896,625	24,002,897	24,101,832	24,191,311
UTILIZATION						
General OP visits	119,364,191	119,533,774	122,290,427	125,180,345	128,189,788	131,314,178
IP admissions	4,811,607	4,905,843	5,012,019	5,126,697	5,250,830	5,381,101
IP adjusted relative DRG weights (ARWs)	4,426,679	4,857,441	5,113,811	5,396,238	5,706,755	6,042,703
Total hospital days	18,592,523	18,956,658	19,366,936	19,810,062	20,289,725	20,793,103
OP contacts/person (avg)	2.56	2.55	2.60	2.66	2.71	2.77
Total increase (% p.a.)		*-0.1%*	*2.0%*	*2.0%*	*2.1%*	*2.2%*
Increase from ageing		*1.1%*	*1.0%*	*1.0%*	*1.1%*	*1.2%*
Non-ageing increase		*-1.2%*	*1.0%*	*1.0%*	*1.0%*	*1.0%*
IP admissions/person (avg)	0.103	0.105	0.107	0.109	0.111	0.114
Total increase (% p.a.)		*1.7%*	*1.8%*	*2.0%*	*2.1%*	*2.2%*
Increase from ageing		*0.2%*	*0.3%*	*0.5%*	*0.6%*	*0.7%*
Non-ageing increase		*1.5%*	*1.5%*	*1.5%*	*1.5%*	*1.5%*
Average case-mix index (ARWs/adm)	0.920	0.990	1.020	1.053	1.087	1.123
Total increase (% p.a.)		*7.6%*	*3.0%*	*3.2%*	*3.3%*	*3.3%*
Increase from ageing		*0.5%*	*0.5%*	*0.6%*	*0.7%*	*0.8%*
Non-ageing increase		*7.1%*	*2.5%*	*2.5%*	*2.5%*	*2.5%*
Length of stay (Hdays per admission)	3.864	3.864	3.864	3.864	3.864	3.864
COST PER CAPITA (THB per person)						
Outpatient care	662.7	596.2	642.1	691.9	763.3	822.5
Chronic Renal Failure						
General Outpatient Care						
Inpatient care	811.1	1,080.1	1,196.2	1,328.9	1,513.9	1,686.2
Prevention and promotion (PP)	244.6	251.1	269.3	289.4	317.9	341.3
Emergency medical care	9.9	9.9	-	-	-	-
Disability care (prosthesis)	3.9	4.0	4.2	4.5	4.9	5.2
Capital replacement cost	140.6	142.6	158.1	173.3	194.6	213.8
Compensation for malpractice	0.5	-	-	-	-	-
Care for non-registered	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-
SUBTOTAL	1,873.4	2,083.8	2,269.9	2,488.0	2,794.7	3,069.0
HIV/Aids	82.5	93.6	99.4	105.7	115.0	122.2
Other expenditure	-	-	-	-	-	-
TOTAL (excl. admin cost)	***1,955.9***	***2,177.4***	***2,369.3***	***2,593.7***	***2,909.7***	***3,191.2***
Increase from prev. year (% p.a.)		*11.3%*	*8.8%*	*9.5%*	*12.2%*	*9.7%*

Annex E

Table E.1.a. Assumptions for SSS expenditure projections

ASSUMPTIONS OP/IP benefits	*2008*	*2009*	*2010*	*2011*	*2012*
A. Specify increase of utilization rates for OP/IP care (if uniform increase assumed)					
OP care (contacts/person)	2.0%	2.0%	2.0%	2.0%	2.0%
IP care (admissions/person)	2.0%	2.0%	2.0%	2.0%	2.0%
B. Specify annual increase of case-mix index (if uniform increase)					
DRG case-mix index (ARWs/admission)	5.0%	4.0%	3.0%	2.0%	2.0%
FACTOR MODEL FOR OP/IP UNIT COST					
D. Specify unit cost increase of input factors					
Labour cost P	11.0%	6.0%	6.0%	6.0%	6.0%
Labout cost T	8.0%	7.5%	7.8%	6.7%	5.6%
Labour cost S	8.0%	7.5%	7.8%	6.7%	5.6%
Drugs	8.9%	7.8%	6.7%	5.6%	4.5%
Medical consumables	7.9%	6.8%	5.7%	4.6%	3.5%
Capital cost (depreciation)	6.9%	5.8%	4.7%	3.6%	2.5%
Other cost (use CPI?)	6.9%	5.8%	4.7%	3.6%	2.5%
E. Specify assumed change of input intensity for OP cost factors (volume change of input factors per OP contact)					
Labour cost P	1%	1%	1%	1%	1%
Labout cost T	1%	1%	1%	1%	1%
Labour cost S	1%	1%	1%	1%	1%
Drugs	1%	1%	1%	1%	1%
Medical consumables	1%	1%	1%	1%	1%
Capital cost (depreciation)	0%	0%	0%	0%	0%
Other cost	0%	0%	0%	0%	0%
F. Specify assumed change of Input intensity for IP cost factors (volume change of input factors per admission or pe					
Labour cost P	1%	1%	1%	1%	1%
Labout cost T	1%	1%	1%	1%	1%
Labour cost S	1%	1%	1%	1%	1%
Drugs	1%	1%	1%	1%	1%
Medical consumables	1%	1%	1%	1%	1%
Capital cost (depreciation)	0%	0%	0%	0%	0%
Other cost	0%	0%	0%	0%	0%
OP input factor cost increase (combined effect of change in price and input intensity of cost factors)					
Labour cost P	12.1%	7.1%	7.1%	7.1%	7.1%
Labout cost T	9.1%	8.6%	8.9%	7.8%	6.6%
Labour cost S	9.1%	8.6%	8.9%	7.8%	6.6%
Drugs	10.0%	8.9%	7.8%	6.7%	5.5%
Medical consumables	9.0%	7.9%	6.8%	5.6%	4.5%
Capital cost (depreciation)	6.9%	5.8%	4.7%	3.6%	2.5%
Other cost	6.9%	5.8%	4.7%	3.6%	2.5%
IP input factor cost increase (combined effect of change in price and input intensity of cost factors)					
Labour cost P	12.1%	7.1%	7.1%	7.1%	7.1%
Labout cost T	9.1%	8.6%	8.9%	7.8%	6.6%
Labour cost S	9.1%	8.6%	8.9%	7.8%	6.6%
Drugs	10.0%	8.9%	7.8%	6.7%	5.5%
Medical consumables	9.0%	7.9%	6.8%	5.6%	4.5%
Capital cost (depreciation)	6.9%	5.8%	4.7%	3.6%	2.5%
Other cost	6.9%	5.8%	4.7%	3.6%	2.5%
Aggregate rate of cost increase					
OP unit cost	9.3%	7.7%	7.3%	6.4%	5.5%
IP unit cost increase (Cost/ARW)	9.3%	7.7%	7.3%	6.4%	5.5%

Table E.1.b. Assumptions for SSS expenditure projections (continued)

ASSUMPTIONS OTHER BENEFITS AND COSTS	*2008*	*2009*	*2010*	*2011*	*2012*
G. Specify annual rate of change (uniform) of unit cost for other benefits					
High cost special services	0%	0%	10.0%	6.4%	5.5%
Accident	0%	0%	10.0%	6.4%	5.5%
Emergency	0%	0%	10.0%	6.4%	5.5%
Medical Instruments	0%	0%	10.0%	6.4%	5.5%
Hemodialysis (HD)	0%	0%	10.0%	6.4%	5.5%
Chronic peritoneal dialysis (CPD)	0%	0%	10.0%	6.4%	5.5%
Renal failure drugs	0%	0%	10.0%	6.4%	5.5%
HIV/AIDS (drugs and lab.)	0%	0%	10.0%	6.4%	5.5%
Bone marrow transplant	0%	0%	10.0%	6.4%	5.5%
Kidney transplant	0%	0%	10.0%	6.4%	5.5%
Cornea transplant*	0%	0%	10.0%	6.4%	5.5%
Dental care	0%	0%	10.0%	6.4%	5.5%
Artificial teeth	0%	0%	10.0%	6.4%	5.5%
Care for the nonregistered	0%	0%	10.0%	6.4%	5.5%
H. Specify annual rate of change (uniform) of utilization rates for other benefits					
High cost special services	20%	10%	2%	2%	2%
Accident	10%	5%	2%	2%	2%
Emergency	10%	5%	2%	2%	2%
Medical Instruments	20%	10%	5%	2%	2%
Hemodialysis (HD)	25%	13%	5%	2%	2%
Chronic peritoneal dialysis (CPD)	25%	13%	5%	2%	2%
Renal failure drugs	25%	13%	5%	2%	2%
HIV/AIDS (drugs and lab.)	40%	20%	10%	5%	2%
Bone marrow transplant	50%	25%	10%	5%	2%
Kidney transplant	100%	50%	25%	13%	5%
Cornea transplant*		2%	2%	2%	2%
Dental care	10%	5%	2%	2%	2%
Artificial teeth	100%	50%	25%	13%	5%
Care for the nonregistered	0%	2%	2%	2%	2%
Annual rate of change of cost per capita for other benefits (combined effect of unit cost and utilization change)					
High cost special services	20%	10%	12%	9%	8%
Accident	10%	5%	12%	9%	8%
Emergency	10%	5%	12%	9%	8%
Medical Instruments	20%	10%	16%	9%	8%
Hemodialysis (HD)	25%	13%	16%	9%	8%
Chronic peritoneal dialysis (CPD)	25%	13%	16%	9%	8%
Renal failure drugs	25%	13%	16%	9%	8%
HIV/AIDS (drugs and lab.)	40%	20%	21%	12%	8%
Bone marrow transplant	50%	25%	21%	12%	8%
Kidney transplant	100%	50%	38%	20%	11%
Cornea transplant*	0%	2%	12%	9%	8%
Dental care	10%	5%	12%	9%	8%
Artificial teeth	100%	50%	38%	20%	11%
Care for the nonregistered	0%	2%	12%	9%	8%
e) Specify rate of increase for other budget lines					
Cash Benefits					
Other cost	5%	5%	5%	5%	5%
Administration cost	10%	10%	10%	10%	10%

Table E.2.a. Assumptions for CSMBS expenditure projections

ASSUMPTIONS ON OP & IP CARE	*2008*	*2009*	*2010*	*2011*	*2012*
a) Specify increase of utilization rates for OP/IP care (if uniform increase assumed)					
OP care (contacts/person)	2%	1%	1%	1%	1%
IP care (admissions/person)	4%	1%	1%	1%	1%
b) Specify annual increase of case-mix index (if uniform increase)					
DRG case-mix index (ARWs/admission)	-1.59%	2.0%	2.0%	2.0%	2.0%
FACTOR MODEL FOR OP/IP UNIT COST					
a) Assumed unit cost increase/decrease of input factors					
Service charges	0.0%	0.0%	0.0%	6.0%	6.0%
Essential drugs	2.5%	2.5%	2.5%	2.5%	2.5%
Non-essential drugs	10.0%	7.8%	6.7%	5.6%	4.5%
Medical consumables & laboratory	0.0%	0.0%	0.0%	3.6%	2.5%
Other cost	6.9%	5.8%	4.7%	3.6%	2.5%
b) Assumed change of input intensity for OP cost factors (volume change per OP contact)					
Service charges	0.0%	0.0%	0.0%	0.0%	0.0%
Essential drugs	21.0%	10.0%	5.0%	2.5%	1.0%
Non-essential drugs	35.5%	25.0%	10.0%	5.0%	2.5%
Medical consumables & laboratory	11.0%	7.5%	5.0%	2.5%	1.0%
Other cost	4.0%	0.0%	0.0%	0.0%	0.0%
c) Assumed change of Input intensity for IP cost factors (volume change per ARW)					
Service charges	0.0%	0.0%	0.0%	0.0%	0.0%
Essential drugs	0.0%	1.0%	1.0%	1.0%	1.0%
Non-essential drugs	0.0%	1.0%	1.0%	1.0%	1.0%
Medical consumables & laboratory	0.0%	1.0%	1.0%	1.0%	1.0%
Other cost	0.0%	0.0%	0.0%	0.0%	0.0%
OP input factor cost increase (combined effect of change in price and input intensity)					
Service charges	0.0%	0.0%	0.0%	6.0%	6.0%
Essential drugs	24.0%	12.8%	7.6%	5.1%	3.5%
Non-essential drugs	49.1%	34.8%	17.4%	10.9%	7.1%
Medical consumables & laboratory	11.0%	7.5%	5.0%	6.2%	3.5%
Other cost	11.2%	5.8%	4.7%	3.6%	2.5%
IP input factor cost increase (combined effect of change in price and input intensity)					
Service charges	0.0%	0.0%	0.0%	6.0%	6.0%
Essential drugs	0.0%	3.5%	3.5%	3.5%	3.5%
Non essential drugs	0.0%	8.9%	7.8%	6.7%	5.5%
Medical consumables & laboratory	0.0%	1.0%	1.0%	4.6%	3.5%
Other cost	0.0%	5.8%	4.7%	3.6%	2.5%
Aggregate rate of unit cost increase					
OP unit cost	26.0%	17.9%	10.3%	7.5%	5.0%
IP unit cost increase (Cost/ARW)	0.0%	4.4%	4.1%	4.8%	4.2%

Table E.2.b. Assumptions for CSMBS expenditure projections (continued)

ASSUMPTIONS FOR OTHER BENEFITS					
a) Specify assumed rate of unit cost increase/decrease for other benefits					
Annual checkups	0.0%	0.0%	0.0%	10.0%	2.5%
Hemodialysis	0.0%	0.0%	0.0%	10.0%	2.5%
High cost cancer drugs					
Medical instruments for OP					
HIV/AIDS (drugs & diagnostics)					
Room and board (acute)	0.0%	0.0%	0.0%	10.0%	2.5%
Non acute and sub-acute care					
Medical instruments for IP	0.0%	0.0%	0.0%	10.0%	2.5%
Other benefit OP					
Other benefit IP					
b) Specify assumed increase/decrease of utilization rates for other benefits					
Annual checkups	0.0%	0.0%	0.0%	0.0%	0.0%
Hemodialysis	25.0%	15.0%	10.0%	5.0%	2.0%
High cost cancer drugs					
Medical instruments for OP					
HIV/AIDS (drugs & diagnostics)					
Room and board (acute)	3.7%	1.5%	1.5%	1.5%	1.5%
Non acute and sub-acute care					
Medical instruments for IP	2.1%	3.9%	3.9%	3.9%	3.8%
Other benefit OP					
Other benefit IP					
Aggregate rate of annual cost increase/decrease for other benefits					
Annual checkups	0%	0%	0%	10%	2%
Hemodialysis	25%	15%	10%	16%	5%
High cost cancer drugs					
Medical instruments for OP					
HIV/AIDS (drugs & diagnostics)					
Room and board (acute)	0%	0%	0%	12%	4%
Non acute and sub-acute care					
Medical instruments for IP	0%	4%	4%	14%	6%
Other benefit OP					
Other benefit IP					

ASSUMPTIONS FOR OTHER BUDGET LINES					
e) Specify rate of cost increase/decrease (in aggregate)					
Administration cost	6%	6%	6%	6%	6%
Other cost					

Table E.3.a. Assumptions for UC expenditure projections

	2008	*2009*	*2010*	*2011*	*2012*
1. Assumptions for OP and IP					
Assumed increase of age-specific utilization rates for OP care					
Annual increase of OP utilization rate (contacts/person)	-1%	1%	1%	1%	1%
Assumed increase of age-specific utilization rate for IP care					
Annual increase of IP utilization rate(admissions/person)	1.5%	1.5%	1.5%	1.5%	1.5%
Assumed increase of case-mix index per admission					
DRG case-mix index (ARWs/admission)	7%	2.5%	2.5%	2.5%	2.5%
2. FACTOR MODEL FOR OP & IP UNIT COST					
Unit cost increase for input factors					
Labour cost (P)		6.0%	6.0%	6.0%	6.0%
Labour cost (T)		6.0%	6.0%	6.0%	6.0%
Labour cost (S)		0.0%	0.0%	20.0%	6.0%
Drugs		7.8%	6.7%	5.6%	4.5%
Medical consumables		0.0%	4.7%	3.6%	2.5%
Other cost		5.8%	4.7%	3.6%	2.5%
Assumed change of input intensity for OP cost factors (volume change of input factors per OP contact)					
Labour cost (P)		1%	1%	1%	1%
Labour cost (T)		1%	1%	1%	1%
Labour cost (S)		1%	1%	1%	1%
Drugs		1%	1%	1%	1%
Medical consumables		1%	1%	1%	1%
Other cost		0%	0%	0%	0%
Assumed change of input intensity for IP cost factors (volume change of input factors per ARW)					
Labour cost (P)		1%	1%	1%	1%
Labour cost (T)		1%	1%	1%	1%
Labour cost (S)		1%	1%	1%	1%
Drugs		1%	1%	1%	1%
Medical consumables		1%	1%	1%	1%
Other cost		0%	0%	0%	0%
OP input factor cost increase (combined effect of change in price and input intensity of cost factors)					
Labour cost (P)		7%	7%	7%	7%
Labour cost (T)		7%	7%	7%	7%
Labour cost (S)		1%	1%	21%	7%
Drugs		9%	8%	7%	6%
Medical consumables		1%	6%	5%	4%
Other cost		6%	5%	4%	2%
IP input factor cost increase (combined effect of change in price and input intensity of cost factors)					
Labour cost (P)		7%	7%	7%	7%
Labour cost (T)		7%	7%	7%	7%
Labour cost (S)		1%	1%	21%	7%
Drugs		9%	8%	7%	6%
Medical consumables		1%	6%	5%	4%
Other cost		6%	5%	4%	2%
Aggregate rate of cost increase					
OP unit cost	-9.9%	5.6%	5.6%	8.0%	5.5%
IP unit cost increase (Cost/ARW)	21.7%	5.6%	5.6%	8.0%	5.5%

