

# **Thailand**

## **Health Care Reform: Financial Management**

### **Report 7A**

**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**

### ***USER MANUAL***

November 2008

**ILO component:  
Financial Management of the Thai Health Care System (THA/05/01/EEC)  
under:  
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- Report 1     Statistical reporting: Structures, methodologies, data and outputs. Initial review
- Report 2     The calculation of capitation fees and the estimation of provider payments. Initial review
- Report 3     A Financial Coordination Framework. A first general outline
- Report 4     Proposal for a Revised Capitation Calculation and Financial Equalisation System
- Report 5     An International Course in Health Finance for South-East Asia
- Report 6     A Common Health Care Financing Model (I) for CSMBS, IHPP, NHSO and SSO. Terms of Reference, Review and Supervision; and Proposal for the Implementation of a Financial Management Structure
- Report 7A    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  
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- Report 7B    A Common Health Care Financing Model (II) for the main health purchasing agencies
- Universal Coverage Scheme
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- Report 8     A Common Health Care Financing Model (III) for CSMBS, IHPP, NHSO and SSO, and  
Proposal for the Implementation of a Financial Management Structure.  
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- Report 9     A Data Reporting Framework
- Report 10    Indicators for the Financial Coordination Group for monitoring the UC scheme and national health budget
- Report 11    Contents and Structure for Annual Reporting on the Financial Development of the Public Health System
- Report 12    Proposed structure of an Integrated Financial Monitoring System



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## Foreword

This user manual and practical guide presents the technical features and handling instructions needed for the operation of the Thai Health Care Financing Model (HCFM) as developed by the International Labour Office (ILO) for three main health care systems of Thailand: 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' during the first semester of 2008 following a preliminary phase of data specification and collection that took place in 2007. A common training session was organized with all three institutions in July 2008 followed by hands-on practical training sessions with the technical officers who are in charge of modeling at the respective institutions.

The manual is structured as follows: Section 1 contains some background information on model development and objectives, and addresses institutional coordination issues. Section 2 presents a detailed description of the methodology and of the model structure as adopted for the UCS, SSS, and CSMBS respectively. Section 3 deals with model operation or handling and with the practical steps involved in the manipulation of the model. Section 4 then addresses model maintenance and regular updating routines for the common parts of the models.

It is noted that the models presented in this manual are not meant to be final products that shall not be altered in the future. The models should rather be considered as working tools subject to further development and improvement following its full appropriation by the three schemes. It is recommended therefore that the architecture and functionality of the models be reviewed regularly and modified as necessary so as to serve best the needs of the respective institutions.

It is hoped that the three versions of the HCF 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.

Finally, complete background information relating to the work involved in developing of the model has been collated in a separate volume: Report 7B: Documentation of work and progress.

October 2008

Wolfgang Scholz

Jean-Claude Hennicot





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# 1. Introduction

## 1.1. Background and objectives

The Health Care Financing Models presented in this manual were developed in 2007/08 by the International Labour Office (ILO) in the context of the EU project on ‘Health Care Reform in Thailand (2005 – 2009)’. The main objective of the exercise is to develop a tool for the projection of the annual budgets of the health care systems administered by the following Thai institutions:

- The National Health Security Office (NHSO), administering the so-called ‘*Universal Coverage*’ scheme (UC) of Thailand.
- The Civil Servants’ Medical Benefits Scheme (CSMBS) operating under the Comptroller General’s Office, Ministry of Finance, and in charge of administering the reimbursement of costs of medical benefits provided to civil servants, permanent state employees, state pensioners and eligible dependents of the aforementioned categories of beneficiaries.
- The Social Security Office (SSO), in charge of administering the sickness branch of the Social Security Scheme (SSS) for employees in the private sector.

The main purpose of the models is to enable these agencies to project their future expenditures in a transparent and unequivocal manner, facilitating thereby the process of determining the appropriate amount of annual capitation fees payable to providers by UCS and SSS respectively. A secondary objective of the models is to assist with the allocation of budgets to different regions, provinces, and individual providers according to the rules and conventions in force regarding budget allocation.<sup>1</sup>

## 1.2. Modeling in health care

Sound financial planning and management is crucial for all social security and health care systems in order to ensure their long-term financial viability. Since health care systems are subject to different cost pressures and operate often in uncertain demographic and economic environments, actuarial models are needed for undertaking comprehensive financial projections based on a sound methodology. Actuarial models thus help to create a rational basis for assessing the future financial situation of a scheme.

In a global context of escalating health care cost worldwide, it is crucial that the nature of cost developments are fully understood when developing projection models. Given the general complexity of health care systems and the intricacies of financing arrangements, it is important that projection models be designed such that they reflect the specific cost dynamics at work for each scheme. Since complexity comes at a cost, it is often necessary to strike a balance between model complexity on the one hand and intuitive clarity and ease of use on the other. However, model design also depends on other considerations, such as the following:

- The conceptual modeling approach adopted
- The explanatory power of variables and their stochastic independence
- The financing provisions of the scheme (including the provider payment mechanism)
- The availability and reliability of data on variables singled out
- The purpose of the model and the requirements of its users

It is stressed here that model development and improvement should be an ongoing and dynamic process; modification of model structure and methodology should therefore be undertaken at any time when required to ensure that the model represents the scheme situation in the most accurate manner and produces projection results in the desired format as required by each scheme.

<sup>1</sup> This does not apply for CSMBS, since the scheme operates on a ‘fee-for-service’ basis.

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### 1.3. Institutional cooperation

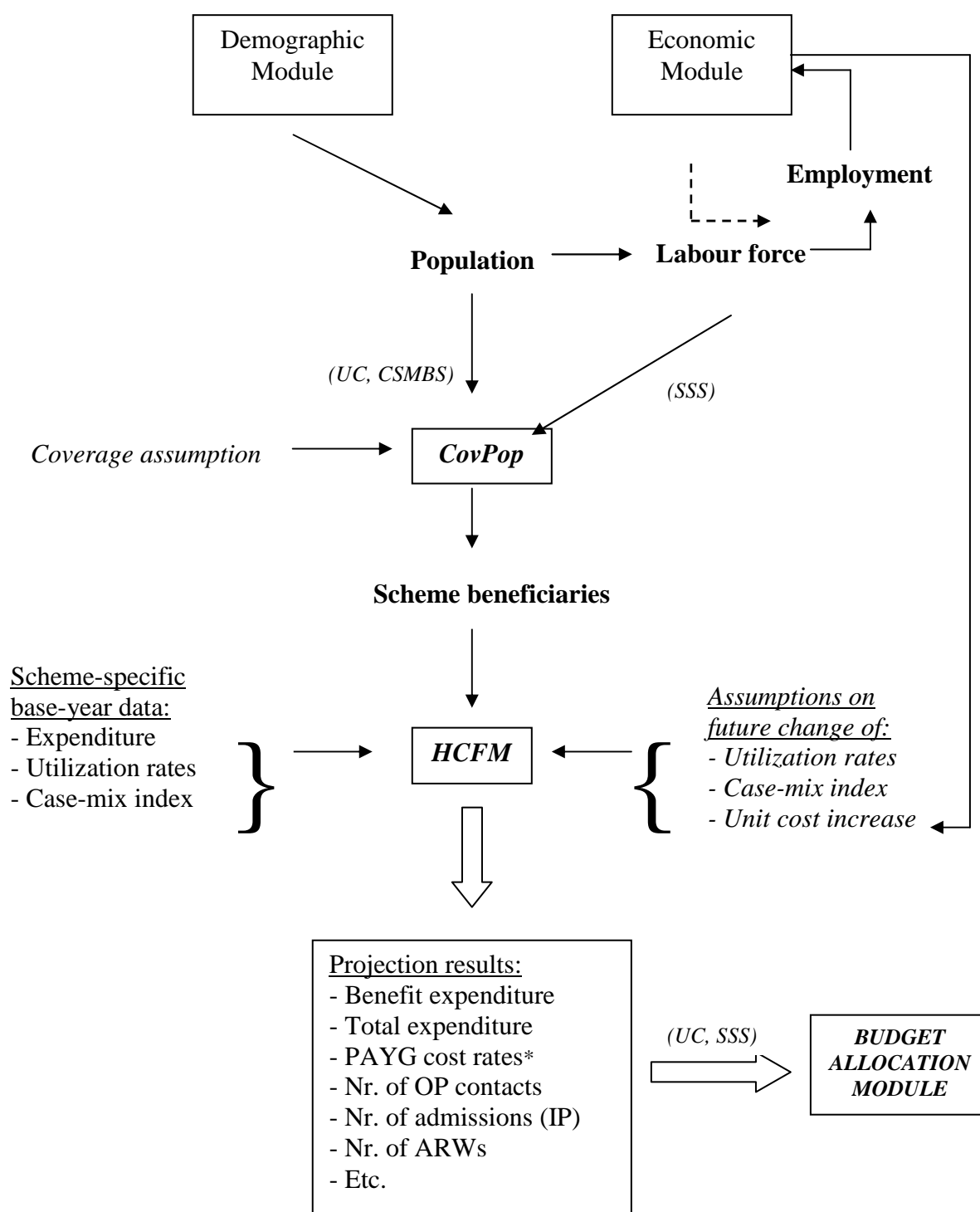
Since the three institutional health care financing models include common model components, the cooperation of the three institutions is necessary to ensure that the common modules are maintained and updated in a coordinated manner and that common assumptions are discussed and agreed upon with all stakeholders. It is therefore important that the cooperation process initiated during the model design stage be established as a regular practice for the periodical model maintenance routine. However, apart from a joint model updating mechanism, a close cooperation between the concerned institutions could yield further benefits such as:

- The exchange of information, data (statistics), and technical modeling know-how
- The improvement and further development of the models as a joint endeavor
- The creation of a platform for the organization of joint training activities on modeling and of other technical cooperation activities

In light of the above, it is suggested that a ‘working group on modelling’ be established to comprise technical staff members of the three institutions (i.e., the NHSO, SSO, and CGD) and of other stakeholders as deemed relevant (CHI, IHPP?). Such a ‘working group’ should meet twice a year at least to discuss model updates, assumptions, and other related matters. It is further suggested that NHSO should take the lead and be in charge of coordination of all actors.