Table E.3.b. Assumptions for UC expenditure projections (continued)

	2008	*2009*	*2010*	*2011*	*2012*
3. OTHER BENEFITS AND PROGRAMMES					
Specify unit cost increase for other benefits/programmes (in % p.a.)					
Disease prevention and health promotion (P & P)		5.6%	5.6%	8.0%	5.5%
Emergency transportation and paramedics		5.6%	5.6%	8.0%	5.5%
Disability care (prosthesis)		5.6%	5.6%	8.0%	5.5%
Compensation malpractice		5.6%	5.6%	8.0%	5.5%
Care for the non-registered		5.6%	5.6%	8.0%	5.5%
HIV/AIDS		5.6%	5.6%	8.0%	5.5%
Chronic Renal Failure		5.6%	5.6%	8.0%	5.5%
Other benefit 1		5.6%	5.6%	8.0%	5.5%
Other benefit 2		5.6%	5.6%	8.0%	5.5%
Specify utilisation rate increase for other benefits/programmes (in % p.a.)					
Disease prevention and health promotion (P & P)		1%	1%	1%	1%
Emergency transportation and paramedics		1%	1%	1%	1%
Disability care (prosthesis)		1%	1%	1%	1%
Compensation malpractice		1%	1%	1%	1%
Care for the non-registered		1%	1%	1%	1%
HIV/AIDS		1%	1%	1%	1%
Chronic Renal Failure		1%	1%	1%	1%
Other benefit 1		1%	1%	1%	1%
Other benefit 2		1%	1%	1%	1%
Aggregate rate of cost increase for other benefits/programmes (price and volume, in % p.a.)					
Disease prevention and health promotion (P & P)	3%	7%	7%	9%	7%
Emergency transportation and paramedics	1%	7%	7%	9%	7%
Disability care (prosthesis)	1%	7%	7%	9%	7%
Compensation malpractice	0%	7%	7%	9%	7%
Care for non-registered	0%	7%	7%	9%	7%
HIV/AIDS	0%	7%	7%	9%	7%
Chronic Renal Failure	0%	7%	7%	9%	7%
Other benefit 1	0%	7%	7%	9%	7%
Other benefit 2	0%	7%	7%	9%	7%
Specify rate of increase for other budget lines					
Administration cost	10%	10%	10%	10%	10%

Annex F

Table F.1. National Expenditure on Health by Agency, 1994 - 2005

Current Expenditure (mio THB)	***1994***	***1995***	***1996***	***1997***	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***
MOPH	26,260.7	30,025.7	35,734.3	42,244.7	38,014.9	47,298.6	50,521.7	49,277.0	47,738.7	46,341.8	52,584.6	46,238.0
Other ministries	3,191.2	5,091.5	5,115.5	4,421.7	4,211.0	4,259.2	3,748.6	2,499.8	6,253.3	7,681.9	6,339.9	7,855.8
Local government	1,160.5	1,595.9	2,749.9	3,091.9	2,937.9	3,516.0	4,140.9	4,229.0	4,658.7	5,154.3	5,730.0	6,403.4
CSMBS	9,954.0	11,155.9	13,583.2	15,502.9	16,460.0	16,041.8	17,057.6	19,130.8	20,476.3	22,685.9	26,043.1	29,380.0
State-owned Enterprises	2,478.4	1,792.8	2,031.7	2,525.0	2,413.6	2,316.2	2,461.2	2,577.4	2,631.8	2,629.4	2,630.2	2,674.0
UC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26,647.8	31,232.8	30,611.1	38,660.5
Social Security Fund	3,248.9	4,353.1	5,275.1	5,630.0	7,936.5	7,382.0	8,359.2	10,752.4	10,684.4	12,428.8	14,253.1	19,123.4
WCF	410.7	513.4	633.0	800.9	649.1	512.1	482.4	521.3	512.5	599.8	617.8	624.7
Private insurance	2,234.1	3,122.0	4,494.0	4,938.3	4,819.7	4,639.5	5,022.8	5,346.5	5,882.1	6,778.6	7,557.4	8,221.0
Traffic insurance	3,007.4	3,503.2	4,411.8	4,145.3	4,223.8	4,615.4	4,339.4	4,776.9	5,114.3	5,227.4	5,618.2	5,710.8
Employer benefit	7,946.4	7,864.1	8,268.7	7,177.1	6,460.4	6,839.7	6,637.7	6,969.4	6,602.4	6,566.7	6,009.2	5,878.0
Household	49,676.5	56,790.9	67,633.1	64,448.8	56,076.1	54,515.7	53,749.3	54,977.4	53,673.9	55,660.9	57,647.9	66,363.3
Non - profit organsiations	555.3	709.1	863.0	850.7	1,027.8	772.5	694.9	662.1	682.8	709.0	747.2	815.2
Rest of the world	42.0	40.3	18.1	39.3	39.8	9.3	12.4	32.6	405.8	372.4	391.0	410.6
Total (current exp.)	110,166.1	126,557.8	150,811.4	155,816.9	145,270.6	152,718.0	157,228.0	161,752.4	191,964.8	204,069.7	216,780.8	238,358.5
Capital Expenditure (all agencies)	17,489.4	21,279.6	26,291.2	33,326.4	27,540.5	9,405.9	9,918.9	8,450.9	8,803.0	24,853.4	8,870.9	9,720.7
TOTAL EXPENDITURE	**127,655.5**	**147,837.5**	**177,102.6**	**189,143.3**	**172,811.0**	**162,123.9**	**167,146.9**	**170,203.3**	**200,767.8**	**228,923.1**	**225,651.7**	**248,079.2**

Current Expenditure (% of GDP)	***1994***	***1995***	***1996***	***1997***	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***
MOPH	0.72%	0.72%	0.77%	0.89%	0.82%	1.02%	1.03%	0.96%	0.88%	0.78%	0.81%	0.65%
Other ministries	0.09%	0.12%	0.11%	0.09%	0.09%	0.09%	0.08%	0.05%	0.11%	0.13%	0.10%	0.11%
Local government	0.03%	0.04%	0.06%	0.07%	0.06%	0.076%	0.084%	0.082%	0.085%	0.087%	0.088%	0.090%
CSMBS	0.27%	0.27%	0.29%	0.33%	0.36%	0.35%	0.35%	0.37%	0.38%	0.38%	0.40%	0.41%
State-owned Enterprises	0.07%	0.04%	0.04%	0.05%	0.05%	0.05%	0.050%	0.050%	0.048%	0.044%	0.041%	0.038%
UC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.49%	0.53%	0.47%	0.54%
Social Security Fund	0.09%	0.10%	0.11%	0.12%	0.17%	0.16%	0.17%	0.21%	0.20%	0.21%	0.22%	0.27%
WCF	0.011%	0.012%	0.014%	0.017%	0.014%	0.011%	0.010%	0.010%	0.009%	0.010%	0.010%	0.009%
Private insurance	0.06%	0.07%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.11%	0.11%	0.12%	0.12%
Traffic insurance	0.08%	0.08%	0.10%	0.09%	0.09%	0.10%	0.09%	0.09%	0.09%	0.09%	0.09%	0.08%
Employer benefit	0.22%	0.19%	0.18%	0.15%	0.14%	0.15%	0.13%	0.14%	0.12%	0.111%	0.093%	0.083%
Household	1.37%	1.36%	1.47%	1.36%	1.21%	1.18%	1.09%	1.07%	0.98%	0.94%	0.89%	0.94%
Non - profit organsiations	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Rest of the world	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%
Total (current expenditure)	3.04%	3.02%	3.27%	3.29%	3.14%	3.29%	3.19%	3.15%	3.52%	3.45%	3.34%	3.36%
Capital Expenditure (total, % of GDP)	0.48%	0.51%	0.57%	0.70%	0.60%	0.20%	0.20%	0.16%	0.16%	0.42%	0.14%	0.14%
TOTAL EXPENDITURE (% of GDP)	**3.52%**	**3.53%**	**3.84%**	**4.00%**	**3.74%**	**3.50%**	**3.40%**	**3.32%**	**3.68%**	**3.87%**	**3.48%**	**3.50%**

Source: National Health Accounts, Thailand

Table F.2. National Expenditure on Health by Agency, Projection, 2006 - 2020

	ACTUAL	*PROJECTION*										
Current Expenditure (mio THB)	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	**--** ***2020***
MOPH	46,238.0	51,025.6	55,187.9	62,122.6	69,044.9	75,176.9	80,962.6	86,236.8	91,811.5	97,674.2	103,814.6	138,819.5
Other ministries	7,855.8	7,998.3	8,669.2	9,376.4	10,554.6	11,730.7	12,772.5	13,755.5	14,651.6	15,598.7	16,594.7	22,291.7
Local government	6,403.4	7,226.1	7,957.6	9,198.4	10,470.3	11,624.3	12,734.4	13,763.8	14,867.9	16,046.0	17,297.8	24,746.8
CSMBS	29,380.0	37,004.5	46,516.1	54,947.2	63,658.7	70,566.8	77,808.6	83,742.9	90,210.7	97,350.4	105,223.2	156,626.3
State-owned Enterprises	2,674.0	2,950.8	3,191.5	3,592.6	3,992.9	4,347.5	4,682.1	4,987.1	5,309.5	5,648.5	6,003.7	8,028.0
UC	38,660.5	51,492.5	65,330.6	74,094.1	69,902.9	79,336.5	88,604.8	97,281.9	109,402.7	120,259.4	132,278.5	216,431.9
Social Security Fund	19,123.4	18,855.8	20,825.6	25,278.5	29,372.7	33,991.2	38,542.7	43,158.1	48,190.8	53,766.4	59,898.4	101,761.2
WCF	624.7	689.3	745.6	839.3	932.8	1,015.6	1,093.8	1,165.0	1,240.3	1,319.5	1,402.5	1,875.4
Private insurance	8,221.0	9,072.3	9,812.3	11,045.3	12,276.1	13,366.3	14,395.0	15,332.8	16,323.9	17,366.3	18,458.1	24,681.9
Traffic insurance	5,710.8	6,302.1	6,816.1	7,672.6	8,527.6	9,284.9	9,999.5	10,650.9	11,339.4	12,063.5	12,821.9	17,145.3
Employer benefit	5,878.0	5,656.8	5,489.0	5,238.3	5,026.1	4,863.8	4,727.7	4,615.8	4,507.3	4,402.7	4,302.1	3,854.1
Household	66,363.3	73,234.8	79,208.6	89,161.8	99,097.0	107,898.0	116,201.9	123,771.7	131,772.8	140,187.3	149,000.4	199,241.3
Non - profit organsiations	815.2	899.6	973.0	1,095.3	1,217.3	1,325.4	1,427.4	1,520.4	1,618.7	1,722.1	1,830.3	2,447.5
Rest of the world	410.6	453.1	490.0	551.6	613.1	667.5	718.9	765.7	815.2	867.3	921.8	1,232.6
Total (current exp.)	238,358.5	272,861.7	311,213.1	354,213.8	384,686.8	425,195.5	464,671.9	500,748.4	542,062.3	584,272.1	629,848.0	919,183.5
Capital Expenditure (all agencies)	9,720.7	25,791.6	27,895.5	31,400.7	34,899.7	37,999.2	40,923.6	43,589.6	46,407.3	49,370.7	52,474.5	70,168.2
TOTAL EXPENDITURE	**248,079.2**	**298,653.3**	**339,108.6**	**385,614.6**	**419,586.5**	**463,194.7**	**505,595.6**	**544,337.9**	**588,469.7**	**633,642.8**	**682,322.5**	**989,351.7**

Current Expenditure (% of GDP)	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2020***
MOPH	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%
Other ministries	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%
Local government	0.090%	0.092%	0.094%	0.096%	0.099%	0.101%	0.102%	0.104%	0.106%	0.107%	0.109%	0.116%
CSMBS	0.41%	0.473%	0.549%	0.576%	0.601%	0.612%	0.626%	0.633%	0.640%	0.649%	0.660%	0.735%
State-owned Enterprises	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%
UC	0.54%	0.658%	0.825%	0.832%	0.836%	0.843%	0.881%	0.909%	0.939%	0.972%	1.008%	1.244%
Social Security Fund	0.27%	0.241%	0.206%	0.222%	0.232%	0.247%	0.260%	0.273%	0.286%	0.300%	0.315%	0.400%
WCF	0.009%	0.009%	0.009%	0.009%	0.009%	0.009%	0.009%	0.009%	0.009%	0.009%	0.009%	0.009%
Private insurance	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%
Traffic insurance	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%
Employer benefit	0.083%	0.072%	0.065%	0.055%	0.047%	0.042%	0.038%	0.035%	0.032%	0.029%	0.027%	0.018%
Household	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%
Non - profit organsiations	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Rest of the world	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Total (current expenditure)	3.36%	3.49%	3.70%	3.74%	3.77%	3.80%	3.86%	3.91%	3.96%	4.02%	4.08%	4.47%
Capital Expenditure (total, % of GDP)	0.14%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
TOTAL EXPENDITURE (% of GDP)	**3.50%**	**3.82%**	**4.03%**	**4.07%**	**4.10%**	**4.13%**	**4.19%**	**4.24%**	**4.29%**	**4.35%**	**4.41%**	**4.80%**

THAILAND

Development of a Health Care Financing Model

Second Phase

REPORT D

5 September 2008

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CONTENTS

1. Background

The present report was drafted in the context of the consultancy agreement concluded by the consultant and the International Labour Office (cf. External Collaboration Contract no. 40033646/0 signed on 1 February 2008). The assignment is taking place within the wider context of the cooperation agreement signed on 9 February 2006 by the International Labour Office (ILO) and the European Commission (EC) pertaining to the EC project on 'Heath Care Reform in Thailand' (THA/AID/CO/2002/0411, 2004 – 2009); the agreement stipulating that the project component 'Financial Management of the Thai Health Care System' shall be implemented by ILO.

The consultancy contract mentioned above is referred to in the following as the 'second phase' assignment; it was arranged in continuity with an earlier agreement (referred to as 'initial phase'), which had been completed in December 2007.

The purpose of the present report is to present output no. 6 of the terms of reference (see Annex A), consisting of the following task:

Describe for each institution (CSMBS, NHSO, SSO, IHPP) separately:
(a) The procedures of model maintenance
(b) The handling of the model

The TORs further stipulate that this output shall be summarized in a report ('Report D') that shall comprise '*A manual: Model Maintenance and practical handling of the models of CSMBS, NHSO, SSO, and IHPP.'* The main subject matter of this report consists of the user manual provided in Annex A; other issues are discussed in section 3.

The author would like to acknowledge the good cooperation extended by the Thai counterparts from the respective institutions, in particular Ms Rangsima, SSO, Mr Kulsek Limpiyakorn, CSMBS, Ms Taweesri Greetong and Ms Kongkran, NHSO, for their cooperation and feedback on the draft models. Special thanks are due to Mr Hiroshi Yamabana, Social Security Specialist, ILO Subregional Office for East Asia, and to Mr. Wolfgang Scholz, Senior Economist, ILO Geneva, for their technical feedback, and to the national project component manager, Dr. Thaworn Sakunphanit, for his technical inputs and overall guidance.

2. User Manual

As stipulated in the terms of reference, a comprehensive user manual has been developed for the different institutions aiming at facilitating model handling and operation. The manual comprises the following:

- A summary description of the final model structure adopted for all model components, including a description of the budget allocation modules developed for UCS and SSS, and a list with a description of all model variables.
- A comprehensive account of all instructions necessary for model configuration, handling, and operation for undertaking expenditure projections.
- A description of model updating procedures, including the updating of the demographic, economic, and coverage modules.

- A picture of input and output sheets of the Health Care Financing Models of UCS, SSS, and CSMBS for illustration.

The user manual is meant to serve as a comprehensive reference document that should accompany the future users of the models in their model operations if/when required. The final draft of the user manual is provided in Annex B.

3. Next steps

The upcoming activities planned in connection with the assignment are the following:

a. Final model structure and projection results to be agreed upon with the ILO project coordinator, Mr. Wolfgang Scholz (10 Spetember).

b. Drafting of final report (Report C) comprising projection results for status quo case and alternative scenarios (tentatively by end of September).

c. Formal hand-over of models and supporting documentation (manuals) to the four institutions (tentatively by end of September).

d. Follow-up training on model handling and adoption of cooperation arrangements between the three schemes (tentatively 13 – 15 October).

e. Presentation of model features and projection results to all stakeholders (tentatively on 20 October).

ANNEX A

Terms of Reference:

These Terms of Reference (TOR-SP) refer to the second phase (SP) of the development of a: health care financing model, and staff capacity building, for the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and the International Health Policy Programme (IHPP) of Thailand.

With respect to the first (initial) phase (TOR-IP) reference is made to contract PO/Ver No: 40029956, dated 29.06.2007

It is understood that, at the commencement of this contract (TOR-SP), the obligations and works of the contract of the initial phase (TOR-IP) have been fulfilled such that the tasks to be carried out under this contract (TOR-SP) can be fulfilled.