## 2. Model structure

*Fig 2.1: Structure of the Health Care Financing Model*



\*Does not apply for the Universal Coverage Scheme

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The basic structure of the health care financing models is shown in figure 2.1. It can be observed that the overall model comprises the following building blocks:

- A demographic module, the purpose of which is to establish the demographic framework within which the schemes will operate in the future. This module comprises a population projection module and a labour force module.
- An economic module, which is needed to project the main economic variables including those that relate to the development of unit factor cost in health.
- A coverage module for each scheme, referred to as *CovPop*, the purpose of which is to project the coverage of each scheme starting from the base-year coverage and based on assumptions regarding the future coverage rate.
- An expenditure module for each scheme, named *Health Care Financing Module (HCFM)*, which is used for the projection of future scheme expenditure based on the projected scheme coverage and certain assumptions determined carefully. Assumptions are needed for the projection of future utilization rates and the projection of future unit cost (see section 2.4.6.) for instance.

It is noted that the demographic and economic modules are common model components shared by the three schemes. The purpose of these modules is to establish a common overall demographic and economic frame with the objective to link the expenditure model of the three schemes to the macro variables that describe the country's overall situation, this in a logical and consistent manner. The coverage and expenditure modules are specific for each scheme so as to take into account the distinctive features of each scheme, such as its target population and actual coverage, its benefit provisions, provider payment mechanism, etc.

In the following sections, the conceptual approach and modeling methodology underlying these four basic model components is outlined in detail.

## **2.1. The Demographic Module**

The demographic module consists of two components, which comprise a population projection model and a labour force module. The two modules are explained below:

### **2.1.1. The Population Projection Model**

The purpose of the population projection model is to project the future population by age and sex from the starting population given in the base year. The model used in the context of Thailand is based on the methodology and spreadsheet model developed by ILO SOC/FAS.<sup>2</sup> The population projection model makes use of the so-called 'cohort component method', which consists of the following steps:

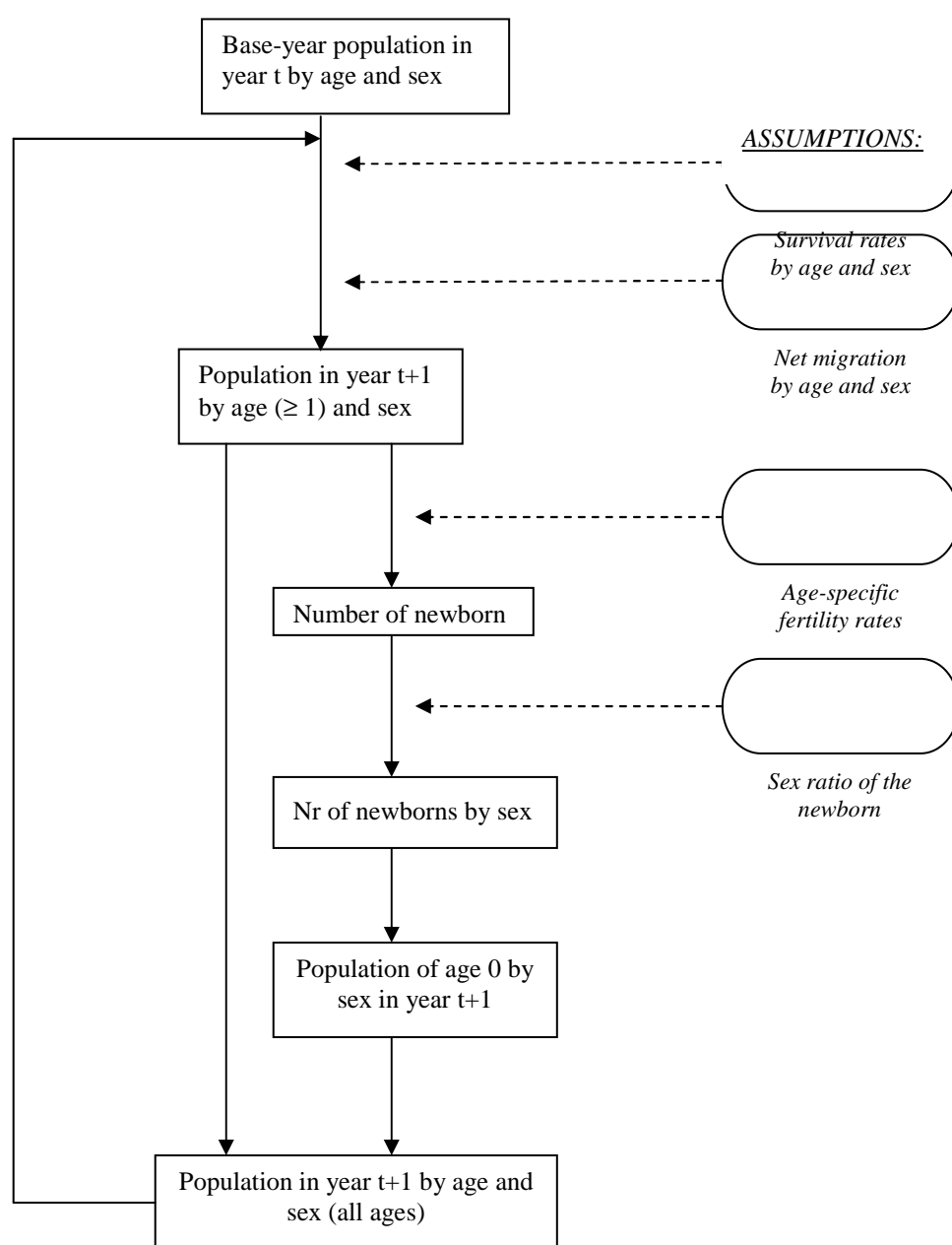
- (1) Dividing the starting population into age/sex cohorts;
- (2) Simulating the year-by-year transition of each cohort by taking into account deaths and migration;
- (3) Adding yearly the projected number of newborn calculated from the assumed fertility rates and the female population.

The cohort-component method is illustrated in the figure below:

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<sup>2</sup> See *The ILO Population Projection Model, A Technical Guide*, The International Financial and Actuarial Service, ILO-FACTS, 2002, Geneva

*Fig 2.2: Structure of the ILO Population Projection Model*



For a technically detailed presentation of the ILO population projection model, reference is made to the relevant user manual.<sup>3</sup>

It can be observed from figure 2.2 that the input data needed for the operation of the population projection model includes the following:

- Initial (base-year) population;
- Mortality rates by age and sex;
- Fertility rates by age of mother;

<sup>3</sup> Ibid.

- Sex ratio of newborn;
- Net migration (assumed nil).<sup>4</sup>

For the updating procedure of the population projection model, see section 4.2.1.

### 2.1.2. The Labour Force Module (see file 'Labour Force TH')

The labour force module allows for the projection of the future labour force and employment by age and sex from the projected population. The labour force is projected by applying age/sex-specific labour force participation rates to the different cohorts of the projected population; hence for the year t:

$$l_{x,s,t} = pop_{x,s,t}^{tot} \cdot \pi_{x,s,t}$$

Where

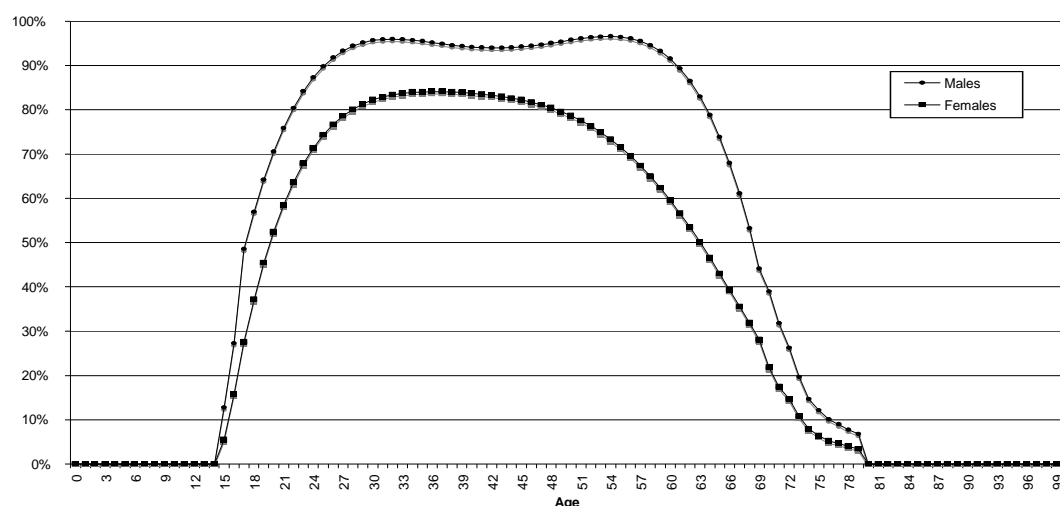
$pop_{x,s,t}^{tot}$  is the projected population of age a and sex s for the year t

$\pi_{x,s,t}$  is the assumed labour force participation rate for the population cohort of age x and sex s the year t

$l_{x,s,t}$  is the total labour force of age x and sex s in the year t

The labour force participation rates as observed in the fiscal year 2007 (Q4 06 – Q3 07) are shown in figure 2.3 below. These were obtained by dividing for each age/sex cohort the labour force (as per NSO labour force surveys) by the population (as per MOI database) in the same cohort.