The overall contents of the Draft Terms of Reference (so-called Draft03 dated 02/05/2007, see attachment to contract re TOR-IP) remains valid. The contractor to these TOR-SP is advised to refer to Draft03 for further information.

The contents of Draft03, as far as not replaced by these TOR-SP, is valid; the time frame defined in Draft03 is however not fully applicable anymore. For the second phase of modelling, these TOR-SP replace the time frame of Draft03 (see the attached updated flow chart of activities under TOR-SP).

A. Activities to be carried out

Under the supervision of the Senior Economist of the ILO Social Security Department and the Social Security Specialist of the ILO SRO-Bangkok, the contractor to these TOR-SP will undertake the following tasks:

On the background as provided in Draft 03 (see above), he will develop four (4) health care finance models, which, each, are characterized by the fact that they can be based on a common, coordinated set of assumptions on demography, economy, labour market, health care utilization and unit cost developments.

The models will be designed such that they project expenditure and revenue of Thailand's health system(s); the models are annual, i.e. they are based on annual data and will produce annual (annualised) outputs; their time horizons will range from short (for budgeting purposes) to long-term.

Institutional, legal and behavioural specificities of the three single schemes will be sufficiently mapped; the scope of the data base of the model for the IHPP goes beyond the scope of the data bases of the three schemes but, where possible, the IHPP model will make use of the data bases of the three schemes.

Core technical staff from the three schemes and the International Health Policy Programme (IHPP) in charge of the maintenance of the model(s), will support the model development and be trained (see below) in the usage and future calibration of the models.

Especially the contractor will:

(1) Establish a common demographic, labour market and economic frame for the four models to be developed for CSMBS, NHSO, SSO and IHPP;

(2) Establish the health care financing modules for three schemes CSMBS, NHSO, and SSO as well as the model for the IHPP (NHA);

(2a) Develop modules for allocating the available overall resources (budgets) to the hospitals that have contracted with NHSO and SSO. The contractor will explore the feasibility of the development of such a module for CSMBS, and make proposal(s), accordingly. Technically, the allocation mechanism will be "top-down" for both, NHSO and SSO, and it will, to the extent possible, replicate, as a standard procedure, the present mechanisms applied by NHSO. The allocation mechanism for SSO will be newly developed; where appropriate, the SSO allocation mechanism will draw advantage from the allocation mechanism developed for NHSO;

(3) With a view to most appropriate model design (possible simulation options; see also point (5) below): consult with CSMBS, NHSO, SSO and IHPP staff on possible reform plans of the CSMBS, NHSO and SSS. These might include different allocation formulas, different ways of capitation calculation (for example,. with or without inclusion of capital depreciation), or the possible coverage of dependents and future pensioners (SSO);

(4) Decide on modelling options that most appropriately incorporate any of those mentioned details;

(5) Carry out status-quo projections, and reform simulations in coordination and cooperation with the staff of CSMBS, NHSO, and SSO – in order to validate the significance of the outputs of the established models; consult with the staff of the CSMBS, NHSO, SSO and the IHPP on the projection and simulation results, and modify the models' structures to the extent that they produce unreasonable results;

(6) Describe, for each institution (CSMBS, NHSO, SSO and IHPP) separately,

(a) the procedures of model maintenance,

(b) the handling of the model;

(7) Develop training material;

(8) Carry out a three days common introductory training workshop (proseminar) for the staff of the CSMBS, NHSO, SSO and the IHPP on the purpose and use of the models;

(9) Carry out separately, for the staff of each of the institutions CSMBS, NHSO, SSO and the IHPP, hands-on training at staff work places, on the technical use of their respective models;

(10) Hand out the electronic version, and any accompanying training material, of the models to the staff of the CSMBS, NHSO, SSO and the IHPP;

(11) Provide the above (items (1) to (10)), and all other stipulations contained in this document to the satisfaction of the ILO.

As part of the technical modeling work, in addition to the electronic model to be developed and in order to reflect and document work progress, the contractor writes the following reports on the above items (draft titles – open to adjustments in consensus with ILO-SECSOC):

(A) A common demographic, labour market and economic frame and health care financing modules for CSMBS, NHSO, SSO and IHPP. (This report covers item (1), above.)

(B) Financial projection models for CSMBS, NHSO, SSO and IHPP – core design and technical incorporation of allocation formulae and reform options. (This report covers items (2), (2a), (3) and (4), above.)

(C) Status-quo projections, and reform simulations, for the financial development of CSMBS, NHSO, SSO and under NHA (IHPP). (This report covers item (5), above.)

(D) Model maintenance and practical handling of the models of CSMBS, NHSO, SSO and IHPP. A manual. (This report covers items (6) and – partially - (7), above.)

(E) Introduction to the practical use of the models for CSMBS, NHSO, SSO and IHPP. Seminar training material. (This report covers items (7) – partially –, and the didactical material needed for items (8) and (9), above.)

(F) Note on the formal hand-over of the models and any accompanying material to the staff of CSMBS, NHSO, SSO and IHPP. Formal notes on the delivery of the training activities. (This note covers items (8), (9) and (10), above.)

B. Schedule

The work is expected to be accomplished over a six-months period, starting with the signature of the contract to which these TOR-SP refer.

A work flow chart stipulating which work should reasonably be done when is attached. It contains the proposal for another, deepening, workshop for the Thai counterparts / users of the model, after the completion of the works to be undertaken under these TOR-SP. This deepening workshop is not part of these TOR-SP.

C. Preconditions and caveats

It is assumed that necessary data for the model(s) have been collected in close collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff. This work has provided all involved with an a priori understanding of the actual modeling (model design) to be undertaken.

In case of delays in the data collection process (see TOR-IP), which might “stretch” the process of data collection and of constructing the data base into this second phase (TOR-

SP) of the project, there could be a delay in delivery of the results as expected under these TOR-SP.

The budget to this contract is expert fees (including fees for his participation in seminars / training workshops, lecturing fees, if any, including travel required under the TOR-SP). Other cost such as printing cost of the reports, the cost for seminars / training workshops (e.g. cost for the venue, equipments and refreshments) are not included in this budget, and will be covered separately.

THAILAND

Development of a Health Care Financing Model

Second Phase

REPORT E

15 August 2008

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CONTENTS

1. Background

The present report was drafted within the framework of the consultancy agreement concluded by the consultant and the International Labour Office (External Collaboration Contract no. 40033646/0 signed on 1 February 2008). The assignment is taking place within the wider context of the cooperation agreement signed by the International Labour Office (ILO) and the European Commission (EC) on 9 February 2006 pertaining to the EC project 'Heath Care Reform in Thailand' (THA/AID/CO/2002/0411, 2004 – 2009), agreement stipulating that the project component 'Financial Management of the Thai Health Care System' shall be implemented by ILO.

The consultancy assignment mentioned above is referred to in the following as the 'second phase' assignment; it was arranged in continuity with an earlier agreement (referred to as 'initial phase'), which had been completed in December 2007.

The purpose of the present report is to present output 7 and to provide an account of outputs 8 and 9 stipulated in the terms of reference (see Annex A), comprising the following:

- The development of training materials on the Health Care Financing Model for the training to be carried out with UCS, SSS, CSMBS, and IHPP staff (output 7).
- To carry out a common introductory training seminar with the staff of UCS, SSS, CSMBS, and IHPP on the purpose and use of the models (output 8).
- To carry out a hands-on technical training session with the designated staff from the UCS, SSS, CSMBS, and IHPP (output 9).

The report is structured as follows:

Section 2 contains an account of the training activities on the EU/ILO Health Care Financing Model as carried out in early August 2008.

Section 3 provides a brief discussion on miscellaneous issues considered of relevance in relation to modeling, and

Section 4 presents a list with the next steps planned under the assignment.

All training materials and presentation slides are provided in the annex of the report together with the terms of reference.

The author would like to acknowledge the good cooperation extended by the Thai counterparts from the respective institutions. Special thanks are due to Ms Rangsima, SSO, Mr Kulsek Limpiyakorn, CSMBS, Ms Taweesri Greetong and Ms Kongkran, NHSO, for their continued assistance with data collection and feedback on modeling, to the national project component manager, Dr. Thaworn Sakunphanit, for his feedback and continous support, and to the ILO project coordinator, Mr Wolfgang Scholz, for his technical inputs and overall guidance.

2. Training activities on the EU/ILO Health Care Financing Model

The TORs of the assignment comprise various training activities with the national stakeholder institutions on the purpose and handling of the Health Care Financing Model developed by the consultant. These training activities notably include a common introductory training seminar with all institutions followed by 'hands-on' practical training sessions with the technical staff of the agencies concerned. A brief account of the these activities is provided below.

2.1. *Introductory training seminar*

The common training seminar with all stakeholders was organized on the 31 July by Dr Thaworn, project component manager of the Health Financing Component of the project. It was attended by the technical staff of the UC, SSS, and CSMBS, including amongst others the main technical counterparts of the consultant, namely Khun Taweesri, and Khun Kongkran, NHSO, Khun Rangsima, SSO, and Khun Kulasake, CSMBS. The meeting was also attended by Mr Hiroshi Yamabana, ILO Social Security Specialist, and Dr Thaworn. It is noted that IHPP was invited to the training but none of its staff was available to attend.

The consultant presented the final proposal on model structure and the results of the demographic projections, which had been revised to reflect the latest assumptions on total fertility rate and life expectancy at birth used by NESDB in its revised population projection, and the latest labour force figures on formal employment in the agricultural sector. The consultant also discussed alternative modeling options as integrated in the model design and issues in relation to assumption setting. Finally, the consultant presented the three expenditure models for the UC, SSS, and CSMBS scheme, and provided clarification on the relevant details for each scheme. The factor component model for projecting unit cost was also discussed by the participants.

It is noted that a follow-up training event with all stakeholder institutions (UC, SSS, CSMBS, and possibly IHPP) will be organized in October (tentatively 13-15) to coincide with the next mission of the ILO project coordinator, Mr Wolfgang Scholz.

2.2. *Training session with the Social Security Scheme (SSS)*

The hands-on training session with the SSS took place on 1 and 8 August 2008. SSO staff attending included Khun Rangsima, Medical Benefits' Division, Khun Wanida, Actuary from the Statistics and Technical Studies Division, and three junior staff members from the same divisions.

The consultant presented all model files in detail and answered all relating questions and comments. A thorough review of the expenditure model was undertaken on 8 August with Khun Rangsima who provided suggestions regarding final modifications of the model.

It was notably suggested by SSO to provide input fields for unit cost (for general OP and IP) and cost structure for specific hospital types to ensure that this information is taken into account. The model has been modified since and these minor alterations incorporated. The training documents produced for SSO on model structure, variables, etc. are provided in the appendix (see Annex D).

2.3. *Training session with the Civil Servants' Medical Benefits' Scheme*

The hands-on training session with the CSMBS took place on 5 August (whole day) and was attended by Mr Kulasake Limpiyakorn, Mr. Art xxx, and Ms. ???. The consultant presented all model files in detail and provided clarifications as requested, notably on modeling of the CSMBS coverage. Data issues were also discussed with regard to base-year coverage, following which Khun Kulasake proposed to revise the registration data for the fiscal year 2007 again to ensure consistency with the data for 2008.

The training documents produced by the consultant for CSMBS on model structure, expenditure mapping, description of model variables, etc. are provided in the appendix (see Annex E).

2.4. *Training session with the Universal Coverage Scheme*

The training session with the UC scheme consisted in a day of meetings with the technical staff in charge of budget projections, namely Khun Taweesri and her team. The meetings were joined by Dr Thaworn, EU project component manager and NHSO expert, and Mr Martin Cambell, EU Consultant on budget allocation.

The consultant provided an overview of the model structure and undertook a demonstration of different model components. He also provided clarification on assumptions and sought feedback on the final model design.

Mr Cambell requested some clarifications on the model philosophy and noted that the budget projection model used by the National Health System of the United Kingdom is very similar to the proposed model. Mr Cambell then provided an overview on the budget allocation process used by the NHS in the UK. He suggested to introduce a separate budget allocation for primary care under the UC scheme.[1]

3. Next steps

The next steps planned by the consultant are the following:

a. Finalization of the user manual on HCF architecture, model handling and maintenance procedures for each scheme;

b. Finalize expenditure projections for the three schemes and for aggregate national health expenditure (IHPP model); this both under status quo conditions and for alternative scenarios (reform options) as deemed relevant.

c. Draft final report on projection results under status quo conditions and reform scenarios.

d. Hand-over models and supporting documentation (manuals) to all four institutions (tentatively by end August).

It is planned tentatively that all outputs due under the assignment be completed by the end of August 2008.

[1] The details of the consultant's recommendations should be taken from his assignment report, which, at the time of writing, is not yet available.

ANNEX A

Terms of Reference:

These Terms of Reference (TOR-SP) refer to the second phase (SP) of the development of a: health care financing model, and staff capacity building, for the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and the International Health Policy Programme (IHPP) of Thailand.

With respect to the first (initial) phase (TOR-IP) reference is made to contract PO/Ver No: 40029956, dated 29.06.2007

It is understood that, at the commencement of this contract (TOR-SP), the obligations and works of the contract of the initial phase (TOR-IP) have been fulfilled such that the tasks to be carried out under this contract (TOR-SP) can be fulfilled.

The overall contents of the Draft Terms of Reference (so-called Draft03 dated 02/05/2007, see attachment to contract re TOR-IP) remains valid. The contractor to these TOR-SP is advised to refer to Draft03 for further information.

The contents of Draft03, as far as not replaced by these TOR-SP, is valid; the time frame defined in Draft03 is however not fully applicable anymore. For the second phase of modelling, these TOR-SP replace the time frame of Draft03 (see the attached updated flow chart of activities under TOR-SP).

A. Activities to be carried out

Under the supervision of the Senior Economist of the ILO Social Security Department and the Social Security Specialist of the ILO SRO-Bangkok, the contractor to these TOR-SP will undertake the following tasks:

On the background as provided in Draft 03 (see above), he will develop four (4) health care finance models, which, each, are characterized by the fact that they can be based on a common, coordinated set of assumptions on demography, economy, labour market, health care utilization and unit cost developments.

The models will be designed such that they project expenditure and revenue of Thailand's health system(s); the models are annual, i.e. they are based on annual data and will produce annual (annualised) outputs; their time horizons will range from short (for budgeting purposes) to long-term.

Institutional, legal and behavioural specificities of the three single schemes will be sufficiently mapped; the scope of the data base of the model for the IHPP goes beyond the scope of the data bases of the three schemes but, where possible, the IHPP model will make use of the data bases of the three schemes.

Core technical staff from the three schemes and the International Health Policy Programme (IHPP) in charge of the maintenance of the model(s), will support the model development and be trained (see below) in the usage and future calibration of the models.

Especially the contractor will:

(1) Establish a common demographic, labour market and economic frame for the four models to be developed for CSMBS, NHSO, SSO and IHPP;

(2) Establish the health care financing modules for three schemes CSMBS, NHSO, and SSO as well as the model for the IHPP (NHA);

(2a) Develop modules for allocating the available overall resources (budgets) to the hospitals that have contracted with NHSO and SSO. The contractor will explore the feasibility of the development of such a module for CSMBS, and make proposal(s), accordingly. Technically, the allocation mechanism will be "top-down" for both, NHSO and SSO, and it will, to the extent possible, replicate, as a standard procedure, the present mechanisms applied by NHSO. The allocation mechanism for SSO will be newly developed; where appropriate, the SSO allocation mechanism will draw advantage from the allocation mechanism developed for NHSO;

(3) With a view to most appropriate model design (possible simulation options; see also point (5) below): consult with CSMBS, NHSO, SSO and IHPP staff on possible reform plans of the CSMBS, NHSO and SSS. These might include different allocation formulas, different ways of capitation calculation (for example,. with or without inclusion of capital depreciation), or the possible coverage of dependents and future pensioners (SSO);

(4) Decide on modelling options that most appropriately incorporate any of those mentioned details;

(5) Carry out status-quo projections, and reform simulations in coordination and cooperation with the staff of CSMBS, NHSO, and SSO – in order to validate the significance of the outputs of the established models; consult with the staff of the CSMBS, NHSO, SSO and the IHPP on the projection and simulation results, and modify the models' structures to the extent that they produce unreasonable results;

(6) Describe, for each institution (CSMBS, NHSO, SSO and IHPP) separately,

    (a) the procedures of model maintenance,

    (b) the handling of the model;

(7) Develop training material;

(8) Carry out a three days common introductory training workshop (proseminar) for the staff of the CSMBS, NHSO, SSO and the IHPP on the purpose and use of the models;

(9) Carry out separately, for the staff of each of the institutions CSMBS, NHSO, SSO and the IHPP, hands-on training at staff work places, on the technical use of their respective models;

(10) Hand out the electronic version, and any accompanying training material, of the models to the staff of the CSMBS, NHSO, SSO and the IHPP;

(11) Provide the above (items (1) to (10)), and all other stipulations contained in this document to the satisfaction of the ILO.

As part of the technical modeling work, in addition to the electronic model to be developed and in order to reflect and document work progress, the contractor writes the following reports on the above items (draft titles – open to adjustments in consensus with ILO-SECSOC):

(A) A common demographic, labour market and economic frame and health care financing modules for CSMBS, NHSO, SSO and IHPP. (This report covers item (1), above.)

(B) Financial projection models for CSMBS, NHSO, SSO and IHPP – core design and technical incorporation of allocation formulae and reform options. (This report covers items (2), (2a), (3) and (4), above.)