*Chart 3.2: Labour Force Participation Rates, FY 2007*



It is noted that labour force participation rates have been assumed constant over the whole projection period at the same rates as observed in the base year; this since the projection horizon is normally rather short in health.<sup>5</sup>

<sup>4</sup> Due to the absence of reliable data, it is recommended to assume no international migration.

<sup>5</sup> This assumption can be changed if deemed appropriate.



The labour force module also allows to project employment by age/sex cohort based on the projected labour force and on assumptions regarding the rate of unemployed and seasonally inactive. Hence for the year t:

$$e_{s,t}^{tot} = l_{s,t}^{tot} \cdot u_{s,t}$$

Where

$e_{s,t}^{tot}$  is the projected total number of employed of sex s in the year t

$l_{s,t}$  is the total labour force of sex s in the year t

$u_{s,t}$  is the assumed rate of unemployed (including seasonally inactive) in the total labour force of sex s in the year t

The total number of employed is thus given by:

$$E_t = e_{m,t}^{tot} + e_{f,t}^{tot} = l_{m,t}^{tot} \cdot u_{m,t} + l_{f,t}^{tot} \cdot u_{f,t}$$

It is noted that based on the labour force survey data of the base year (fiscal year 2007), the rate of unemployed and seasonally inactive has been estimated at 1.92 per cent in aggregate for males and 1.94 per cent for females. The assumed unemployment rates for subsequent years need to be stipulated in the model based on the economic outlook prevailing in the base year. Since the rates observed in 2007 are very low by international comparison, the situation can be qualified as one of quasi ‘full employment’. It is quite unlikely however that this will perdure throughout the whole projection period.

## 2.2. The Economic Module

The purpose of the economic model is to project the main economic variables relevant for our model framework, and which include the following:

- The Gross Domestic Product, which measures aggregate output of the Thai economy (and from which we can derive National Income);
- The GDP Deflator, which reflects the relationship between real GDP (i.e., GDP at constant prices) and nominal GDP (i.e., GDP at market prices);
- The Consumer Price Index (CPI), which measures price developments in the Thai economy;
- GDP per employed, referred to here as ‘labour productivity’, which is defined as the annual output at constant prices per employed person:  $lp_t^{(CP)} = GDP_t^{(CP)} / E_t$ ;
- The National Average Wage and the average wage in the public and private sectors.

The methodology used for projecting these variables is explained below:

### *GDP at constant prices*

For the short term (years t+1 and t+2), it is recommended to make use of the official forecasts as published by the national authorities (NESDB). For the following years, GDP is projected via the projected labour productivity, which is projected by assuming an annual rate of increase from the previous year:

$$\tilde{lp}_{t+1}^{(CP)} = lp_t^{(CP)} \cdot (1 + \tilde{r}_{t+1})$$

Where  $\tilde{r}_{t+1}$  is the assumed annual rate of increase in labor productivity (from the year t).

Multiplying the projected labour productivity with the projected number of employed (see previous section) yields aggregate output (i.e., GDP at constant prices):

$$GDP_{t+1}^{(CP)} = \tilde{E}_{t+1} \cdot \tilde{lp}_{t+1}^{(CP)}$$

---

### *GDP at market prices*

Output at market prices is then obtained by using the projected rate of GDP deflator, which is assumed equal to the assumed rate of CPI increase for the years where no official forecast is given; hence:

$$G\tilde{D}P_{t+1}^{(MP)} = G\tilde{D}P_{t+1}^{(CP)} \cdot \tilde{D}_{t+1} = G\tilde{D}P_{t+1}^{(CP)} \cdot D_t \cdot (1 + \tilde{i}_{t+1})$$

Where

$\tilde{D}_{t+1}$  is the projected GDP deflator for the year t+1

$D_t$  is the GDP deflator in the year t

$\tilde{i}_{t+1}$  is the assumed rate of CPI increase for the year t+1

### *National Average Wage*

The national average wage is given by dividing the compensation of employees (see National Income data) by the number of employees (as per labour force survey data). For future years, the national average wage is projected on a year-by-year basis by applying an assumed rate of wage inflation. In the model proposed, it is assumed that real wages increase in line with labour productivity, i.e., that the elasticity of wages to labour productivity will be equal to 1 in future years.<sup>6</sup>

The average public sector wage is obtained by dividing the compensation of public employees (see GDP figures, under 'Recurrent Public Expenditure') by the number of public employees reported in the labour force survey data.

## **2.3. The Coverage Modules**

The coverage modules are specific for each scheme since the three schemes target different occupational groups of the population. The modeling approach for projecting the scheme coverage of the three schemes is outlined below:

### **2.3.1. Coverage of the Social Security Scheme (see file 'CovPop SSS')**

#### Modeling approach

The SSS covers only employees in the private (or so-called formal economic) sector, with the exception of workers in agricultural enterprises. The coverage of SSS is projected based on the projected employment in the private sector (excluding agriculture), which is derived from the labour force projected with the common labour force module.

In order to project the overall coverage rate for SSS, 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 proposed to project the future coverage rate by extrapolating the trend observed in the past (provided that a marked trend can be observed).

Algebraically the total population insured by SSS in year t writes as follows:

$$Pop_t^{SSS} = L_t \cdot (1 - u_t) \cdot {}^{NA}priv_t \cdot cov_t$$

Where:

<sup>6</sup> It is thereby assumed implicitly that the labour income share in national income will remain at the same level in the future. The assumption on the elasticity of wages to labour productivity can be modified by the model users if deemed necessary.

- 
- $Pop_t^{SSS}$  is the population insured under the SSS in year t
- $L_t$  is the total labour force in year t
- $u_t$  is the unemployment rate (including here the seasonally inactive) in year t
- $^{NA}priv_t$  is the ratio of the total number of private employees in all non-agricultural sectors to total employed in year t
- $^{COV}_t$  is the ratio of SSS beneficiaries (in aggregate) to the legally covered, i.e. to the total number of private sector employees in all sectors except agriculture, referred to hereunder as the ‘coverage rate’.<sup>7</sup>

As the coverage rate can differ between male and female, we distinguish between the two genders, hence:

$$Pop_t^{SSS} = L_t^{(m)} \cdot (1 - u_t^{(m)}) \cdot ^{NA}priv_t^{(m)} \cdot ^{COV}_t^{(m)} + L_t^{(f)} \cdot (1 - u_t^{(f)}) \cdot ^{NA}priv_t^{(f)} \cdot ^{COV}_t^{(f)}$$

In order to project the number of insured based on the above equation, we need to specify for future years (i.e., the years t+1, t+2, ...) assumptions on the following:

- $u_t^{(m)}$  and  $u_t^{(f)}$  : the rate of unemployed and seasonally inactive
- $^{NA}priv_t^{(m)}$  and  $^{NA}priv_t^{(f)}$  : the share of private non-agricultural employees in total employed
- $^{COV}_t^{(m)}$  and  $^{COV}_t^{(f)}$  : the ‘coverage rate’ for males and females

It is noted that the projected labour force for males and females ( $L_t$ ) is obtained from the common labour force module (see file ‘*Labour force TH*’).

The above formula allows for the projection of the total number of SSS-insured males and females. For the age distribution of insured, it is suggested to use the same pro-rata distribution as observed in the base year (see worksheet ‘*Covrate m/f*’).<sup>8</sup>

### 2.3.2 Coverage of the CSMBS (see file ‘CovPop CSMBS’)

The CSMBS covers the following categories of insured:

- Civil Servants and permanent state employees (m/f) named hereafter ‘actives’
- State pensioners (m/f) including age and invalidity pensioners
- Dependent spouses (m/f) of actives and of pensioners
- Dependent children (m/f) if under 20 years old (up to 3 per family)
- Dependent parents (m/f) of actives and of pensioners

For the projections, the number of actives and pensioners is determined first.

#### Actives

The future number of actives is determined first in aggregate (total number), based on the government’s staff plan for the civil service, assuming a constant sex ratio male/female.<sup>9</sup> In order to

<sup>7</sup> It is noted that strictly speaking this ratio differs from the conventional coverage ratio since the pool of HI beneficiaries includes those who left the scheme during the six months preceding the date of record. For the modeling purposes intended here, this is not considered of relevance.

<sup>8</sup> This assumption is considered acceptable for short-term projections.

obtain the total number of actives determined in this manner, the starting population is projected year-by-year and cohort-by-cohort, and by applying age-specific exit rates for deaths, retirements, and permanent disability (these have been estimated from sample data). New entrants are then generated each year for both male and females as required to obtain the target number of actives, this by assuming the same age distribution [of new entrants] as observed in the base year. It is noted that the age structure of actives as resulting from this process is not assumed exogenously but results endogenously based on the simulated dynamics of ageing, exists (due to retirement or death) and new entrants (see worksheets 'Active M' and 'Active F').

## Pensioners

For pensioners, the existing population (base year) is projected year-by-year and adjusted for exits (due to death) and new entrants (i.e., new retirement and disability pensioners). Exit rates are obtained by applying the mortality rates from the population module, whereas retirement rates have been assumed based on the average retirement age in the civil service (see worksheets 'Pens M' and 'Pens F').

## Dependents

For the projection of dependents, the proposed model makes use of constant age/sex-specific dependency ratios for the different categories of dependents, this by age and sex of the respective dependents. For each category of dependents a matrix of dependency ratios has been obtained from the age/sex-specific dependency ratios observed in the base year. For male children of male actives and pensioners for instance, the matrix of dependency ratios is given by:

$${}_m\mathbf{D}^{(ch)} := ({}_m p_{ij}^{(ch)})$$

Where  ${}_m p_{ij}^{(ch)}$  is the probability that in the given year a male person (active or pensioner) of age i has a male child (son) of age j (see worksheets 'ADIST').

The number of dependents is then obtained by multiplying the row vector of primary insured (actives and pensioners) with the respective matrix of dependents. For male children dependents of male actives and pensioners for instance, the number of dependents of age j writes algebraically as follows:

$${}_m n_{j,t}^{(ch)} = \sum_i {}_m a_{i,t} \cdot {}_m p_{ij}^{(ch)}$$

Where:

${}_m n_{j,t}^{(ch)}$  is the total number of male children of age j dependent of male insured in year t

${}_m a_{i,t}$  is the number of male actives and pensioners of age i in year t

Adding up over all ages j yields the total number of male children dependents of male actives and pensioners:

$${}_m n_t^{(ch)} = \sum_j \sum_i {}_m a_{i,t} \cdot {}_m p_{ij}^{(ch)}$$

Or equivalently in matrix notation:

$${}_m n_t^{(ch)} = {}_m \mathbf{a}_t^T \cdot {}_m \mathbf{D}^{(ch)} \cdot \bar{\mathbf{e}}$$

Where  $\bar{\mathbf{e}}$  is the unitary (column) vector, and

<sup>9</sup> According to the CSMBS, the Civil Service Commission is planning to freeze the number of civil servant and permanent state employees until the year 2012 at least. For the period thereafter, it is suggested to assume that the total number of actives will increase/decrease in line with the total population.

${}_m\bar{\mathbf{a}}_t$  is the row vector of male insured (actives and pensioners), all ages, in year t

${}_m n_t^{(ch)}$  is the total number of male children dependent on male insured in year t

The projected total CSMBS coverage for each year ( $pop_t^{CSMBS}$ ) is then obtained by adding up the projected number of actives, pensioners, and dependents for each category.

### 2.3.3. Coverage of the UC scheme (see file ‘CovPop UC’)

The UC scheme covers in principle all citizens who are not covered under any other scheme. The target coverage of the UC scheme thus consists of the population obtained after subtracting from the total population all those insured under any other statutory health insurance schemes.<sup>10</sup> However, since there are several smaller schemes, the coverage of which we cannot project due to lack of data, the maximum potential coverage of UC is only known approximately.<sup>11</sup> The methodology adopted here consists in projecting UC coverage as a percentage of the ‘residual’, obtained after deducting the CSMBS and SSS-covered population from the total population. The ratio of registered UC members to this ‘residual’ population for males and females is given as follows:

$$\theta_{s,t_0} = \frac{pop_{s,t_0}^{UC}}{pop_{s,t_0}^{RES}} \quad \text{where} \quad pop_{s,t_0}^{RES} = pop_{s,t_0}^{tot} - pop_{s,t_0}^{CSMBS} - pop_{s,t_0}^{SSS}$$

For the fiscal year 2007, this ratio has been estimated at 93.9% for males and 94.4% for females. For the projection, the model user must specify an assumption on the future value of this ratio.<sup>12</sup> The future UC coverage for males and females is then given as follows:

$$pop_{s,t}^{UC} = \tilde{\theta}_{s,t} \cdot pop_{s,t}^{RES} \quad \text{for } t > t_0$$

For single-age cohorts of age x and sex s, it is assumed that the ratio of registered to the ‘residual’ population will increase in line with the overall ratio for males and females. For the base year we can write:

$$\theta_{x,s,t_0} = \frac{pop_{x,s,t_0}^{UC}}{pop_{x,s,t_0}^{RES}} \quad \text{where} \quad pop_{x,s,t_0}^{RES} = pop_{x,s,t_0}^{tot} - pop_{x,s,t_0}^{CSMBS} - pop_{x,s,t_0}^{SSS}$$

The projected UC population for the cohort of age x and sex s is obtained as follows:

$$pop_{x,s,t}^{UC} = \tilde{\theta}_{x,s,t} \cdot pop_{x,s,t}^{RES} = \left( \tilde{\theta}_{x,s,t} / \theta_{x,s,t_0} \right) \cdot \theta_{x,s,t_0} \cdot \left( pop_{x,s,t}^{tot} - pop_{x,s,t}^{CSMBS} - pop_{x,s,t}^{SSS} \right)$$

And consequently the projected total UC population is given by:

$$Pop_t^{UC} = \sum_{x,s} pop_{x,s,t}^{UC}$$

<sup>10</sup> It is noted that the MOI population data used for the base year includes foreign residents. It is considered justifiable to include those since all three schemes have foreign members and the impact on total figures is marginal in absolute terms.

<sup>11</sup> The smaller schemes referred to here include the existing schemes for private school teachers, local government officials, state-owned enterprises, independent state agencies, etc. The proportion of the total population covered under the ‘smaller’ schemes is estimated at 2.1% in the FY 2007.

<sup>12</sup> It can be assumed that with the ongoing registration of the non-covered, this ratio will increase in the future although at a slow pace.

It is noted that in this module the future coverage of the UC scheme is determined solely by the assumption on the ratio  $\tilde{\theta}_{s,t}$  since the other variables (total population and projected coverage of the SSS and CSMBS) are projected in separate modules (see sections 2.1.1, 2.31, and 2.3.2)

## 2.4. The Expenditure Modules

### 2.4.1. Methodological issues

In order to model the total expenditure of the three schemes, it is necessary to break down total expenditure into constituent components. The mapping of cost, undertaken for the base year initially, determines the architecture of the model by separating out the variables for which a separate projection is considered sensible and useful from a modelling perspective. The break down of the different components that make up total expenditure as adopted for the three schemes is outlined in the following sections. It can be observed that the variables singled out for each benefit item vary depending on different considerations as explained earlier (see section 1.2).

### 2.4.2. 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 outpatient care (OP)
  - Expenditure for inpatient care (IP)
  - Expenditure for disease prevention and health promotion services (PP)
  - Expenditure for medical instruments related to disability (DIS)
  - Expenditure for emergency medical transportation and paramedics (EMS)
  - Expenditure for medical care provided to non-registered persons (NR)
  - Expenditure for HIV/AIDS drugs and diagnostics (HIV)
  - Expenditure for chronic renal failure (CRF)
- 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:

$$Exp_t^{(TOT)} = Exp_t^{(ADM)} + Exp_t^{(MED)} + Exp_t^{(OTH)}$$

Where:

$$Exp_t^{(MED)} = Exp_t^{(OP)} + Exp_t^{(IP)} + Exp_t^{(PP)} + Exp_t^{(DIS)} + Exp_t^{(EMS)} + Exp_t^{(HIV)} + Exp_t^{(CRF)} + Exp_t^{(NR)}$$

And:

$$Exp_t^{(OTH)} = Exp_t^{(CAP)} + Exp_t^{(MM)}$$

The further disintegration of the terms on the right side of the above equations is discussed below:

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## Outpatient care (OP)

The cost for general outpatient care provided to registered persons is broken down by age and sex and into population, utilization rate (i.e., frequency per capita per annum), and cost per case.<sup>13</sup> Hence for year t we can write:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_{x,s} Exp_{x,s,t}^{(OP)} \\ &= \left( \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(OP)} \right) \cdot c_t^{(OP)} \end{aligned}$$

Where:  $Exp_t^{(OP)}$  is the aggregated OP expenditure in year t  
 $Exp_{x,s,t}^{(OP)}$  is the expenditure for OP care for the age cohort of age x and sex s in the year t  
 $u_{x,s,t}^{(OP)}$  is the average utilization rate for OP care for the population cohort of age x and sex s in year t  
 $c_t^{(OP)}$  is the average cost per OP visit in year t

## Inpatient care (IP)

The cost for inpatient care provided to UC registered persons is disintegrated into population, utilization rate, and cost per admission by age and sex. It is further proposed to break up cost per admission into average number of adjusted relative weights (ARWs) per admission (referred to as 'case-mix index' or CMI) and payment (i.e., cost) per ARW, which is referred to as the DRG 'base rate'. Hence:

$$\begin{aligned} Exp_t^{(IP)} &= \sum_{x,s} Exp_{x,s,t}^{(IP)} \\ &= \left( \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot cmi_{x,s,t}^{(IP)} \right) \cdot c_t^{(DRG)} \end{aligned}$$

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  
 $cmi_{x,s,t}^{(IP)}$  is the average DRG case-mix index per admission for all persons of age x and sex s in year t  
 $c_t^{(DRG)}$  is the DRG base rate applied by UC in year t

## 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 population by age and sex and annual per capita cost by age and sex. The remaining cost relate to PP activities targeting pregnant women; hence:

$$Exp_t^{(PP)} = Exp_t^{(PP / preg)} + Exp_t^{(PP / other)}$$

<sup>13</sup> General outpatient care includes all OP treatments excluding those included already under other benefit categories, such as 'renal failure treatments', 'HIV drugs and diagnostics', and OP care for non registered persons for instance)

$$= \left( \sum_x pop_{x,F,t} \cdot f_{x,t} \right) \cdot c_t^{(PP / preg)} + \sum_{x,s} pop_{x,s,t} \cdot c_{x,s,t}^{(PP / other)}$$

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;  
 $pop_{x,s,t}^{(tot)}$  is the total number of persons of age x and sex s in year t;  
 $pop_{x,F,t}^{(tot)}$  is the female population of age x and sex s in year t;  
 $f_{x,t}$  is the age-specific fertility rate for women of age x in year t;<sup>14</sup>  
 $c_t^{(PP / preg)}$  is the average annual cost per capita for PP activities targeting pregnant women in year t;  
 $c_{x,s,t}^{(PP / other)}$  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 further.