(C) Status-quo projections, and reform simulations, for the financial development of CSMBS, NHSO, SSO and under NHA (IHPP). (This report covers item (5), above.)

(D) Model maintenance and practical handling of the models of CSMBS, NHSO, SSO and IHPP. A manual. (This report covers items (6) and – partially - (7), above.)

(E) Introduction to the practical use of the models for CSMBS, NHSO, SSO and IHPP. Seminar training material. (This report covers items (7) – partially –, and the didactical material needed for items (8) and (9), above.)

(F) Note on the formal hand-over of the models and any accompanying material to the staff of CSMBS, NHSO, SSO and IHPP. Formal notes on the delivery of the training activities. (This note covers items (8), (9) and (10), above.)

B. Schedule

The work is expected to be accomplished over a six-months period, starting with the signature of the contract to which these TOR-SP refer.

A work flow chart stipulating which work should reasonably be done when is attached. It contains the proposal for another, deepening, workshop for the Thai counterparts / users of the model, after the completion of the works to be undertaken under these TOR-SP. This deepening workshop is not part of these TOR-SP.

C. Preconditions and caveats

It is assumed that necessary data for the model(s) have been collected in close collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff. This work has provided all involved with an a priori understanding of the actual modeling (model design) to be undertaken.

In case of delays in the data collection process (see TOR-IP), which might “stretch” the process of data collection and of constructing the data base into this second phase (TOR-SP) of the project, there could be a delay in delivery of the results as expected under these TOR-SP.

The budget to this contract is expert fees (including fees for his participation in seminars / training workshops, lecturing fees, if any, including travel required under the TOR-SP). Other cost such as printing cost of the reports, the cost for seminars / training workshops (e.g. cost for the venue, equipments and refreshments) are not included in this budget, and will be covered separately.

ANNEX B

Introductory training seminar

On

The EU/ILO Health Care Financing Model

31 July 2008

Presentation slides

Development of a Health Care Financing Model

Introductory Training Session

31 July 2008
NHSO, Bangkok

1

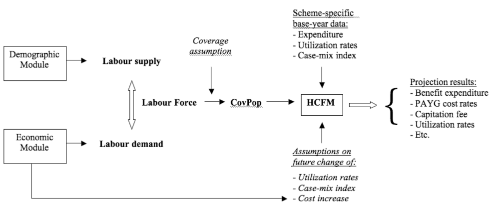
Outline

1. Model structure revisited
2. Demographic modelling
3. Expenditure modelling
4. Projection methodology
5. Observations

2

1. Model structure

Structure of the Health Care Financing Model



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2. Demographic modelling

a) Base year (t = 0):
$Pop^{tot} = Pop^{UC} + Pop^{CSMBS} + Pop^{SSS} + Pop^{oth}$

b) Projection (t > 0):

Pop^{tot} from population projection

Pop^{CSMBS} projected separately by category of insured

Pop^{SSS} based on labour force projection

Pop^{oth} from total population and base year ratio

$Pop^{UC} = Pop^{tot} - Pop^{CSMBS} - Pop^{SSS} - Pop^{oth}$

2. Demographic modelling

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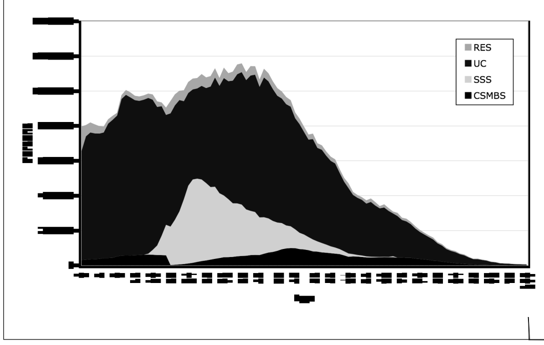
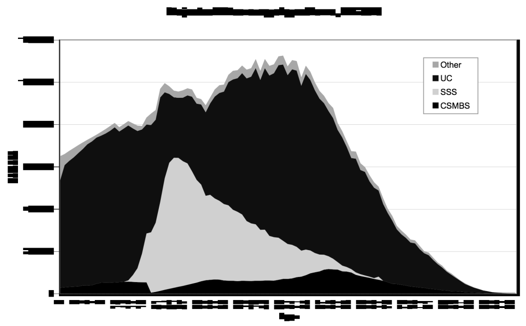
2. Demographic modelling



2. Demographic modelling



2. Demographic modelling

Assumptions for CSMBS projection:

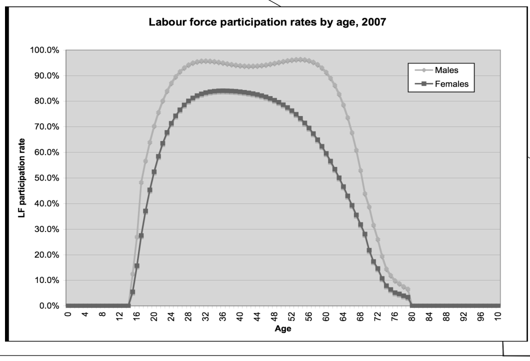
- Number of actives (CS and permanent EEs) constant over the period 2007 - 2012
- Nr of actives increases in line with total population over the period 2013 - 2020
- All actives retire at age 60
- Dependency ratios constant by age/sex

2. Demographic modelling

Assumptions for SSO coverage:

- Constant LF participation rates
- Private employees in total employed to increase from 36.6% to 45% during 07 - 20
- Share of agricultural workers in private employees constant at 18.4% (2007)
- Coverage rate for males to increase from 78.8% to 85% over the period 2007 - 2020, and to remain constant at 98.5% for females

2. Demographic modelling



2. Demographic modelling

[redacted]

2. Demographic modelling

[redacted]

3. Modelling expenditure

a) Break-up of total expenditure into main components as relevant, e.g.,:

[illegible]

b) Disaggregation of benefit expenditure by benefit category and financing:

[illegible]

3. Modelling expenditure

c) Break-up of medical expenditure by type of care and financing mechanism e.g.,:

[illegible]

d) Disaggregate cost components into population by age and sex, utilization (if relevant) and unit cost. For OP care:

[illegible]

3. Modelling expenditure

- Expenditure model specific for each scheme
- Choice of model structure and parameters based on the following considerations:
  - Conceptual framework
  - Explanatory power of variables (i.e., stochastic independence)
  - Financing provisions of scheme
  - Availability (& reliability) of data
  - Model purpose and user requirements
- Design of model structure dynamic process

4. Projection methodology

- Projection of future expenditure through the projection of all model parameters
- Demographic projection to obtain projected scheme coverage
- Projection of utilization pattern based on trend analysis and/or assumptions
- Projection of unit cost pattern based on economic projection (wages, CPI, PPI, etc.) and trend analysis

5. Observations

- Coverage projection for UC dependent on SSS and CSMBS coverage projection
- Expenditure module different for each scheme to reflect scheme specifics (benefit structure, provider payment, data availability, etc.)
- Factor model for unit cost to separate cost drivers and distinguish between price and volume effects
- Use input factors for UC and SSS, but output factors (billing items) for CSMBS

Development of a
Health Care Financing Model

Introductory training session
Model settings and assumptions

31 July 2008
NHSO, Bangkok

Outline

1. Model components
2. Model settings in HCFM
3. Input data for HCFM
4. Assumptions in HCFM
5. Utilization rates
6. DRG case-mix index
7. Factor model for unit cost
8. Projection results
9. Next steps

1. Model components

- Population projection module (ILO-Pop)
- Labour force module (ILO-Lab)
- Economic module (ECON TH)
- Scheme coverage modules (e.g., CovPop UC)
- Expenditure modules (e.g., HCFM UC)
- Allocation modules (for UC and SSO)

2. Model settings in HCFM

a) Utilization rates for OP and IP:

- Option 1: it is assumed that all age/sex specific utilization rates increase uniformly by the same rate (in %).
- Option 2: it is assumed that age-specific utilization rates gradually converge towards an ultimate (assumed) target pattern of age/sex-specific rates.

2. Model settings in HCFM

b) Methodology for projecting IP expenditure:

- Option 1:
  By using average cost per admission
- Option 2:
  By using adjusted relative weights (DRG) and average DRG base-rate (amount paid per ARW).

2. Model settings in HCFM

c) Projection of case-mix index (if relevant):

- Option 1: use overall average case-mix index and assume annual rate of change
- Option 2: use average cmi by sex and assumed annual rate of change
- Option 3: use age/sex - specific cmi and assume uniform increase (in %)
- Option 4: use age/sex - specific cmi and assume convergence towards target pattern

2. Model settings in HCFM

d) Framework for unit cost assumptions:

- Option 1: use factor model to determine annual rate of change in unit cost
- Option 2: specify annual rate of change in unit cost explicitly

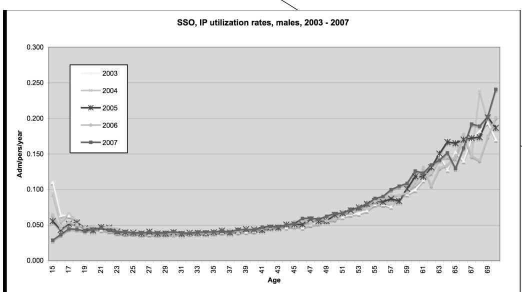
3. Input data for HCFM

- Insured population by single age & sex (to be generated with ‘CovPop’ module)
- Base year expenditure by cost category, type of benefit, and age/sex cohort where relevant
- Base year data on utilization (for OP/IP)
- Case-mix index by age and sex for base year
- Data on insurable earnings (CSMBS & SSS)
- Data on cost structure for factor model

4. Assumptions in HCFM

- Future change of utilization rates for OP and IP (uniform increase or target rate)
- Future change of case-mix index by age/sex or average (uniform or target rate)
- Annual increase of unit costs for OP and IP or alternatively:
- Future change of input factors (unit cost and and input intensities or volumes)

5. Utilization rates



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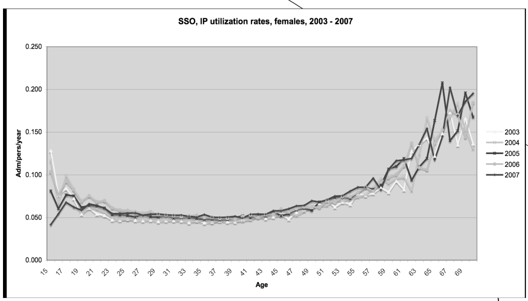

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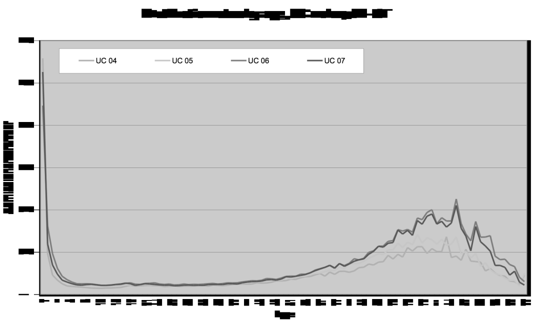

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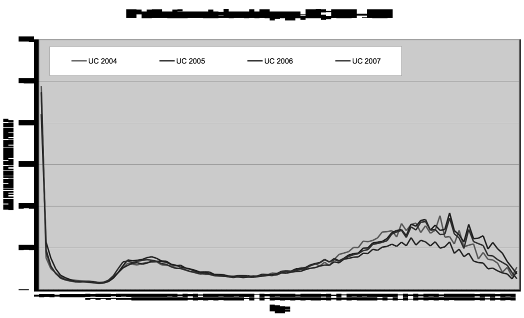

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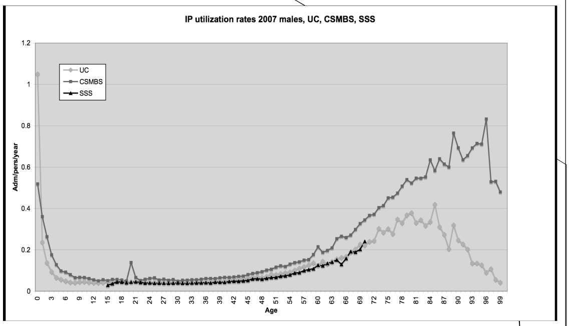

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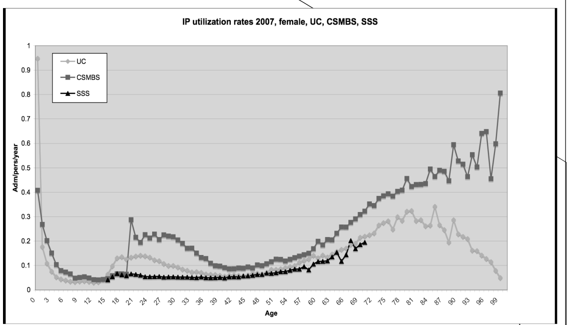

5. Utilization rates

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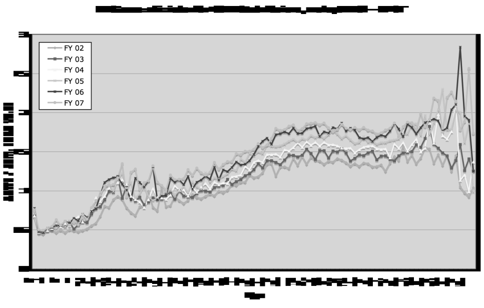
6. DRG case-mix index



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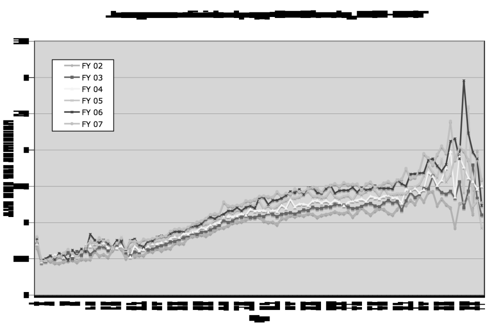

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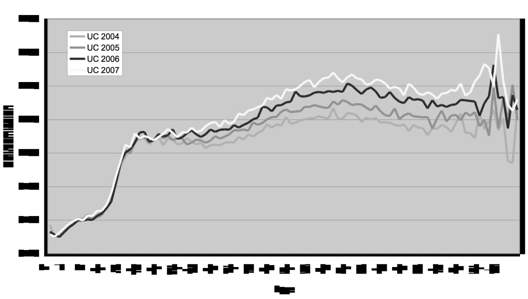

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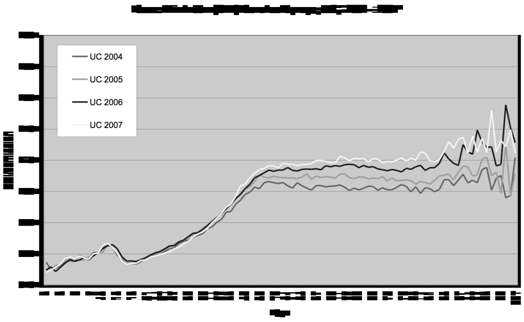

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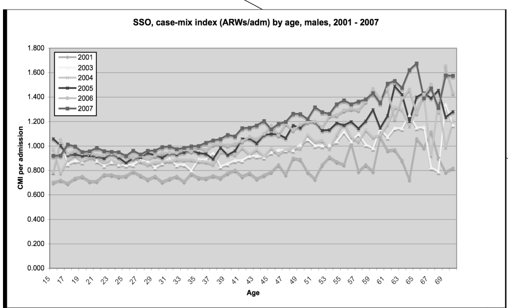

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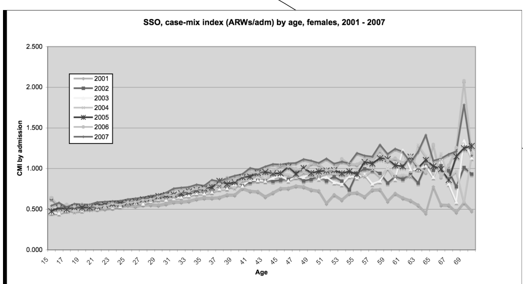

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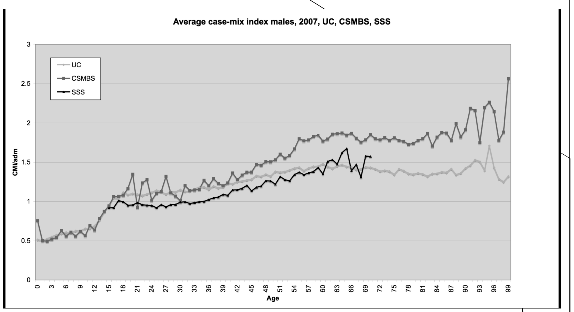

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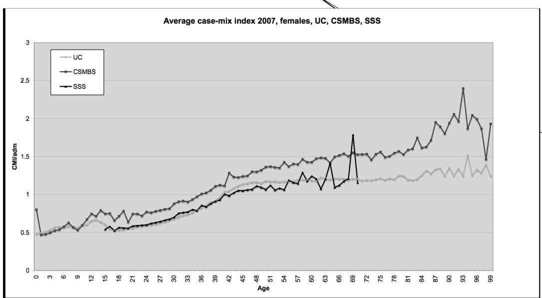

6. DRG case-mix index

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7. Unit cost factor model

- Objectives of factor model:
  (i) To single out main cost drivers and (ii) to distinguish between price and volume changes
- Allows to factor in supply-side constraints (e.g., for medical staff)
- Input versus output cost ?
- Data availability?
- Need to agree on common data framework for future surveys