### 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 further.

### HIV/AIDS drugs and diagnostics (HIV)

The cost for HIV drugs and diagnostics is not broken down since no data is available on number of cases and cost per case.

### Chronic Renal Failure (CRF)

The cost for outpatient visits related to chronic renal failure (hemodialysis, drugs, etc.) is broken down into population, utilization rate by age and m/f, and average cost per case. For year t we can write:

$$\begin{aligned} Exp_t^{(CRF)} &= \sum_{x,s} Exp_{x,s,t}^{(CRF)} \\ &= \left( \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(CRF)} \right) \cdot c_t^{(CRF)} \end{aligned}$$

Where:  $Exp_{x,s,t}^{(OP)}$  is the expenditure for chronic renal failure for the age cohort of age x and sex s in the year t  
 $u_{x,s,t}^{(CRF)}$  is the utilization rate of renal failure treatment for the population cohort of age x and sex s in year t  
 $c_t^{(CRF)}$  is the average cost per case for chronic renal failure treatment in year t

<sup>14</sup> The age-specific fertility rate is used here as a proxy to determine the ratio of pregnant women in the age cohorts of ages 15 – 49. Although this is not totally correct (since it does not take into account stillbirths and interrupted pregnancies), it is considered a good estimation.



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## 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.<sup>15</sup> 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 for both OP and IP care, hence:

$$\begin{aligned}Exp_t^{(NR)} &= Exp_t^{(NR/OP)} + Exp_t^{(NR/IP)} \\&= n_t^{(NR/OP)} \cdot c_t^{(NR/OP)} + n_t^{(NR/IP)} \cdot c_t^{(NR/IP)}\end{aligned}$$

Where:

- $n_t^{(NR/OP)}$  is the number of OP visits of non-registered persons with UC entitlement in year t
- $n_t^{(NR/IP)}$  is the number of IP visits of non-registered persons with UC entitlement in year t
- $c_t^{(NR/OP)}$  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, this item is not broken down further.

## 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:

$$Exp_t^{(CMM)} = n_t^{(MM)} \cdot c_t^{(MM)}$$

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

### 2.4.3. Model specification for the CSMBS (see file 'CSMBS HCF Model')

Total benefit expenditure for the Civil Servants Medical Benefits' Scheme consists of three components, which are inpatient care, outpatient care, and administration cost:

$$Exp_t^{(TOT)} = Exp_t^{(OP)} + Exp_t^{(IP)} + Exp_t^{(ADM)}$$

The disintegration of expenditure for OP and IP care is discussed below:

#### a) Outpatient care

Total expenditure for outpatient care can be broken down into the following:

<sup>15</sup> According to the National Health Security Act, every Thai citizen who is not ensured under any health insurance scheme is entitled to medical care under the UC scheme.

- Expenditure for annual medical checkups (examinations<sup>16</sup>),
- Expenditure for hemodialysis visits,
- Expenditure for chemotherapy 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:

$$Exp_t^{(OP)} = Exp_t^{(CHECK)} + Exp_t^{(HD)} + Exp_t^{(CHT)} + Exp_t^{(InstOP)} + Exp_t^{(HIV)} + Exp_t^{(GOP)}$$

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 chemotherapy 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 the equation above is broken down further based on data availability and what is considered appropriate:

$$Exp_t^{(CHECK)} = \left( \sum_{x,s} pop_{x,s,t}^{(A \& P)} \cdot c_{x,s,t}^{(CHECK)} \right) \cdot u_t^{(CHECK)}$$

$$Exp_t^{(HD)} = pop_t^{CSMBS} \cdot u_t^{(HD)} \cdot c_t^{(HD)}$$

$$Exp_t^{(CHT)} = pop_t^{CSMBS} \cdot u_t^{(CHT)} \cdot c_t^{(CHT)}$$

$$Exp_t^{(Inst / OP)} = pop_t^{CSMBS} \cdot u_t^{(Inst / OP)} \cdot c_t^{(Inst / OP)}$$

$$Exp_t^{(HIV)} = pop_t^{CSMBS} \cdot u_t^{(HIV)} \cdot c_t^{(HIV)}$$

$$Exp_t^{(HD)} = pop_t^{CSMBS} \cdot u_t^{(HD)} \cdot c_t^{(HD)}$$

$$Exp_t^{(GOP)} = \left( \sum_{x,s} pop_{x,s,t}^{CSMBS} \cdot u_{x,s,t}^{(GOP)} \right) \cdot c_t^{(GOP)}$$

Where:  $pop_t^{CSMBS}$  is the aggregate number of people registered with CSMBS in year t  
 $pop_{x,s,t}^{CSMBS}$  is the number of persons of age x and sex s registered with CSMBS 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

<sup>16</sup> Civil servants, permanent state employees, and state pensioners are entitled to a free annual medical check-up under CSMBS benefit rules.

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$c_{x,s,t}^{(...)}$	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:

$$Exp_t^{(IP)} = Exp_t^{(RB)} + Exp_t^{(N-AC)} + Exp_t^{(Inst/IP)} + Exp_t^{(GIP)}$$

Each component on the right side of the above equation is broken down further based on data availability and what is considered appropriate, hence:

$$Exp_t^{(RB)} = \left( \sum_{x,s} pop_{x,s,t}^{CSMBS} \cdot u_{x,s,t}^{(IP)} \cdot los_t^{(IP/AC)} \cdot c_t^{(PD/AC)} \right)$$

$$Exp_t^{(N-AC)} = \left( \sum_{x,s} pop_{x,s,t}^{CSMBS} \cdot u_{x,s,t}^{(IP)} \cdot los_t^{(IP/N-AC)} \cdot c_t^{(PD/N-AC)} \right)$$

$$Exp_t^{(Inst/IP)} = pop_t^{CSMBS} \cdot u_t^{(Inst/IP)} \cdot c_t^{(Inst/IP)}$$

$$Exp_t^{(GIP)} = \left( \sum_{x,s} pop_{x,s,t}^{CSMBS} \cdot u_{x,s,t}^{(GIP)} \cdot cmi_{x,s,t}^{(GIP)} \right) \cdot c_t^{(DRG)}$$

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

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$cm_{x,s,t}^{(IP)}$	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

#### 2.4.4. Model specification for the SSS

Total SSS expenditure comprises expenditure for medical (in-kind) benefits, expenditure for sickness (cash) benefits, and expenditure for administration cost. Total SSS expenditure in year  $t$  thus writes as follows:

$$Exp_t^{(TOT)} = Exp_t^{(ADM)} + Exp_t^{(MED)} + Exp_t^{(SICK)}$$

Expenditure for sickness cash (SICK) benefit is broken down in frequency and average benefit amount:

$$Exp_t^{(SICK)} = pop_t^{SSS} \cdot u_t^{(SICK)} \cdot b_t^{(SICK)}$$

Where:

- $Exp_t^{(SICK)}$  is the aggregated expenditure for sickness cash benefits in year t
- $u_t^{(SICK)}$  is the average frequency of sickness benefit for the whole population in year t
- $b_t^{(SICK)}$  is the average amount of sickness cash benefit disbursed in year t

Since the amount of cash benefit is directly related to the insured wage, there is a unique  $\alpha_t$  such that, in the year t:

$$b_t^{(SICK)} = \alpha_t \cdot w_t$$

Where  $w_t$  is the average insured wage in year t

Expenditure for SSS medical (in-kind) benefits comprises the following components:

- a) General outpatient care (OP capitation)
- b) General inpatient care (IP capitation)
- c) Expenditure for high cost medical care, comprising both OP and IP care (HC)
- d) Expenditure for medical care in case of accidents, comprising OP and IP care (ACC)
- e) Expenditure for emergency medical care, comprising both OP and IP care (EM)
- f) Expenditure for medical instruments (implants and prosthesis)
- g) Expenditure for hemodialysis (HD)
- h) Expenditure for chronic peritoneal dialysis (CPD)
- i) Expenditure for renal failure related drugs (RFD)
- j) Expenditure for HIV drugs and diagnostics (HIV)
- k) Expenditure for kidney transplant (KID)
- l) Expenditure for dental care (DC)
- m) Expenditure for artificial teeth (AT)
- n) Expenditure for bone marrow transplant (BMT)
- o) Expenditure for cornea transplant (COR)
- p) Expenditure for treatments provided to non-registered persons who are entitled to SSO medical benefits (NR)

The break up of individual components listed above is discussed below:

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### (a) General outpatient care (OP)

The cost for general outpatient care provided to SSS registered persons is broken down by age and sex and into population, utilization rate (i.e., frequency per capita per annum), and cost per case.<sup>17</sup> Hence for year t we can write:

$$\begin{aligned} Exp_t^{(OP)} &= \sum_{x,s} Exp_{x,s,t}^{(OP)} \\ &= \left( \sum_{x,s} pop_{x,s,t}^{SSS} \cdot u_{x,s,t}^{(OP)} \right) \cdot c_t^{(OP)} \end{aligned}$$

Where:  $Exp_t^{(OP)}$  is the aggregated OP expenditure in year t  
 $Exp_{x,s,t}^{(OP)}$  is the expenditure for OP care for the age cohort of age x and sex s in the year t  
 $u_{x,s,t}^{(OP)}$  is the average utilization rate for OP care for the population cohort of age x and sex s in year t  
 $c_t^{(OP)}$  is the average cost per OP visit in year t

### (b) General inpatient care (IP)

The cost for general inpatient care provided to SSS registered persons is disintegrated into population, utilization rate, and cost per admission by age and sex. It is further proposed to break up cost per admission into average number of adjusted relative weights (ARWs) per admission (referred to as ‘case-mix index’ or CMI) and payment (i.e., cost) per ARW, which is referred to as the DRG ‘base rate’. Hence:

$$\begin{aligned} Exp_t^{(IP)} &= \sum_{x,s} Exp_{x,s,t}^{(IP)} \\ &= \left( \sum_{x,s} pop_{x,s,t}^{SSS} \cdot u_{x,s,t}^{(IP)} \cdot cmi_{x,s,t}^{(IP)} \right) \cdot c_t^{(DRG)} \end{aligned}$$

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  
 $cmi_{x,s,t}^{(IP)}$  is the average DRG case-mix index per admission for all persons of age x and sex s in year t  
 $c_t^{(DRG)}$  is the DRG base rate applied by UC in year t

### Items (c) – (m)

For these items, annual expenditure is broken up in population and cost per capita by age and sex. For high cost care for instance we have:

$$Exp_t^{(HC)} = \sum_{x,s} pop_{x,s,t}^{SSS} \cdot c_{x,s,t}^{(HC)}$$

<sup>17</sup> General outpatient care includes all OP treatments excluding those included already under other benefit categories.

Where  $c_{x,s,t}^{(HC)}$  is the average cost per capita for high cost care for the insured cohort of age x and sex s in year t

#### Items (n) and (o)

No data is available on average cost of care by age and sex for these items; it is therefore proposed to use the overall average cost per capita for all age/sex cohorts. For bone marrow transplantation (BMT) for instance, we have:

$$Exp_t^{(BMT)} = pop_t^{SSS} \cdot c_t^{(BMT)}$$

Where  $c_t^{(BMT)}$  is the overall average cost per capita for bone marrow transplantation for all registered persons in year t

#### (p) Expenditure for non-registered persons (NR)

Medical care for insured persons who are entitled to SSO medical care but have not registered with a provider 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 should however be possible in the future to determine this figure based on the difference between the number of contributors and registered persons.<sup>18</sup> It is proposed to disaggregate this expenditure item as follows:

$$\begin{aligned} Exp_t^{(NR)} &= Exp_{m,t}^{(NR)} + Exp_{f,t}^{(NR)} \\ &= {}^{(NR)}pop_{m,t} \cdot c_{m,t}^{(NR)} + {}^{(NR)}pop_{f,t} \cdot c_{f,t}^{(NR)} \end{aligned}$$

Where:

$Exp_{m,t}^{(NR)}$  is the aggregated expenditure for male non-registered persons in year t

${}^{(NR)}pop_{m,t}$  is the estimated number of male insured who are not registered in year t

$c_{m,t}^{(NR)}$  is the average cost per capita for non-registered males in year t

### 2.4.5. Expenditure projections

The expenditure of the three schemes is projected based on the cost break-down presented in the previous sections, this by projecting separately the different model components singled out and by aggregating for each year of the projection period. In the three models, expenditure for general OP and IP care is broken down into coverage (i.e., insured population), frequency (or utilization rate), and unit cost (or average cost per case), hence these model components need to be projected. For IP care unit cost is disaggregated further into case-mix index times DRG base-rate (i.e., payment per ARW).

The coverage of the schemes is projected with the respective scheme coverage modules presented in section 2.3. For benefit utilization rates (or frequencies), assumptions are needed regarding their future rates of change in each year (see section 3.3.1.). The projection of unit cost is discussed in the next section (2.4.6).

### 2.4.6. Unit cost projections

Unit cost for OP and IP care can be projected either in aggregate or via the input factor model proposed (see section 3.1 on model configuration). Assumptions are needed either on future increases of unit cost (in aggregate) or on the future development of cost components, if use is made of the

<sup>18</sup> There is a complication here due to the qualifying period (of 3 months) for new entrants.

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factor model for the projection of unit cost. The factor model allows to break up unit cost in components or factors that relate to different ‘cost drivers’ (e.g., labour, drugs, capital investment, etc.), and to distinguish between price and volume effects. The aim of this approach is to break up unit cost into all its constituent components and to identify thereby the nature of all cost drivers, and to model their respective effects on cost. A formal description of the proposed factor model is provided in Annex A.

## **2.5. Resource Allocation Modules**

A separate module for the allocation of the total capitation budget has been developed for the UCS and SSS as an addendum to the expenditure projection models described in the previous sections. The purpose of the allocation module is to simulate the allocation of the overall budgetary resources to the different providers contracted in different provinces and/or regions based on the conventions in force on resource allocation. The allocation modules are based on the assumption that the total budget to be allocated would match with the total expenditure projected with the HCFM of the respective scheme. A description of the two allocation modules is provided below.

### **2.5.1. The SSS Budget Allocation Module (see file ‘SSS Allocation’)**

The allocation module for SSS consists of an EXCEL file comprising the following four worksheets:

- Basic CAP – worksheet that allows for the monthly calculation of basic capitation monies payable to providers
- Risk ADJ – worksheet that allows for the bi-annual calculation of the ‘Risk Adjustment’ component (OP & IP) of the capitation fee
- Utilization INC – worksheet allowing for the annual calculation of the so-called ‘Utilization Incentive’ component of the capitation fee
- Total – summary worksheet where the annual total amount is calculated

The different capitation amounts payable to providers are calculated from the following variables:

- The average number of persons registered with each provider in each month (basic capitation)
- The Chronic Disease Score and number of DRG relative weights cumulated by each provider during six-months’ periods (risk adjustment amount)
- The frequency of utilization experienced by each provider in each year (OP visits and IP hospital days), this in relative terms compared to other providers (utilization incentive)

Apart from the above input variables, other data items needed include the basic capitation amount, the average amount of risk adjustment, and the amount payable for each decile of the utilization index. All input fields are highlighted in grey colour. The detailed formulas for calculating the different components of the capitation fee are summarized in Annex B.1.

Output fields in the allocation module are highlighted in light blue colour and include the following items:

- Monthly amounts of basic capitation amount payable to each provider
- Total annual amount of utilization incentive payable to each provider
- Amount of OP risk adjustment payable bi-annually to each provider
- Amount of IP risk adjustment payable bi-annually to each provider
- Total annual amount of capitation monies payable to each provider

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The above amounts are calculated automatically through formulas that are linked to the different input cells.<sup>19</sup>

### **2.5.2. The UC Budget Allocation Module (see file 'UC Allocation')**

The allocation module for the UC scheme comprises two worksheets named 'OP' and 'IP' and simulates 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 registered in each province, and cost weights 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 (highlighted in grey colour):

- 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 (highlighted in light blue):

- 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. For 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.<sup>20</sup> The spreadsheet contains the following input fields (highlighted in grey colour):

- 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 highlighted in light blue and include 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

<sup>19</sup> It is noted that the automatic calculation mode has to be switched on in EXCEL 'Preferences' (see menu 'calculation').

<sup>20</sup> It is noted that one of the two base rates can be set freely, whereas the other one is given endogenously.



- 
- 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 detailed allocation mechanism and formulas are summarized in the attachment (see Annex B.2).



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## 3. Model Handling

The purpose of this chapter is to describe the handling of the expenditure module in practical terms, i.e., the details of how to apply the model for generating expenditure projections. The procedures for updating other model components (modules on population, economy, coverage, etc.) are explained in the following chapter on model maintenance since these need updates less frequently.

The present chapter is divided in the following section: model configurations, data input, formulating assumptions, and model results.

### 3.1. Model configuration

The expenditure module contains features that allow the user to select among alternative modeling configurations reflecting differences in modeling methodology (e.g., different methodologies for projecting utilization rates). This feature should enable the user to adjust or ‘fine-tune’ the methodology depending on the purpose of the projections, the availability of data, the projection horizon, etc. A separate sheet (see worksheet ‘CONFIG’) has been designed for the selection of optional model settings. The model configuration process is divided in 8 sequential steps to be followed by a model user for setting modeling options. Each step also comprises instructions on the progressive input of base year data. The eight steps as displayed in the model configuration sheet are explained below:

#### **STEP 1:** *Selecting the base year for the projections*

In this step a list box allows the user to select the base year for the projections starting from the year 2007. It is noted that a given year should only be chosen as the base year if a full set of data (on expenditure, utilization, and cost structure) is available for that year.

#### **STEP 2:** *Select the target year (or horizon) for the projections*

In step 2 a list box requires from the user to select the target (end-) year of the projections, this up to the year 2020.

#### **STEP 3:** *Select the method for setting base year cost data (for UCS and SSS only)*

Step 3 requires from the user to specify the method for determining the starting basis for the projection of unit cost by selecting from the following two options:

- A. *Exogenous (specify explicitly)* – where base year unit cost for OP and IP care need to be specified explicitly by the user (see section 3.2.3.).
- B. *Endogenous (from expenditure)* – where base year unit cost for OP and IP care is calculated implicitly by dividing annual expenditure for OP/IP care (data input) by the total number of contacts/admissions.

#### **STEP 4:** *Selecting the method for projecting OP utilization rates (STEP 3 for CSMBS)*

In step 4 the user has to select the method for projecting OP utilization rates from the following options:

- A. *Uniform increase* – option where the assumed rate of increase of age-specific utilization rates is uniform (in per cent) over all ages.
- B. *Target rate* – where it is assumed that the curve of age-specific utilization rates for OP care (the so-called ‘J-curve’) converges towards a target curve to be specified by the user (see section 3.2.4).

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**STEP 5: Select the method for projecting IP utilization rates (STEP 4 for CSMBS)**

Step 5 requires from the user to select the method for projecting IP utilization rates from the following options:

- A. *Uniform increase* – option where the assumed rate of increase (in per cent) of age-specific utilization rates is uniform over all ages.
- B. *Target rate* – option where it is assumed that the curve of age-specific utilization rates for IP care (the so-called ‘J-curve’) converges towards a target curve to be specified by the user (see section 3.2.4).