8. Projection results

- Expenditure by category and type of benefit
- Cost par capita and capitation fee
- PAYG cost rates if relevant and wage data available (CSMBS & SSS)
- Number of OP contacts, IP admissions, hospital days, adjusted relative weights, etc.
- Utilization rates for OP/IP and DRG case-mix index per capita and per admission
- Unit cost (OP/IP) and DRG base rate

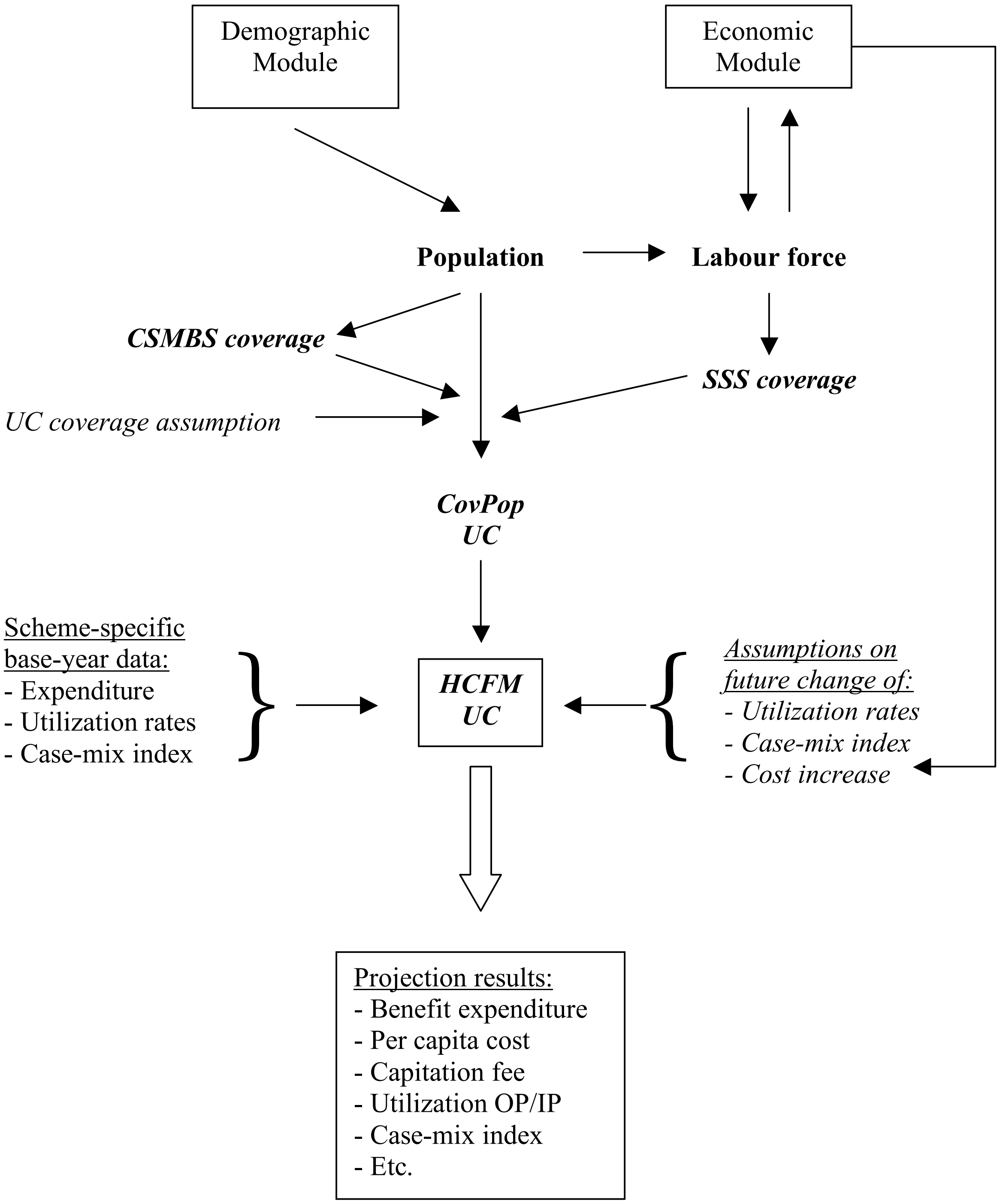
9. Next steps

- Hand-on training session with each scheme
- Fine-tuning of HCFM worksheets
- Agree on all assumptions
- Projections (status quo and reforms)
- Updating of Budget Allocation module (UC)

ANNEX C

Training materials for the UC scheme

Structure of the UC Health Care Financing Model



HEALTH CARE FINANCING MODEL

Universal Coverage Scheme

Description of model components

1. Demographic and labour force module

a. Population projection model

(*See files: 'pop', 'mort', 'fert', 'mig', and 'control')*

The ILO population projection model consists of five separate EXCEL files and allows to project the future population by age and sex for up to 100 years into the future. The methodology that it incorporates is based on the cohort-component model for projecting populations. The model comprises separate files for generating assumptions on fertility by age (see file 'fert'), mortalities by age and sex (see file 'mort'), and migration by age and sex (see file 'mig'). The main model variables are listed below:

Input variables:

- Base-year population by age & sex
- Life expectancy at birth for base year
- Mortality table for base year
- Fertility rates by single age for ages 15 – 49

Assumptions:

- Future life expectancy at birth for M/F (at 5-year intervals)
- Assumed mortality pattern for M/F by LEB
- Assumed future TFR - total fertility rate at 5-year intervals
- Assumed sex ratio at birth i.e., male/female ratio for newborns
- Assumed future net migration figures by age/sex (assumed nil)

Output variables:

- Projected population by age and sex
- Number of newborn M/F

b. Labour Force module (*File: 'Labour force TH')*

This model allows to generate a projection for the labour force and number of employed by single age and sex from on the projected population. The main variables are described below:

Input variables:

- Projected population by age & sex (from 'pop')
- Labour force participation rates by age/sex, base year
- Ratio of unemployed and seasonally inactive (M/F), base year

Assumptions:

- Assumed future labour force participation rates by age/sex

- Assumed future rate of unemployed and seasonally inactive

<u>*Output variables:*</u>

- Projected labour force by age and sex
- Projected number of employed by age and sex

2. <u>Economic module</u> (*See File: 'ECON TH')*

The economic module contains the main macroeconomic variables that are of relevance in the given context. Its objective is to provide a sound framework for the projection of economic variables, this in the most consistent manner. The main model variables are described below:

<u>*Input variables:*</u>

- GDP by composition, base year and time series
- National Income by composition, base year and time series
- Number of employed, public and private (from Labour force TH)
- Consumer Price Index (CPI), base year and time series

<u>*Assumptions:*</u>

- Assumed future rate of labour productivity increase
- Assumed annual rate of CPI increase
- Assumption on future elasticity of wage growth to labour productivity

<u>*Output variables:*</u>

- Projected GDP, in real terms and nominal, and GDP deflator
- Projected future CPI
- Projected average wage, public sector, and private employees

3. <u>Coverage module</u> (*See File: 'CovPoP UC')*

The purpose of the coverage module is the projection of the UC-insured population, this by single age and M/F. The future coverage of UC is obtained as a percentage of the residual population given after deducting from the projected total population the projected population covered under CSMBS and SSS. The UC coverage module contains the following variables:

<u>*Input variables:*</u>

- Insured population by age and sex, base year
- Projected total population by single age and sex
- Projected coverage of CSMBS and SSS, by age and sex

<u>*Assumptions:*</u>

- Assumed percentage of UC members among the residual population for M/F and by single age

<u>*Output variables:*</u>

- Base year coverage rate by age and sex (in % of the residual population)
- Projected UC coverage by age and sex

4. **Expenditure module for health** (*See File: 'HCFM UC')*

The purpose of his module is the projection of future expenditure of the scheme by benefit and in aggregate. The module also allows to project other scheme variables of interest including future benefit utilization rates, cost structure, and average cost per capita (and thus capitation fee). The main model variables are the following:

Input variables:

- Covered population by age, and sex (from CovPop UC)
- Base year expenditure by type of benefit and M/F
- Base year expenditure by single age and sex for OP and IP
- Expenditure composition by cost factor for OP and IP, base year
- Base year utilization for OP/IP and other benefits (aggregate)
- Base year unit cost for OP and IP
- Utilization rate by age/sex for OP/IP
- Base year case-mix index for IP, in aggregate and by age/sex

Assumptions:

- Assumed annual increase/decrease of utilization rates for OP/IP (or target rate)
- Assumed annual increase of unit cost for OP/IP (by cost factor or in aggregate)
- Assumed future increase/decrease of case-mix index per admission
- Assumed unit cost increase/decrease for other items
- Assumed utilization increase/decrease for other items

Output variables:

- Projected expenditure by item and in aggregate
- Projected number of contacts, admissions, and ARWs
- Projected unit cost for OP, IP, and DRG base-rate
- Projected cost structure by cost factor
- Projected expenditure by capita, all benefits
- Projected UC capitation fee

EXPENDITURE MODEL FOR THE UNIVERSAL COVERAGE SCHEME

1. General issues

In order to model expenditure of the Universal Coverage Scheme, it is necessary to develop a model for the UC base year expenditure by breaking down all expenditure items into constituent components. This cost mapping for the base year determines the architecture of the projection model by separating out the variables for which an independent projection is considered sensible and useful from a modelling perspective. The break down of the different expenditure components is outlined in section 2. It can be observed that the variables singled out for each cost item respectively vary substantially depending on the nature of cost, and a number of other considerations, including the following:

- Conceptual modelling framework
- Explanatory power of variables and their stochastic independence
- Financing provisions (i.e., provider payment mechanism)
- Availability and reliability of data on variables singled out
- Model purpose and user requirements

It is stressed here that model development should be an ongoing and dynamic process; modifications on model structure should therefore be undertaken on a regular basis to ensure that the model represents the scheme situation in a truthful manner and produces results as accurately as possible.

2. Model specification for the UC scheme

The total expenditure of the UC scheme is broken down into the following components:

a) Administration cost (ADM)

b) Medical benefit expenditure (MED), which comprises the following:

- Expenditure for chronic renal failure (CRF)
- Expenditure for general outpatient care (GOP)
- Expenditure for inpatient care (IP)
- Expenditure for disease prevention and health promotion services (PP)
- Expenditure for medical instruments related to disability (DIS)
- Expenditure for medical care provided to non-registered persons (NR)

c) Other expenditure items (OTH), which include:

- Expenditure for capital replacement (CAP)
- Expenditure for the settlement of medical malpractice claims (MM)

Total UC expenditure in year *t* thus writes as follows:

$$Exp_t^{(TOT)} = Exp_t^{(ADM)} + Exp_t^{(MED)} + Exp_t^{(OTH)} \qquad (1)$$

Where:

$$Exp_t^{(MED)} = Exp_t^{(CRF)} + Exp_t^{(GOP)} + Exp_t^{(IP)} + Exp_t^{(PP)} + Exp_t^{(DIS)} + Exp_t^{(NR)} \qquad (2)$$

And:

$$Exp_t^{(OTH)} = Exp_t^{(CAP)} + Exp_t^{(MM)} \qquad (3)$$

The disaggregation of the terms on the right side of equations (2) and (3) is discussed below:

General outpatient care (GOP)

The cost for general outpatient care is broken down by age and sex and into population, utilization, and cost per case. Hence for year t we can write:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_{x,s} Exp_{x,s,t}^{(OP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(OP)} \cdot c_t^{(OP)} \end{aligned} \qquad (4)$$

Where: $Exp_t^{(GOP)}$ is the aggregated GOP expenditure in year t

$Exp_{x,s,t}^{(GOP)}$ is the expenditure for GOP care for the age cohort of age x and sex s in the year t

$u_{x,s,t}^{(GOP)}$ is the average utilization rate for GOP care for the population cohort of age x and sex s in year t

$c_t^{(GOP)}$ is the average cost per GOP visit in year t

Inpatient care

It is proposed to disaggregate the cost for inpatient care provided to UC registered persons into population, utilization rate, and cost per admission by age and sex. It is further proposed to break up cost per admission into ARWs per admission (or case-mix index) and payment per ARW, i.e., average DRG base rate. Hence:

$$\begin{aligned} Exp_t^{(IP)} &= \sum_{x,s} Exp_{x,s,t}^{(IP)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot cmi_{x,s,t}^{(IP)} \cdot c_t^{(DRG)} \end{aligned} \qquad (5)$$

Where: $Exp_{x,s,t}^{(IP)}$ is the expenditure for IP care for all UC registered of age x and sex s in year t

$pop_{x,s,t}$ is the number of persons of age x and sex s registered in year t

$u_{x,s,t}^{(IP)}$ is the utilization rate for IP care as provided under UC in year t

$cmi^{(IP)}_{x,s,t}$	is the average DRG case-mix index per admission for all persons of age x and sex s in year t
$c^{(DRG)}_{t}$	is the average DRG base rate applied by UC in year t

Chronic renal failure (CRF)

The cost for outpatient visits related to chronic renal failure is broken down into population and cost per capita by age and sex. Hence for year t we can write:

$$\begin{aligned} Exp_t^{(CRF)} &= \sum_{x,s} Exp^{(CRF)}_{x,s,t} \\ &= \sum_{x,s} pop_{x,s,t} \cdot c^{(CRF)}_{x,s,t} \qquad (6) \end{aligned}$$

Where:		
	$Exp^{(OP)}_{x,s,t}$	is the expenditure for chronic renal failure for the age cohort of age x and sex s in the year t
	$c^{(CRF)}_{x,s,t}$	is the average cost per capita for chronic renal failure for the population cohort of age x and sex s in year t

Cost for disease prevention and health promotion (PP)

The expenditure for disease prevention and health promotion (PP) under UC relates to PP activities targeting the whole population. For PP activities targeting specific age-groups of the population the cost is disaggregated into target population and annual per capita cost by age and sex. Other cost relates to PP activities targeting pregnant women; hence:

$$\begin{aligned} Exp_t^{(PP)} &= Exp_t^{(PP/preg)} + Exp_t^{(PP/other)} \\ &= \sum_{x,s} pop_{x,F,t} \cdot f_{x,t} \cdot c_t^{(PP/preg)} + \sum_{x,s} pop_{x,s,t} \cdot c^{(PP/other)}_{x,s,t} \qquad (7) \end{aligned}$$

Where:		
	$Exp_t^{(PP/preg)}$	is the aggregated expenditure for PP activities targeting pregnant women in year t
	$Exp_t^{(PP/other)}$	is the aggregated expenditure for other PP activities in year t
	$pop_{x,s,t}$	is the total number of persons of age x and sex s registered in all hospitals of type h in year t
	$pop_{x,F,t}$	is the female population of age x and sex s registered in year t
	$f_{x,t}$	is the age-specific fertility rate for women of age x in year t
	$c_t^{(PP/preg)}$	is the average annual cost per capita for PP activities for pregnant women in year t
	$c^{(PP/other)}_{x,s,t}$	is the average annual per capita cost of PP activities for the population of age x and sex s in year t

Cost for emergency medical services (EMS)

The cost for emergency medical services relates to the cost for emergency medical transportation (ambulance services) and related communication cost. Since no data is available on cost per case and number of cases, this item is not broken down.

Disability health benefits (DIS)

The cost for disability health benefits relates to the cost for medical appliances (prosthesis) provided to disabled persons under the UC scheme. It does not include the cost for medical services (OP/IP) provided to disabled, which is included under OP and IP cost. Since no data is available on cost per case and number of cases, this item is not broken down.

Medical care provided to non-registered persons (NR)

This cost item relates to the medical care provided to un-registered persons entitled to UC care. The number of persons contained in this group is unknown and difficult to estimate. Expenditure is broken down into cost per case and number of cases, this
both for OP and IP care, hence:

$$\begin{aligned} Exp_t^{(NR)} &= Exp_t^{(NR/OP)} + Exp_t^{(NR/IP)} \\ &= n_t^{(NR/OP)} \cdot c_t^{(NR/OP)} + n_t^{(NR/IP)} \cdot c_t^{(NR/IP)} \end{aligned} \qquad (8)$$

Where: $n_t^{(NR/OP)}$ is the number of OP visits of non-registered persons with UC entitlement in year t

$n_t^{(NR/OP)}$ is the number of IP visits of non-registered persons with UC entitlement in year t

$c_t^{(NR/IP)}$ is the average cost per OP visit for non-registered persons with UC entitlement in year t

$c_t^{(NR/IP)}$ is the average cost per IP visit for non-registered persons with UC entitlement in year t

Capital replacement and investment cost (CAP)

This item relates to the cost incurred by contract hospitals for capital investment and replacement (e.g. hospital facilities, medical equipment, etc.). Since this relates to non-medical expenditure and does not have a demographic component, hist item is not broken down.

Compensation for medical malpractice claims (MM)

This cost item relates to the compensation monies paid by NHSO to settle compensation claims for medical malpractice. This item is disaggregated into cases and average amount, hence:

$$Exp_t^{(CMM)} = n_t^{(MM)} \cdot c_t^{(MM)} \qquad (9)$$

Where: $n_t^{(MM)}$ is the number of persons compensated for medical malpractice in year t

$c_t^{(MM)}$ is the average amount of compensation for medical malpractice disbursed in year t

3. Projection of model components

Expenditure projections are obtained by projecting model components individually and aggregating for each year of the projection period.