**STEP 6: Select the method for projecting IP expenditure (STEP 5 for CSMBS)**

This step requires the user to select the methodology for projecting inpatient expenditure, notably whether to make use in the cost projections of DRG weights, this by selecting between the following alternative choices:

- A. *Use average cost per admission* – option where the volume of IP service units is expressed in terms of number of admissions, and the cost per admission thus represents unit cost.
- B. *Use DRG base rate (cost per ARW)* – option where the volume of IP service units is expressed in terms of adjusted relative weights (ARWs), and unit cost is given by the so-called DRG base rate (i.e., cost per ARW).<sup>21</sup>

**STEP 7: Select the method for projecting the DRG base rate (STEP 6 for CSMBS)**

Step 7 requires the user to select the method for projecting the ‘case-mix index’ (CMI), i.e., the average number of ARWs per admission. This only applies if option B is selected in STEP 6.<sup>22</sup> For the projection of the CMI, the following choices are given:

- A. *Average CMI (overall average)* – option where IP unit cost is expressed and projected based on the overall average CMI per admission (over all ages and m/f) and where a uniform rate of increase/decrease is assumed for the projection.
- B. *Average CMI (m & f)* – option where IP unit cost is expressed and projected based on the average CMI per admission for m/f (assumed equal over all ages) and where a uniform rate of increase/decrease is assumed
- C. *CMI by age/sex and uniform increase* – option where IP unit cost is expressed and projected based on the CMI by single age and sex, and where a uniform rate of increase/decrease over all ages is assumed.
- D. *CMI by age/sex and target rate* – option where IP unit cost is expressed and projected based on the CMI by age and sex and where it is assumed that the CMI curve converges gradually towards a target curve (to be specified).

**STEP 8: Select method for specifying the assumed rate of unit cost increase (STEP 7 for CSMBS)**

- A. *Specify explicitly* – option where the assumed annual rate of increase in OP/IP unit cost is specified explicitly (in aggregate) as an assumption.

<sup>21</sup> With the system of ‘Disease Related Groups (DRGs)’, all medical interventions are assigned to ‘groups’ based on the type of the underlying disease. For each such group, weights are allocated based on the complexity (and cost) of the medical procedure employed. These DRG weights are then adjusted to correct for any deviation of the actual length of stay from the average length of stay for all episodes where the same procedure is employed.

<sup>22</sup> Step 7 does not appear if option A is selected in Step 5, as this step becomes irrelevant in that case.

- 
- B. *Determine with factor model* – option where the annual rate of increase for OP and IP unit cost is derived with the proposed method of input factor cost (see section 2.4.6. and Annex A).

## **3.2. Data input**

This section contains a description of the data input required before expenditure projections can be undertaken, and which includes the following:

- The scheme coverage by age/sex cohort for all years of the projection period (to be generated with ‘CovPop’)
- The base year expenditure by type of cost and benefit item
- The base year unit cost data and cost structure (cost break-up in cost factors)
- The base year data on utilization and case-mix index (if relevant) by age and sex

Data input for the above items is discussed in the following section.

### **3.2.1. Input of coverage data**

For data input on coverage, simply insert the projected scheme coverage by age and sex (as projected with the coverage module ‘CovPop’) into the worksheets ‘CovPop M’, and ‘CovPop F’.

### **3.2.2. Input of expenditure data**

For data input on base year expenditure by type of benefit, insert the relevant data in the worksheet ‘INPUT Expenditure’ (see Annex E for illustration). Ideally total expenditure for each separate benefit item is broken down into males and females.<sup>23</sup>

### **3.2.3. Input of unit cost data**

The sheet ‘INPUT cost data’ contains data on cost that is only required if the respective model configuration has been selected (in the worksheet ‘CONFIG’).

Data input on base year unit cost for OP and IP care is required only if the respective model setting has been selected (exogenous specification of cost) in step 3.<sup>24</sup> If so, insert the relevant data in the respective input fields (these are highlighted in grey).

The data on cost structure or factor cost (by hospital type for UCS and SSS) is only required if the factor model has been selected for specifying future rates of change in unit cost in step 8. For the data on factor cost, it is noted that for UCS and SSS, the factors selected are input cost factors (salaries, cost for drugs, etc.) whereas for the CSMBS these relate to billing data (service charges, charges for drugs, etc.) and can thus be regarded as output cost factors. For a summary discussion of the factor model, see Annex A.

### **3.2.4. Input of utilization data**

Data on base year utilization rates and case-mix index shall be inserted in the worksheet ‘INPUT utilization’. The input data required in this sheet includes the following:

<sup>23</sup> This information may not be available; in that case, it is suggested to allocate expenditure on a pro-rata basis according to the relative share of total utilization of each respective group.

<sup>24</sup> This does not apply for the CSMBS

- 
- The total number of OP contacts by m/f and by hospital type<sup>25</sup>
  - Total number of admissions (IP) for m/f and by hospital type
  - Total number of DRG weights for m/f and by hospital type
  - The total number of registered by hospital type
  - For specific items, the total number of benefits provided by m/f
  - Utilization rates by age cohort for m/f
  - Average case-mix index (CMI) per admission by age cohort for m/f
  - Target utilization rates (OP/IP) by age cohort and m/f (if required, see settings)
  - Target case-mix index per admission by age and m/f (if required, see settings)

It is noted that the target curves for utilization and CMI are only required if the respective modeling options have been selected in the sheet 'CONFIG' (see steps 4, 5, and 7).

### 3.3. Assumptions

Apart from the input data summarized in section 3.2., assumptions are also required for undertaking expenditure projections. Assumptions shall be inserted in the sheets 'ASSUMPTIONS' (see illustration in Annex E) and 'INPUT utilization'. We distinguish assumptions for the following types of variables:

- Annual rate of change of utilization rates for OP/IP care and other benefits;
- Annual rate of change of the case-mix index (CMI) per admission for IP care;
- Annual rate of change in unit cost, i.e., cost per contact/admission or cost per DRG adjusted relative weight (if the relevant option has been selected);
- Annual rate of change in unit factor cost (if relevant, see model settings);
- Annual rate of change of 'factor input intensities' or 'factor input volume per unit of output' (see Annex A);

The formulation of assumptions is discussed below.

#### 3.3.1. Assumptions on utilization rates

The increase of utilization rates is a major cost driver for many health care schemes. It is therefore important that future changes in utilization rates are taken into account. As explained in section 2.1 (see step 4 & 5), two alternative methods for projecting future utilization rates are provided:

With the option of uniform increases of age-specific utilization rates, it is assumed that utilization rates for all ages increase by the same factor (expressed in per cent). It is recommended here that assumptions are formulated based on the trend observed in the previous years. The respective assumptions shall be inserted in the worksheet 'ASSUMPTIONS' (see point A. for OP and IP care and point H. for other benefits).

With the alternative setting, it is assumed that utilization rates gradually converge towards a 'target' or 'benchmark' pattern. It is considered crucial here that a broad consensus is given among stakeholders on the choice of the target curve. The target curve on OP and IP utilization rates shall be inserted in the worksheet 'INPUT utilization'.

#### 3.3.2. Assumptions on the case-mix index

The average case-mix index per admission shows an increasing trend in the past years, which may reflect a trend of DRG up-coding (or 'creeping'), a trend of increasing use of 'technology' in IP care (i.e., complexity of procedures), an increasing share of tertiary care in IP care, or (most probably) a

<sup>25</sup> Data by hospital type is needed only for UC and SSS

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combination of these factors. Two alternative methods are provided for projecting the future CMI as explained in section 2.1 (see step 6).

With the option of uniform increases of the age-specific CMI per admission, it is assumed that all rates increase by the same factor (expressed in per cent). It is recommended that assumptions be formulated in line with the trend observed in the previous years. The assumptions shall be inserted in the worksheet 'ASSUMPTIONS' (see point B.).

With the alternative option, it is assumed that the pattern of age-specific rates converges gradually towards a 'target' or 'benchmark' pattern. It is considered important here that the assumed target pattern be agreed upon by all stakeholders. The target curves of assumed CMI per admission by age (for males and females) shall be inserted in the worksheet 'INPUT utilization'.

### **3.3.3. Assumptions on cost increase**

Formulating assumptions on future cost increases is a sensitive issue since cost developments are difficult to predict. As explained in section 2.1 (see STEP 8), two options are provided for setting assumptions on cost increases: either in aggregate or with the factor model.

With the first option, it is recommended to formulate assumptions based on the past trend observed compared to the increase of the CPI and of the National Average Wage, and to take into account economic projections (see section 2.2 'Economic module'). Assumptions shall be inserted in the sheet 'ASSUMPTIONS' (see point C).

If use is made of the factor model, assumptions on the increase of factor cost should be set in line with economic projections (e.g., on CPI and wage increases) and with the trends observed in the past (e.g., on unit cost for drugs). When setting assumptions on factor 'input intensities' or input volumes, it is recommended to take into account the trends observed in the recent past and any possible supply constraints that may arise in the future.<sup>26</sup> The relevant assumptions shall be inserted in the sheet 'ASSUMPTIONS' (see points D, E, and F).

## **3.4. Model calibration**

The calibration of the model is necessary to ensure that the model results produced for the base year match with actual figures (notably on total expenditure by type of benefit, total utilization, DRG relative weights, etc.). The model has been designed such that base year calibration occurs automatically. Hence for each curve of variables to be calibrated, (utilization by age/sex, case-mix index by age/sex, and cost per capita for non OP/IP benefits), calibration factors are calculated implicitly in the model and the relevant variables adjusted through multiplication. It is noted that since the calibration process occurs automatically, no intervention is required by the user. The implicit calibration factors are displayed in the respective sheets ('OP utilization', 'IP utilization', 'IP case-mix index', etc.)