UC HEALTH CARE FINANCING MODEL

SUMMARY DESCRIPTION OF MODEL VARIABLES

File name	***Variable description***	***Type of variable***	***Location***	
			worksheet	***cells***
Pop	- Base-year population	*INPUT*	'INPUT'	C6:D106
	- Projected population males	*OUTPUT*	'PopM'	B5:AU105
	- Projected population females	*OUTPUT*	'PopF'	B5:AU105
	- Projected population total	*OUTPUT*	'PopT'	B5:AU105
Fert	- Base year fertility rates	*INPUT*	'INPUT fert'	C7:C41
	- Total fertility rate for future years (assumed)	*ASSUMPTION*	'Fert'	B41:AU41
	- Projected fertility rates	*OUTPUT*	'Fert'	A5:AU39
Mort	- Base year LEB for males and females	*INPUT*	'LEB'	C13, C15
	- Base year mortality pattern, m & f	*INPUT*	'MortM calc', and 'MortF calc'	H5:S105
	- LEB for future years, males and females	*ASSUMPTION*	'LEB'	D13:L13, and D15:L15
	- Projected mortality rates by age and sex	*OUTPUT*	'MortM' and 'MortF'	B5:AU105
Control	- Base year for population projection	*INPUT*	'CONTROL'	B2
	- Sex ratio of newborns	*INPUT*	'CONTROL'	B4
	- Calculation basis for population	*INPUT*	'CONTROL'	B6
Labour Force TH	- Labour force participation rates	*INPUT*	'LF part INPUT'	E8:F108
	- Rate of unemployed and seasonally inactive	*ASSUMPTION*	EmplM, EmplF	C3
	- Labour Force male & female	*OUTPUT*	LabfM, LabfF, LabfTot	B4:AU104
	- Employed, male & fem.	*OUTPUT*	EmplM, EmplF	B4:AU104
	-			
ECON TH	- Expenditure on GDP, base year and earlier	*INPUT*	'GDP'	C5:Q20
	- National Income, base year and earlier	*INPUT*	'GDP'	C27:Q39
	- Labour force comp., base year and earlier	*INPUT*	'LF balance'	E8:T36
	- CPI headline, base year and earlier	*INPUT*	'Prices&wages'	C6:T6
	- Increase of labour productivity, future	*ASSUMPTION*	'Summary'	P26:AB26
	- Future CPI increase	*ASSUMPTION*	'Summary'	P31:AB31

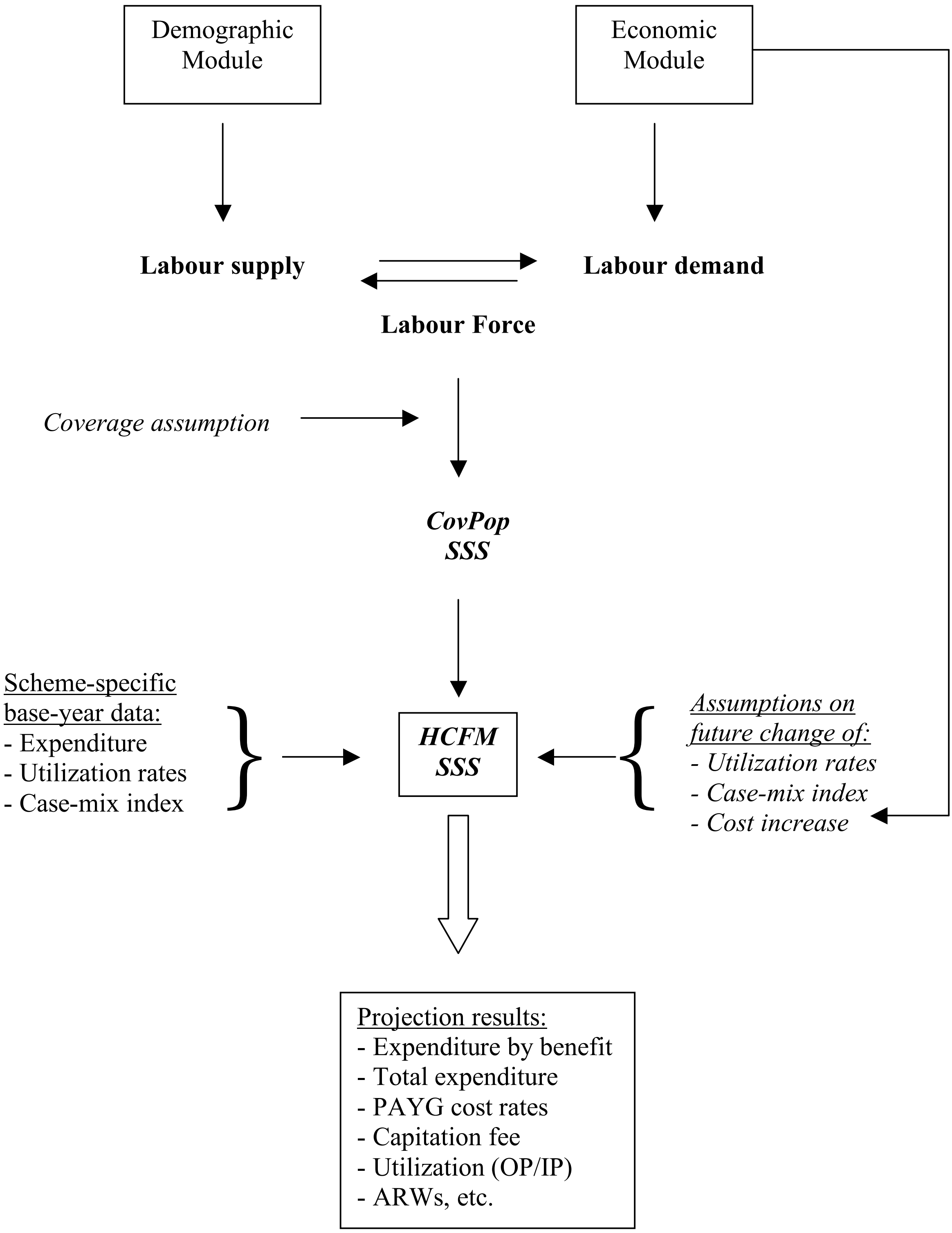
	- Elasticity of wage growth to lab. prod. growth	*ASSUMPTION*	'Summary'	N40, N43
	- Projected GDP and GDP deflator	*OUTPUT*	'Summary'	P8:AB10
	- Projected CPI and GDP deflator	*OUTPUT*	'Summary'	P31:AB31
	- Projected future wages, public sector, private EEs	*OUTPUT*	'Summary'	O39:AB45
	-			
CovPop UC	- Population by scheme, age, and sex, base year	*INPUT*	'INPUT M', 'INPUT F'	B5:H105
	- UC base year population, male & female by age	*INPUT*	'INPUT M', 'INPUT F'	K5:K105
	- Projected UC coverage, male & female by age	*OUTPUT*	'CovPop M', 'CovPop F'	C5:T105
	-			
HCFM UC	- UC expenditure by type of benefit, base year	*INPUT*	'INPUT expenditure'	C8:F21
	- OP and IP expenditure by component	*INPUT*	'INPUT expenditure'	D29:F32, F29:F32
	- Aggregate OP & IP utilization data, base year	*INPUT*	'INPUT utilization'	E5:F7
	- OP & IP utilization rates by age & sex, base year	*INPUT*	'INPUT utilization'	C18:F118
	- Total adjusted relative DRG weights, base year	*INPUT*	'INPUT utilization'	E8:F9
	- DRG case-mix index by age/sex, base-year	*INPUT*	'INPUT utilization'	G19:H119
	- Annual cost per capita by age & sex for PP care	*INPUT*	'P & P'	T12:T112, T115:215
	- Target utilization rates by age &sex, OP & IP	*ASSUMPTION*	'INPUT utilization'	K19:N119
	- Target pattern, case-mix index by age & sex	*ASSUMPTION*	'INPUT utilization'	O19:P119
	- Assumed increase of utilization rates, OP & IP	*ASSUMPTION*	'INPUT assumptions'	D9:P10
	- Assumed future increase of CMI	*ASSUMPTION*	'INPUT assumptions'	D13:P13
	- Assumed future rate of cost increase, OP & IP	*ASSUMPTION*	'INPUT assumptions'	D16:P17
	- Assumption on cost increase for other items	*ASSUMPTION*	'INPUT assumptions'	D20:P30
	- Assumptions on cost increase for input factors	*ASSUMPTION*	'INPUT assumptions'	D42:P45
	- Assumption on volume change of input factors	*ASSUMPTION*	'INPUT assumptions'	D48:P57
	- Projection results for	*OUTPUT*	'OUTPUT'	D7:D21

	expenditure by item			
	- Projection results for OP & IP utilization, CMI	*OUTPUT*	'OUTPUT'	D30:P36
	- Pojection results for OP & IP unit cost & structure	*OUTPUT*	'OUTPUT'	D56:P75
	- Projection results per capita cost, all benefits	*OUTPUT*	'OUTPUT'	D40:P51
	- Projected capitation fee	*OUTPUT*	'OUTPUT'	D52:P52

ANNEX D

Training materials for the Social Security Scheme

Structure of the SSS Health Care Financing Model



HEALTH CARE FINANCING MODEL

SSS

Description of model components

1. Demographic and labour force module

a. Population projection model

(*See files: 'pop', 'mort', 'fert', 'mig', and 'control')*

The ILO population projection model consists of five separate EXCEL files and allows to project the future population by age and sex for up to 100 years into the future. The methodology that it incorporates is based on the cohort-component model for projecting populations. The model comprises separate files for generating assumptions on fertility by age (see file 'fert'), mortalities by age and sex (see file 'mort'), and migration by age and sex (see file 'mig'). The main model variables are listed below:

Input variables:

- Base-year population by age & sex
- Life expectancy at birth for base year
- Mortality table for base year
- Fertility rates by single age for ages 15 – 49

Assumptions:

- Future life expectancy at birth for M/F (at 5-year intervals)
- Assumed mortality pattern for M/F by LEB
- Assumed future TFR - total fertility rate at 5-year intervals
- Assumed sex ratio at birth i.e., male/female ratio for newborns
- Assumed future net migration figures by age/sex (assumed nil)

Output variables:

- Projected population by age and sex
- Number of newborn M/F

b. Labour Force module (*File: 'Labour force TH')*

This model allows to generate a projection for the labour force and number of employed by single age and sex from on the projected population. The main variables are described below:

Input variables:

- Projected population by age & sex (from 'pop')
- Labour force participation rates by age/sex, base year
- Ratio of unemployed and seasonally inactive (M/F), base year

Assumptions:

- Assumed future labour force participation rates by age/sex
- Assumed future rate of unemployed and seasonally inactive

<u>*Output variables:*</u>

- Projected labour force by age and sex
- Projected number of employed by age and sex

2. **<u>Economic module</u>** (*See File: 'ECON TH')*

The economic module contains the main macroeconomic variables that are of relevance in the given context. Its objective is to provide a sound framework for the projection of economic variables, this in the most consistent manner. The main model variables are described below:

<u>*Input variables:*</u>

- GDP by composition, base year and time series
- National Income by composition, base year and time series
- Number of employed, public and private (from Labour force TH)
- Consumer Price Index (CPI), base year and time series

<u>*Assumptions:*</u>

- Assumed future rate of labour productivity increase
- Assumed annual rate of CPI increase
- Assumption on future elasticity of wage growth to labour productivity

<u>*Output variables:*</u>

- Projected GDP, in real terms and nominal, and GDP deflator
- Projected future CPI
- Projected average wage, public sector, and private employees

3. **<u>Coverage module</u>** (*See File: 'CovPoP SSS')*

The purpose of the coverage module is the projection of the SSS-insured population, this by single age and M/F. The module contains the following variables:

<u>*Input variables:*</u>

- Insured population by age and sex, base year
- Number of private employees (non agriculture) by age and sex, base year (from *Labour Force TH*)

<u>*Assumptions:*</u>

- Assumed future coverage rate for M/F

<u>*Output variables:*</u>

- Base year coverage rate by age and M/F
- Projected coverage (persons) by age and M/F

4. **<u>Expenditure module for health</u>** (*See File: 'HCFM SSS')*

The purpose of his module is the projection of future expenditure of the scheme by benefit and in aggregate. The module also allows to project other scheme variables of interest including future benefit utilization rates, cost structure, and average cost per capita. The main model variables are the following:

Input variables:

- Covered population by category, age, and sex (from CovPop SSS)
- Base year expenditure by type of benefit and M/F
- Base year expenditure by single age and sex for OP and IP
- Expenditure composition by cost factor for OP and IP, base year
- Base year utilization for OP/IP and other benefits (aggregate)
- Base year unit cost for OP and IP
- Utilization rate by age/sex for OP/IP
- Base year case-mix index for IP, in aggregate and by age/sex

Assumptions:

- Assumed annual increase of utilization rates for OP/IP (or target rate)
- Assumed annual increase of unit cost for OP/IP
- Assumed future increase of case-mix index
- Assumed unit cost increase for other items
- Assumed utilization increase for other items

Output variables:

- Projected expenditure by item and in aggregate
- Projected number of contacts, admissions, and ARWs
- Projected unit cost for OP, IP, and DRG base-rate
- Projected cost structure by cost factor
- Projected expenditure by capita, all benefits
- Projected capitation fee

HEALTH CARE FINANCING MODEL

Social Security Scheme

SUMMARY DESCRIPTION OF MODEL VARIABLES

File name	*Variable description*	*Type of variable*	*Location*	
			worksheet	*cells*
Pop	- Base-year population	*INPUT*	'INPUT'	C6:D106
	- Projected population males	*OUTPUT*	'PopM'	B5:AU105
	- Projected population females	*OUTPUT*	'PopF'	B5:AU105
	- Projected population total	*OUTPUT*	'PopT'	B5:AU105
Fert	- Base year fertility rates	*INPUT*	'INPUT fert'	C7:C41
	- Total fertility rate for future years (assumed)	*ASSUMPTION*	'Fert'	B41:AU41
	- Projected fertility rates	*OUTPUT*	'Fert'	A5:AU39
Mort	- Base year LEB for males and females	*INPUT*	'LEB'	C13, C15
	- Base year mortality pattern, m & f	*INPUT*	'MortM calc', and 'MortF calc'	H5:S105
	- LEB for future years, males and females	*ASSUMPTION*	'LEB'	D13:L13, and D15:L15
	- Projected mortality rates by age and sex	*OUTPUT*	'MortM' and 'MortF'	B5:AU105
Control	- Base year for population projection	*INPUT*	'CONTROL'	B2
	- Sex ratio of newborns	*INPUT*	'CONTROL'	B4
	- Calculation basis for population	*INPUT*	'CONTROL'	B6
Labour Force TH	- Labour force participation rates	*INPUT*	'LF part INPUT'	E8:F108
	- Rate of unemployed and seasonally inactive	*ASSUMPTION*	EmplM, EmplF	C3
	- Labour Force male & female	*OUTPUT*	LabfM, LabfF, LabfTot	B4:AU104
	- Employed, male & fem.	*OUTPUT*	EmplM, EmplF	B4:AU104
ECON TH	- Expenditure on GDP, base year and earlier	*INPUT*	'GDP'	C5:Q20
	- National Income, base year and earlier	*INPUT*	'GDP'	C27:Q39
	- Labour force comp., base year and earlier	*INPUT*	'LF balance'	E8:T36
	- CPI headline, base year and earlier	*INPUT*	'Prices&wages'	C6:T6
	- Increase of labour productivity, future	*ASSUMPTION*	'Summary'	P26:AB26
	- Future CPI increase	*ASSUMPTION*	'Summary'	P31:AB31
	- Elasticity of wage growth	*ASSUMPTION*	'Summary'	N40, N43

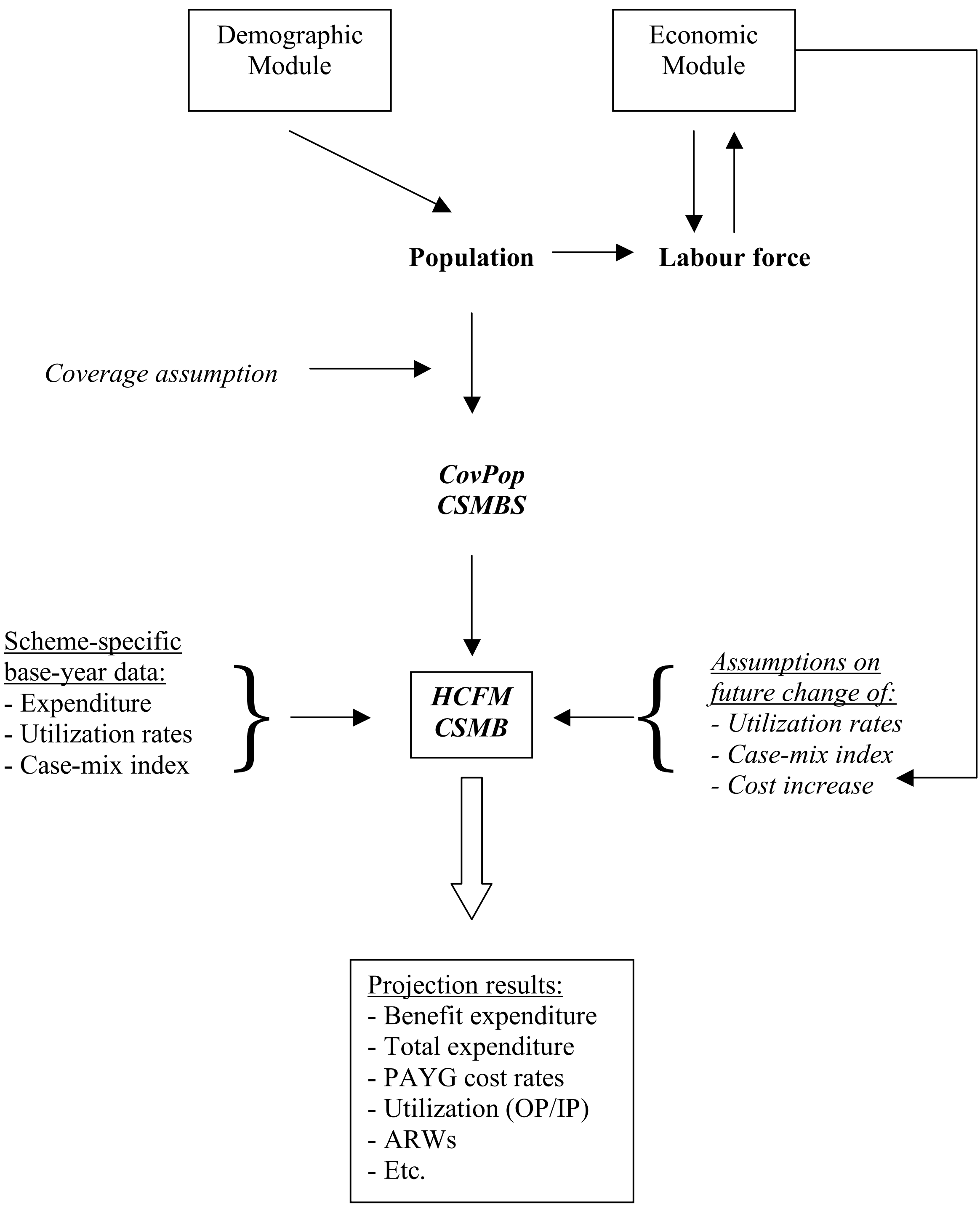
	to lab. prod. growth			
	- Projected GDP and GDP deflator	*OUTPUT*	'Summary'	P8:AB10
	- Projected CPI and GDP deflator	*OUTPUT*	'Summary'	P31:AB31
	- Projected future wages, public sector, private EEs	*OUTPUT*	'Summary'	O39:AB45
CovPop SSS	- Nr. of insured by age, and sex, base year	*INPUT*	'CovPop INPUT'	H6:I61
	- Nr of employed & private employees, base year	*INPUT*	'INPUT assumptions'	E11:E13, E17, E18, E22, E24
	- Future share of private EEs in total employed	*ASSUMPTION*	'INPUT assumptions'	F16:W16
	- Future overall SSS coverage rate for M/F	*ASSUMPTION*	'INPUT assumptions'	F32:W33
	- Projected SSS coverage by age and sex	*OUTPUT*	'CovPop M', 'CovPop F'	B25:T80
HCFM SSS	- Model settings	*INPUT*	'Settings'	
	- SSS expenditure by type of benefit, base year	*INPUT*	'INPUT expenditure'	C8:E31
	- Total insured earnings, base year	*INPUT*	'INPUT expenditure'	E33
	- OP/IP exp. composition by factor, public hosp.	*INPUT*	'INPUT expenditure'	C39:D45, E39:F45
	- OP/IP exp. composition by factor, public hosp.	*INPUT*	'INPUT expenditure'	C50:D56, E50:F56
	- Aggregate utilization data OP & IP, base year	*INPUT*	'INPUT utilization'	E5:F8
	- OP & IP utilization rates by age & sex, base year	*INPUT*	'INPUT utilization'	C21:F91
	- Total adjusted relative DRG weights, base year	*INPUT*	'INPUT utilization'	E7:F7
	- DRG case-mix index by age/sex, base-year	*INPUT*	'INPUT utilization'	G21:H100
	- Annual cost per capita by age/sex, other Benefits	*INPUT*	'Accident', 'HD', 'Emergeny', etc.	T12:T112, T115:215
	- Target utilization rates by age &sex, OP & IP	*ASSUMPTION*	'INPUT utilization'	K21:N91
	- Target pattern, case-mix index by age & sex	*ASSUMPTION*	'INPUT utilization'	O21:P101
	- Assumed increase of utilization rates, OP & IP	*ASSUMPTION*	'INPUT assumptions'	D9:P10
	- Assumed future increase of CMI	*ASSUMPTION*	'INPUT assumptions'	D13:P13
	- Assumed future rate of cost increase, OP & IP	*ASSUMPTION*	'INPUT assumptions'	D16:P17
	- Assumptions on cost increase for input factors	*ASSUMPTION*	'INPUT assumptions'	D28:P33
	- Assumption on volume change of input factors	*ASSUMPTION*	'INPUT assumptions'	D36:P49
	- Assumption on unit cost	*ASSUMPTION*	'INPUT	D74:P89

increase for other items		assumptions’	
- Assumption on utilization rate increase for other items	*ASSUMPTION*	‘INPUT assumptions’	D92:P107
- Assumption on cost increase for other BL	*ASSUMPTION*	‘INPUT assumptions’	D130:P131
- Projection results for expenditure by item	*OUTPUT*	‘OUTPUT’	D7:P31
- Projection results for OP & IP utilization, CMI	*OUTPUT*	‘OUTPUT’	D45:P52
- Projection results for OP & IP unit cost & structure	*OUTPUT*	‘OUTPUT’	D88:P115
- Projection results per capita cost, all benefits	*OUTPUT*	‘OUTPUT’	D55:P76

ANNEX E

Training materials for the CSMBS

Structure of the CSMBS Health Care Financing Model



HEALTH CARE FINANCING MODEL

CSMBS

Description of model components

1. Demographic and labour force module

a. Population projection model

(*See files: 'pop', 'mort', 'fert', 'mig', and 'control')*

The ILO population projection model consists of five separate EXCEL files and allows to project the future population by age and sex for up to 100 years into the future. The methodology that it incorporates is based on the cohort-component model for projecting populations. The model comprises separate files for generating assumptions on fertility by age (see file 'fert'), mortalities by age and sex (see file 'mort'), and migration by age and sex (see file 'mig'). The main model variables are listed below:

Input variables:

- Base-year population by age & sex
- Life expectancy at birth for base year
- Mortality table for base year
- Fertility rates by single age for ages 15 – 49

Assumptions:

- Future life expectancy at birth for M/F (at 5-year intervals)
- Assumed mortality pattern for M/F by LEB
- Assumed future TFR - total fertility rate at 5-year intervals
- Assumed sex ratio at birth i.e., male/female ratio for newborns
- Assumed future net migration figures by age/sex (assumed nil)

Output variables:

- Projected population by age and sex
- Number of newborn M/F

b. Labour Force module (*File: 'Labour force TH')*

This model allows to generate a projection for the labour force and number of employed by single age and sex from on the projected population. The main variables are described below:

Input variables:

- Projected population by age & sex (from 'pop')
- Labour force participation rates by age/sex, base year
- Ratio of unemployed and seasonally inactive (M/F), base year

Assumptions:

- Assumed future labour force participation rates by age/sex

- Assumed future rate of unemployed and seasonally inactive

Output variables:

- Projected labour force by age and sex
- Projected number of employed by age and sex

2. **Economic module** (*See File: 'ECON TH')*

The economic module contains the main macroeconomic variables that are of relevance in the given context. Its objective is to provide a sound framework for the projection of economic variables, this in the most consistent manner. The main model variables are described below:

Input variables:

- GDP by composition, base year and time series
- National Income by composition, base year and time series
- Number of employed, public and private (from Labour force TH)
- Consumer Price Index (CPI), base year and time series

Assumptions:

- Assumed future rate of labour productivity increase
- Assumed annual rate of CPI increase
- Assumption on future elasticity of wage growth to labour productivity

Output variables:

- Projected GDP, in real terms and nominal, and GDP deflator
- Projected future CPI
- Projected average wage, public sector, and private employees

3. **Coverage projection** (*See File: 'CovPoP CSMBS')*

The purpose of the coverage module is the projection of the CSMBS-insured population, this by single age and M/F, i.e., the future number of civil servants and permanent employees, dependent spouses, dependent children, and dependent parents. The module contains the following variables:

Input variables:

- Insured population by category, age, and sex, base year
- Dependency ratios by age and sex, base year
- Mortality rates by age and sex

Assumptions:

- Assumed future coverage (i.e., total number of actives)
- Age distribution of new entrants
- Age distribution of dropouts (retirement rates by age and sex)

Output variables:

- Projected coverage by type, age and sex

4. **HC Expenditure projections** (*See File: 'HCFM CSMBS')*

The purpose of his module is the projection of future expenditure of the scheme by benefit and in aggregate. The module also allows to project other scheme variables of interest including future benefit utilization rates, cost structure, and average cost per capita. The main model variables are the following:

Input variables:

- Covered population by category, age, and sex (from CovPop CSMBS)
- Base year expenditure by type of benefit and M/F
- Base year expenditure by single age and sex for OP and IP
- Expenditure composition by cost factor for OP and IP
- Base year utilization for OP/IP and other benefits (aggregate)
- Utilization rate by age/sex for OP/IP
- Base year case-mix index for IP, in aggregate and by age/sex

Assumptions:

- Assumed annual increase of utilization rates for OP/IP (or target rate)
- Assumed annual increase of unit cost for OP/IP
- Assumed future increase of case-mix index
- Assumed unit cost increase for other items
- Assumed volume change for other items

Output variables:

- Projected expenditure by item and in aggregate
- Projected number of contacts, admissions, and ARWs
- Projected unit cost for OP, IP, and IP base-rate
- Projected cost structure by cost factor
- Projected expenditure by capita, all benefits
- Projected capitation fee

EXPENDITURE MODEL FOR THE CIVIL SERVANTS' MEDICAL BENEFITS SCHEME

1. General issues

In order to model expenditure of the Civil Servants' Medical Benefits Scheme, it is necessary to develop a model for the base year expenditure of CSMBS by breaking down total expenditure items into constituent components. This cost mapping for the base year determines the architecture of the projection model by separating out the variables for which an independent projection is considered sensible and useful from a modelling perspective. The break down of the different expenditure components is outlined in section 2. It can be observed that the variables singled out for each cost item respectively vary substantially depending on the nature of cost, and a number of other considerations, including the following:

- Conceptual modelling framework
- Explanatory power of variables and their stochastic independence
- Financing provisions (i.e., provider payment mechanism)
- Availability and reliability of data on variables singled out
- Model purpose and user requirements

It is stressed here that model development should be an ongoing and dynamic process; modifications on model structure should therefore be undertaken on a regular basis to ensure that the model represents the scheme situation in a truthful manner and produces results as accurately as possible.

2. Model specification for the CSMBS

Total benefit expenditure for the Civil Servants Medical Benefits' Scheme consists of two main components, which are inpatient and outpatient care, hence:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} \tag{1}$$

a) Outpatient care

Total expenditure for outpatient care can be broken down into the following:

- Expenditure for annual medical checkups (examinations[1]),
- Expenditure for hemodialysis visits,
- Expenditure for chemotheraphy and cancer drugs,
- Expenditure for medical instruments for OP care,
- Expenditure for HIV/AIDS drugs and diagnostics, and
- Expenditure for general outpatient care, comprising all expenditure not included in the above categories.

Hence:

[1] Civil servants, permanent state employees, and state pensioners are entitled to a free annual medical check-up under CSMBS benefit rules.

$$Exp_t^{(OP)} = Exp_t^{(CHECK)} + Exp_t^{(HD)} + Exp_t^{(CHT)} + Exp_t^{(InstOP)} + Exp_t^{(HIV)} + Exp_t^{(GOP)} \quad (2)$$

Where:

$Exp_t^{(CHECK)}$	is the aggregated expenditure for medical checkups in year t
$Exp_t^{(HD)}$	is the aggregated expenditure for hemodialysis in year t
$Exp_t^{(CHT)}$	is the aggregated expenditure for chemotheraphy and cancer drugs in year t
$Exp_t^{(InstOP)}$	is the aggregated expenditure for medical instruments for OP care in year t
$Exp_t^{(HIV)}$	is the aggregated expenditure for HIV/Aids drugs and diagnostics in year t
$Exp_t^{(GOP)}$	is the aggregated expenditure for general outpatient care in year t

Each term on the right side of equation (2) is broken down further based on data availability and what is considered appropriate:

$$Exp_t^{(CHECK)} = \sum_{x,s} pop_{x,s,t}^{(A\&P)} \cdot u_t^{(CHECK)} \cdot c_{x,s,t}^{(CHECK)}$$

$$Exp_t^{(HD)} = pop_t \cdot u_t^{(HD)} \cdot c_t^{(HD)}$$

$$Exp_t^{(CHT)} = pop_t \cdot u_t^{(CHT)} \cdot c_t^{(CHT)}$$

$$Exp_t^{(Inst/OP)} = pop_t \cdot u_t^{(Inst/OP)} \cdot c_t^{(Inst/OP)}$$

$$Exp_t^{(HIV)} = pop_t \cdot u_t^{(HIV)} \cdot c_t^{(HIV)}$$

$$Exp_t^{(HD)} = pop_t \cdot u_t^{(HD)} \cdot c_t^{(HD)}$$

$$Exp_t^{(GOP)} = \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(GOP)} \cdot c_t^{(GOP)}$$

Where:

pop_t	is the aggregate number of people registered in year t
$pop_{x,s,t}$	is the number of persons of age x and sex s registered in year t
$pop_{x,s,t}^{(A\&P)}$	is the number of actives and pensioners of age x and sex s registered in year t
$u_t^{(...)}$	is the average utilization rate of each benefit respectively in year t (number of cases per registered person per year)
$u_{x,s,t}^{(...)}$	is the average utilization rate of the respective benefit for the registered population of age x and sex s in year t
$c_{x,s,t}^{(...)}$	is the respective average cost per case of the respective benefit for the registered population of age x and sex s in year t
$c_t^{(...)}$	is the average cost per case of benefit for all registered in year t

b) Inpatient care

Expenditure for inpatient care can be broken down into the following components:

- Expenditure for room and board (per diems) during acute care
- Expenditure for non-acute and sub-acute care (per diems)
- Expenditure for medical instruments for IP
- Expenditure for general IP medical service (as reimbursed via the DRG system)

Hence we can write:

$$Exp_t^{(IP)} = Exp_t^{(RB)} + Exp_t^{(N-AC)} + Exp_t^{(Inst/IP)} + Exp_t^{(GIP)} \tag{3}$$

Each component on the right side of equation (3) is broken down further based on data availability and what is considered appropriate, hence:

$$Exp_t^{(RB)} = \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot los_t^{(IP/AC)} \cdot c_t^{(PD/AC)}$$

$$Exp_t^{(N-AC)} = \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot los_t^{(IP/N-AC)} \cdot c_t^{(PD/N-AC)}$$

$$Exp_t^{(Inst/IP)} = pop_t \cdot u_t^{(Inst/IP)} \cdot c_t^{(Inst/IP)}$$

$$Exp_t^{(GIP)} = \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(GIP)} \cdot cmi_{x,s,t}^{(GIP)} \cdot c_t^{(DRG)}$$

Where:

Where:	$Exp_t^{(RB)}$	is the expenditure for daily allowances (per diems) to cover cost for room and board during admissions (acute phase) in year t
	$Exp_t^{(N-AC)}$	is the aggregate expenditure for non-acute and sub-acute care in year t
	$Exp_t^{(Inst/IP)}$	is the aggregate expenditure for medical instruments related to inpatient care in year t
	$Exp_t^{(GIP)}$	is the aggregate expenditure for medical inpatient services in year t
	$pop_{x,s,t}$	is the number of persons of age x and sex s registered with CSMBS in year t
	$u_{x,s,t}^{(IP)}$	is the average utilization rate for inpatient care for registered persons of age x and sex s in year t
	$u_t^{(Inst/IP)}$	is the average aggregate utilization rate for medical instruments related to inpatient care in year t
	$los_t^{(IP/AC)}$	is the average length of stay (days) per admission (acute phase) in year t
	$los_t^{(IP/N-AC)}$	is the average length of stay (days) per admission for the non-acute and sub-acute phase in year t
	$c_t^{(PD)}$	is the average amount of daily allowance (per diem) payable per day of admission in year t

$c_t^{(Inst/IP)}$ is the average cost per case for medical instruments related to IP care in year t

$cmi_{x,s,t}^{(IP)}$ is the average DRG case-mix index of the insured population of age x and sex s in year t, i.e., the average number of DRG adjusted relative weights per person per year in year t

$c_t^{(DRG)}$ is the average DRG base rate (payment per ARW) in year t

3. Projection of model components

Expenditure projections are obtained by projecting model components individually and by aggregating projected annual values.

HEALTH CARE FINANCING MODEL

CSMBS

SUMMARY DESCRIPTION OF MODEL VARIABLES

File name	*Variable description*	*Type of variable*	*Location*	
			worksheet	*cells*
Pop	- Base-year population	*INPUT*	'INPUT'	C6:D106
	- Projected population males	*OUTPUT*	'PopM'	B5:AU105
	- Projected population females	*OUTPUT*	'PopF'	B5:AU105
	- Projected population total	*OUTPUT*	'PopT'	B5:AU105
Fert	- Base year fertility rates	*INPUT*	'INPUT fert'	C7:C41
	- Total fertility rate for future years (assumed)	*ASSUMPTION*	'Fert'	B41:AU41
	- Projected fertility rates	*OUTPUT*	'Fert'	A5:AU39
Mort	- Base year LEB for males and females	*INPUT*	'LEB'	C13, C15
	- Base year mortality pattern, m & f	*INPUT*	'MortM calc', and 'MortF calc'	H5:S105
	- LEB for future years, males and females	*ASSUMPTION*	'LEB'	D13:L13, and D15:L15
	- Projected mortality rates by age and sex	*OUTPUT*	'MortM' and 'MortF'	B5:AU105
Control	- Base year for population projection	*INPUT*	'CONTROL'	B2
	- Sex ratio of newborns	*INPUT*	'CONTROL'	B4
	- Calculation basis for population	*INPUT*	'CONTROL'	B6
Labour Force TH	- Labour force participation rates	*INPUT*	'LF part INPUT'	E8:F108
	- Rate of unemployed and seasonally inactive	*ASSUMPTION*	EmplM, EmplF	C3
	- Labour Force male & female	*OUTPUT*	LabfM, LabfF, LabfTot	B4:AU104
	- Employed, male & fem.	*OUTPUT*	EmplM, EmplF	B4:AU104
ECON TH	- Expenditure on GDP, base year and earlier	*INPUT*	'GDP'	C5:Q20
	- National Income, base year and earlier	*INPUT*	'GDP'	C27:Q39
	- Labour force comp., base year and earlier	*INPUT*	'LF balance'	E8:T36
	- CPI headline, base year and earlier	*INPUT*	'Prices&wages'	C6:T6
	- Increase of labour productivity, future	*ASSUMPTION*	'Summary'	P26:AB26
	- Future CPI increase	*ASSUMPTION*	'Summary'	P31:AB31
	- Elasticity of wage growth	*ASSUMPTION*	'Summary'	N40, N43

	to lab. prod. growth			
	- Projected GDP and GDP deflator	*OUTPUT*	‘Summary’	P8:AB10
	- Projected CPI and GDP deflator	*OUTPUT*	‘Summary’	P31:AB31
	- Projected future wages, public sector, private EEs	*OUTPUT*	‘Summary’	O39:AB45
CovPop CSMBS	- Insured by category, age, and sex, base year	*INPUT*	‘INPUT’	C7:W107
	- Dependency ratios by age and type, base year	*INPUT*	‘xyz ADIST’	B7:CI90
	- Mortality by age/sex, base year and projected	*INPUT*	‘Mort M’, ‘Mort F’	B5:Au 105
	- Projected coverage by category, age, and M/F	*OUTPUT*	‘CovPop Male’, ‘CovPop Female’	C6:U106
HCFM CSMBS	- UC expenditure by type of benefit, base year	*INPUT*	‘INPUT expenditure’	C5:F21
	- OP and IP expenditure composition (by factor)	*INPUT*	‘INPUT expenditure’	C32:D36, E32:F36
	- Aggregate utilization data OP & IP, base year	*INPUT*	‘INPUT utilization’	E5:H10
	- OP & IP utilization rates by age & sex, base year	*INPUT*	‘INPUT utilization’	C25:F125
	- Total adjusted relative DRG weights, base year	*INPUT*	‘INPUT utilization’	E11:F12
	- DRG case-mix index by age/sex, base-year	*INPUT*	‘INPUT utilization’	G25:H125
	- Annual cost per capita checkups by age & sex	*INPUT*	‘OP checkups’	T5, T12:T112, T115:215
	- Target utilization rates by age &sex, OP & IP	*ASSUMPTION*	‘INPUT utilization’	K25:N125
	- Target pattern, case-mix index by age & sex	*ASSUMPTION*	‘INPUT utilization’	O25:P125
	- Assumed increase of utilization rates, OP & IP	*ASSUMPTION*	‘INPUT assumptions’	D9:P10
	- Assumed future increase of CMI	*ASSUMPTION*	‘INPUT assumptions’	D13:P13
	- Assumed future rate of cost increase, OP & IP	*ASSUMPTION*	‘INPUT assumptions’	D16:P17
	- Assumptions on cost increase for input factors	*ASSUMPTION*	‘INPUT assumptions’	D29:P33
	- Assumption on volume change of input factors	*ASSUMPTION*	‘INPUT assumptions’	D36:P47
	- Assumption on unit cost increase for other items	*ASSUMPTION*	‘INPUT assumptions’	D71:P80
	- Assumption on utilization rate increase for other items	*ASSUMPTION*	‘INPUT assumptions’	D83:P92
	- Assumption on cost increase for other BL	*ASSUMPTION*	‘INPUT assumptions’	D110:P111
	- Projection results for expenditure by item	*OUTPUT*	‘OUTPUT’	D7:P25

- Projection results for OP & IP utilization, CMI	*OUTPUT*	‘OUTPUT’	D37:P47
- Pojection results for OP & IP unit cost & structure	*OUTPUT*	‘OUTPUT’	D63:P86
- Projection results per capita cost, all benefits	*OUTPUT*	‘OUTPUT’	D51:P59

THAILAND

Development of a Health Care Financing Model

Second Phase

REPORT F

(Handover note)

26 November 2008

Jean-Claude Hennicot
Consulting Actuary
ILO

CONTENTS

ANNEXES

1. Background

The present report was drafted within the framework of the consultancy agreement concluded by the consultant and the International Labour Office (External Collaboration Contract no. 40033646/0 signed on 1 February 2008). The assignment was carried out within the wider context of the cooperation agreement signed by the International Labour Office (ILO) and the European Commission (EC) on 9 February 2006 pertaining to the EC project 'Heath Care Reform in Thailand' (THA/AID/CO/2002/0411, 2004 – 2009), the agreement stipulating that the project component 'Financial Management of the Thai Health Care System' shall be implemented by ILO.

The consultancy assignment mentioned above is referred to in the following as the 'second phase' assignment; it was arranged in continuity with an earlier agreement (referred to as 'initial phase'), which had been completed in December 2007.

The purpose of the present report is to document the formal handover of the electronic model files and accompanying user manual to the national stakeholders. The report also contains an account of the final training session with the technical counterparts and the final presentation of model results to all national stakeholders.

The report is structured as follows:

Section 2 contains an account of the final training workshop on the EU/ILO Health Care Financing Models and the final presentation of the models to all national stakeholders.

Section 3 provides a summary description of all model files and documentation as handed over to the technical counterparts at CSMBS, SSO, NHSO, and IHPP.

Section 4 contains concluding remarks of the consultant.

The terms of reference are provided in the annex of the report together with the correspondence relating to the handover of the models and accompanying documentation.

The author would like to acknowledge the good cooperation extended by the Thai counterparts from the respective institutions. Special thanks are due to Ms Rangsima Preechachard, SSO, Mr Kulasake Limpiyakorn, CSMBS, Ms Taweesri Greetong and Ms Kongkran, NHSO, for their continued assistance with data collection and feedback on modeling, to the National Project Director, Dr. Thaworn Sakunphanit, for his technical feedback and support with administrative matters, to the ILO Project Coordinator, Mr Wolfgang Scholz, for his technical inputs and overall guidance, and to Mr. Hiroshi Yamabana, ILO Social Security Specialist, for his insightful comments.

2. Final training seminar and presentation of results

During the mission of the project coordinator that took place from 11 - 22 October a final training workshop with the technical counterparts of NHSO, SSO, CSMBS, and IHPP was organized. A meeting with all national stakeholders was also convened during the same period aiming at the presentation of the final model architecture and preliminary model results.

2.1. *Final training seminar*

The final training seminar on the models was organized from 13 to 16 October with the technical counterparts of NHSO, SSO, CSMBS, and IHPP.

During the training the consultant presented in detail the final version of the models as tailored to the needs and data situation of the respective institutions. The consultant also presented the alternative modeling options as integrated in the model design and issues in relation to assumption setting. The following discussions with the national counterparts was centered around agreeing on concrete assumptions for the models, notably with regard to economic variables and scheme-specific assumptions as needed for the different institutional models respectively.

2.2. *Final presentation of models to national stakeholders*

A meeting with all national stakeholders was organized on 20 October for the presentation of the model architecture and of the preliminary projection results.

The project coordinator presented the conceptual modeling approach and discussed issues in relation to the practical use of the models. The consultant then presented the common model framework including demographic and economic modeling and the coverage modules for each scheme. The national counterparts of the NHSO, CSMBS, and SSO, then presented the expenditure models of their respective scheme and the preliminary projection results as obtained with the models.

Upon request by the national stakeholders clarification was provided on model methodology, mainly on the demographic and economic modules.

3. Summary list of outputs delivered

The final version of the models and handbook was sent by mail (CD-ROM) to the technical counterparts of NHSO, SSO, CSMBS, and IHPP respectively (see Annex B for cover letters). A copy of the model files was also sent by mail to the National Project Director and a further copy will be sent to the Project Coordinator together with a hardcopy of the present report.

The electronic files included on the CD-ROM are listed below together with a summary description:

- *Read me* (pdf file with instructions on model use and updating links between files)
- *Control* (control variables for population projection, see folder '*Population')*
- *Fert* (age-specific fertility assumptions, see folder '*population*')
- *Mort* (age/sex-specific mortality assumptions, see folder '*population*')
- *Pop* (results of the population projection by age/sex, see folder '*population*')
- *Econ TH* (economic variables and projection)
- *Labour Force TH* (labour force and employment data and projection)
- *CovPop SSS* (coverage projection for the Social Security Scheme)
- *CovPop CSMBS* (coverage projection for the CSMBS)
- *CovPop UC* (coverage projection for the Universal Coverage Scheme)
- *HCF Model SSS* (expenditure projection for the SSS)
- *HCF Model CSMBS* (expenditure projection for the CSMBS)
- *HCF Model UC* (expenditure projection for the UC scheme)
- *NHA Model* (projection model for the National Health Accounts)
- *SSS Allocation Module* (budget allocation module for the SSS)

- *UC Allocation Module* (budget allocation module for the UC scheme)
- *User Manual HCF Model v1.0* (user manual for the models in pdf format)

4. Concluding remarks

This is the final report prepared by the consultant under his ‘second phase’ assignment on model development under the EU health Care Reform Project. The work of the consultant greatly benefited from the technical cooperation of the national counterparts, which can be qualified as excellent. The national counterparts therefore deserve the main credit for the work accomplished and the outputs attached to this report.

It is hoped that the models developed will be of use for the budgeting and resource allocation processes of the institutions concerned. It is also hoped that the coordination mechanism on modeling as proposed under the project will take shape and that a working group will be established to discuss modeling issues, agree on common assumptions, and update the databases needed to obtaining meaningful model results. It is further hoped that efforts will be undertaken to fill the remaining data gaps and that routines for the collection and maintenance of the relevant data will be established in the future.

ANNEX A

Terms of Reference:

These Terms of Reference (TOR-SP) refer to the second phase (SP) of the development of a: health care financing model, and staff capacity building, for the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), The Universal Health Care Scheme (UC), and the International Health Policy Programme (IHPP) of Thailand.

With respect to the first (initial) phase (TOR-IP) reference is made to contract PO/Ver No: 40029956, dated 29.06.2007

It is understood that, at the commencement of this contract (TOR-SP), the obligations and works of the contract of the initial phase (TOR-IP) have been fulfilled such that the tasks to be carried out under this contract (TOR-SP) can be fulfilled.

The overall contents of the Draft Terms of Reference (so-called Draft03 dated 02/05/2007, see attachment to contract re TOR-IP) remains valid. The contractor to these TOR-SP is advised to refer to Draft03 for further information.

The contents of Draft03, as far as not replaced by these TOR-SP, is valid; the time frame defined in Draft03 is however not fully applicable anymore. For the second phase of modelling, these TOR-SP replace the time frame of Draft03 (see the attached updated flow chart of activities under TOR-SP).

A. Activities to be carried out

Under the supervision of the Senior Economist of the ILO Social Security Department and the Social Security Specialist of the ILO SRO-Bangkok, the contractor to these TOR-SP will undertake the following tasks:

On the background as provided in Draft 03 (see above), he will develop four (4) health care finance models, which, each, are characterized by the fact that they can be based on a common, coordinated set of assumptions on demography, economy, labour market, health care utilization and unit cost developments.

The models will be designed such that they project expenditure and revenue of Thailand's health system(s); the models are annual, i.e. they are based on annual data and will produce annual (annualised) outputs; their time horizons will range from short (for budgeting purposes) to long-term.

Institutional, legal and behavioural specificities of the three single schemes will be sufficiently mapped; the scope of the data base of the model for the IHPP goes beyond the scope of the data bases of the three schemes but, where possible, the IHPP model will make use of the data bases of the three schemes.

Core technical staff from the three schemes and the International Health Policy Programme (IHPP) in charge of the maintenance of the model(s), will support the model development and be trained (see below) in the usage and future calibration of the models.

Especially the contractor will:

(1) Establish a common demographic, labour market and economic frame for the four models to be developed for CSMBS, NHSO, SSO and IHPP;

(2) Establish the health care financing modules for three schemes CSMBS, NHSO, and SSO as well as the model for the IHPP (NHA);

(2a) Develop modules for allocating the available overall resources (budgets) to the hospitals that have contracted with NHSO and SSO. The contractor will explore the feasibility of the development of such a module for CSMBS, and make proposal(s), accordingly. Technically, the allocation mechanism will be “top-down” for both, NHSO and SSO, and it will, to the extent possible, replicate, as a standard procedure, the present mechanisms applied by NHSO. The allocation mechanism for SSO will be newly developed; where appropriate, the SSO allocation mechanism will draw advantage from the allocation mechanism developed for NHSO;

(3) With a view to most appropriate model design (possible simulation options; see also point (5) below): consult with CSMBS, NHSO, SSO and IHPP staff on possible reform plans of the CSMBS, NHSO and SSS. These might include different allocation formulas, different ways of capitation calculation (for example,. with or without inclusion of capital depreciation), or the possible coverage of dependents and future pensioners (SSO);

(4) Decide on modelling options that most appropriately incorporate any of those mentioned details;

(5) Carry out status-quo projections, and reform simulations in coordination and cooperation with the staff of CSMBS, NHSO, and SSO – in order to validate the significance of the outputs of the established models; consult with the staff of the CSMBS, NHSO, SSO and the IHPP on the projection and simulation results, and modify the models’ structures to the extent that they produce unreasonable results;

(6) Describe, for each institution (CSMBS, NHSO, SSO and IHPP) separately,

   (a) the procedures of model maintenance,

   (b) the handling of the model;

(7) Develop training material;

(8) Carry out a three days common introductory training workshop (proseminar) for the staff of the CSMBS, NHSO, SSO and the IHPP on the purpose and use of the models;

(9) Carry out separately, for the staff of each of the institutions CSMBS, NHSO, SSO and the IHPP, hands-on training at staff work places, on the technical use of their respective models;

(10) Hand out the electronic version, and any accompanying training material, of the models to the staff of the CSMBS, NHSO, SSO and the IHPP;

(11) Provide the above (items (1) to (10)), and all other stipulations contained in this document to the satisfaction of the ILO.

As part of the technical modeling work, in addition to the electronic model to be developed and in order to reflect and document work progress, the contractor writes the following reports on the above items (draft titles – open to adjustments in consensus with ILO-SECSOC):

(A) A common demographic, labour market and economic frame and health care financing modules for CSMBS, NHSO, SSO and IHPP. (This report covers item (1), above.)

(B) Financial projection models for CSMBS, NHSO, SSO and IHPP – core design and technical incorporation of allocation formulae and reform options. (This report covers items (2), (2a), (3) and (4), above.)

(C) Status-quo projections, and reform simulations, for the financial development of CSMBS, NHSO, SSO and under NHA (IHPP). (This report covers item (5), above.)

(D) Model maintenance and practical handling of the models of CSMBS, NHSO, SSO and IHPP. A manual. (This report covers items (6) and – partially - (7), above.)

(E) Introduction to the practical use of the models for CSMBS, NHSO, SSO and IHPP. Seminar training material. (This report covers items (7) – partially –, and the didactical material needed for items (8) and (9), above.)

(F) Note on the formal hand-over of the models and any accompanying material to the staff of CSMBS, NHSO, SSO and IHPP. Formal notes on the delivery of the training activities. (This note covers items (8), (9) and (10), above.)

B. Schedule

The work is expected to be accomplished over a six-months period, starting with the signature of the contract to which these TOR-SP refer.

A work flow chart stipulating which work should reasonably be done when is attached. It contains the proposal for another, deepening, workshop for the Thai counterparts / users of the model, after the completion of the works to be undertaken under these TOR-SP. This deepening workshop is not part of these TOR-SP.

C. Preconditions and caveats

It is assumed that necessary data for the model(s) have been collected in close collaboration with CSMBS, IHPP, NHSO and SSO staff and in close consultations between the contractor, CSMBS, IHPP, NHSO and SSO staff. This work has provided all involved with an a priori understanding of the actual modeling (model design) to be undertaken.

In case of delays in the data collection process (see TOR-IP), which might "stretch" the process of data collection and of constructing the data base into this second phase (TOR-SP) of the project, there could be a delay in delivery of the results as expected under these TOR-SP.

The budget to this contract is expert fees (including fees for his participation in seminars / training workshops, lecturing fees, if any, including travel required under the TOR-SP). Other cost such as printing cost of the reports, the cost for seminars / training workshops (e.g. cost for the venue, equipments and refreshments) are not included in this budget, and will be covered separately.

ANNEX B

Letters sent by mail to national counterparts

(with CD-ROM enclosed)