## **3.5. Projection results**

The results of the expenditure projections are displayed in the worksheet 'OUTPUT'. It is noted that the model calculations contained in this sheet are updated automatically via the formulas linked dynamically to the other sheets of the file (input sheets, assumptions, etc.). It is noted however that the

<sup>26</sup> This applies mainly to the labour input, where the overall number of doctors and other medical staff is constrained over the short to medium term since the number of new university graduates cannot be increased swiftly.

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‘automatic calculation mode’ must be switched on (see EXCEL preferences) for automatic updates to occur.<sup>27</sup>

The projection results displayed in the output sheet include the following:

- The projected benefit expenditure by item and in aggregate
- The projected PAYG cost ratio (for SSS and CSMBS only)
- The number of registered by m/f and total
- The projected number of OP visits, admissions (IP), and other benefits provided
- The annual cost per capita for each benefit item, and
- The projected OP/IP unit cost by composition

The result sheets of the three schemes are displayed in Annex E (see sheet ‘OUTPUT’).

<sup>27</sup> To change the preferences on ‘calculation’, go to the menu ‘EXCEL’, select ‘Preferences’, then ‘calculation’, and then mark the option button ‘Automatic’.



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## 4. Model maintenance

In order to ensure that the model results reflect the latest demographic, economic, and coverage data, it is necessary to update periodically the databases of the respective modules.

### 4.1. Model maintenance routine

Since most of the input data required consists of annual figures or statistics, an annual updating routine would seem natural. However, timing can be an issue, since the different statistics required are released at different points in time, and not necessarily at the time when needed. Due to this timing problem, annual updates following a predetermined schedule are not always possible.

For the data sets shared by the three schemes, notably the overall demographic and economic framework, it is sensible to undertake data updates jointly or in close collaboration among the three schemes. It was therefore proposed during the model development activities that a coordination mechanism be established between the three schemes to ensure close cooperation when updating the model framework.

For population figures, the selected data source is the database of the Ministry of Interior (MOI), which is maintained on an ongoing basis; hence updates can be made available at any point in time. However, since populations change at a slow pace, frequent updates are not necessary. It is therefore recommended that data updates be undertaken on an annual basis at most, and only if considered necessary (e.g., if the actual figures deviate from the projected one by a non-negligible amount).

For labour force figures, new data is released quarterly by the National Statistical Office (NSO) through the release of the results of the labour force surveys. Since labour force figures are subject to seasonal variations, it is recommended to use annual averages that cancel out the seasonality. Data updates should thus be undertaken annually as well.

For economic data, annual updates are also generally recommended. Some of the data required is released on a monthly or even weekly basis (e.g., CPI), annual updates should be sufficient unless extraordinary reasons should exist (e.g., a drastic change in the economic outlook) that would call for an ad-hoc updating of the economic framework.

The practical steps involved in updating the different model components are described in the sections below.

### 4.2. Updating the demographic framework

#### 4.2.1. Updating the population projection

The ILO population projection model consists of the following EXCEL worksheets:

- *Control* (modeling control variables)
- *Mort* (mortality data)
- *Fert* (fertility data)
- *Pop* (population data)

The sheet '*Pop*' is the main sheet, which contains the population data for the base year and projection period. The sheet '*Pop*' is linked to the other worksheets containing assumptions and control parameters needed for the projections, and which include the following:

- Selection of base year (see worksheet '*Control*');
- Sex-ratio of newborns (see worksheet '*Control*');
- Selection of calculation basis for population figures: beginning, mid- or end of the year (see worksheet '*Control*');

- Life expectancy at birth and age-specific mortality rates (see worksheet '*Mort*');
- Total fertility rate and age-specific fertility rates (see worksheet '*Fert*');

A complete list of all model variables is provided in Annex D.

To update one of the above variables, open the respective sheet and insert the new value where required. When assumptions or control variables are updated, the results (population projection) are updated automatically, provided both worksheets are open at the same time. If the secondary worksheet is closed before the result sheet ('*Pop*') is opened, the model user needs to confirm that the respective links shall be updated.<sup>28</sup> To update the base year population, open the worksheet '*INPUT*' in the file '*Pop*' and paste the new population figures in the highlighted fields.

A complete description of the structure and handling of the ILO population projection model is provided in the respective user manual (see 'The ILO Population Model, A Technical Guide').

#### 4.2.2. Updating the labour force projection

The projected labour force and employment figures are calculated in the EXCEL file 'Labour Force TH'. The file is linked to the file 'Pop' to extract the projected population data by age/sex cohort. The input data required in the file 'Labour Force TH' comprises the following:

- The base year labour force participation rates by age/sex cohort (see sheet 'LF part INPUT')
- The rate of unemployed (including seasonally inactive) in the base year for males and females (see sheets '*Empl M*' and '*Empl F*')

The assumptions that need to be specified in the file 'Labour Force TH' are the following:

- The projected labour force participation rates by age/sex cohort (see sheets '*Part M*' and '*Part F*') for the years  $t+1$ ,  $t+2$ , ...
- The projected rate of unemployment (including seasonally inactive) for males and females (see sheets '*Empl M*' and '*Empl F*') for the years  $t+1$ ,  $t+2$ , ...

It is noted that for labour force participation rates by age/sex the default setting assumes constant rates.<sup>29</sup> However, this assumption can be changed if deemed necessary by modifying the respective rates in the sheets '*Part M*' and '*Part F*'.

The output data produced in this file consist of the projected labour force data by age, m/f, and total (see sheets '*Labf M*', '*Labf F*', and '*Labf Tot*'), and the projected number of employed by age and m/f (see sheets '*Empl M*' and '*Empl F*'). These figures are updated automatically when input data or assumptions are modified, provided the automatic calculation modus is switched on (see EXCEL preferences).

### 4.3. Updating the economic framework

The economic framework consists of the EXCEL file 'Econ TH', which is linked to the population and labour force files. The main worksheets included in the file 'Econ TH' are the following: 'BASE YEAR', 'INPUT ECO', 'INPUT DEM', 'ASSUMPTIONS', and 'OUTPUT'. The other sheets include data time series with figures of past years for information and trend analysis.

For changing the base year of the economic projections, open the sheet 'BASE YEAR' and modify as required. For updating the economic base year data, open the sheet 'INPUT ECO' and key-in the new data. For updating the demographic data (employment), open the sheet 'INPUT DEM'. The data fields

<sup>28</sup> A pop-up window will appear when opening the file. This can also be done manually at any time via the menu 'Edit': go to 'Links' and select 'Update now'.

<sup>29</sup> This assumption is considered reasonable in the given context, particularly for short-term projections.

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in this sheet are linked to the file 'Labour Force TH'. If the demographic data has been revised, update the respective link (see menu 'Edit', select item 'links' and the file name and click 'update now').

The assumptions are summarized in the worksheet 'ASSUMPTIONS', which is linked to the respective cells in the output sheet. The cells containing pure assumptions on economic variables are highlighted in grey whereas cells containing official forecasts or other estimates are highlighted in yellow. The sheet includes the following variable:

- The projected rate of real GDP growth for the years  $t+1$  and  $t+2$  (use official forecasts)
- The future rate of increase in labour productivity for the year  $t+3$  and thereafter
- The assumed rate of increase of the Consumer Price Index (use BOT forecasts as available)
- The elasticity of wage increase to labour productivity for the national average wage, and for the average wage in the public and private sectors.<sup>30</sup>

For modifying any of these assumptions, go to the sheet 'ASSUMPTIONS' and modify the respective fields by replacing the current figure as required.

#### 4.4. Updating cost structure data

In the proposed framework estimating OP/IP unit cost increases (see Annex A), data on cost structure is needed to assess the relative weight of the different cost factors or components (and thus the relative importance of the different cost drivers). The cost structure data is therefore important for the calculation of the weighted average cost driver or composite cost inflator.

When gathering updated data on unit cost by cost factor or component, it is important to select the data source most appropriate for the scheme under consideration; this issue is discussed below:

##### **CSMBS**

Since scheme expenditures relate directly to hospital bills for the CSMBS, it is proposed to derive cost structure data from MOPH hospital billing information. For IP care, it should be possible in the near future to extract the relevant data directly from the database on individual records (as maintained by CHI). For OP care, in case the data cannot be extracted from the 'Direct Payment System', it is recommended to use sample data from selected MOPH hospitals if these are representative for all provider hospitals.

##### **UC**

For the UC scheme, it is recommended that the cost structure data be extracted from the aggregated hospital accounting reports (the so-called Report No. 5). It is recommended that, in the future, this report be requested from all hospitals on a mandatory basis, including from all hospitals operating under ministries other than the MOPH.<sup>31</sup> For the allocation of cost between OP and IP care, it is suggested to draw on sample data from selected hospitals that allocate costs to cost centers on a comprehensive basis.<sup>32</sup>

<sup>30</sup> As the default setting it is assumed that the elasticity equals 1 for the years where no information on wage increases is available. If for the first years (e.g., for the year  $t+1$ ) an estimate on the rate of wage increases is available, key in the respective figure directly in the output sheet.

<sup>31</sup> This notably applies to teaching hospitals operating under the Ministry of Education, and to private hospitals operating under the Ministry of Commerce and Industry.

<sup>32</sup> It is noteworthy that the IHPP is currently undertaking activities to support pilot hospitals in undertaking comprehensive cost allocation exercises.

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## SSS

It is suggested to use for the SSS the same data source as for the UC since there is an overlap in the providers contracted under the two schemes, and both schemes face more or less the same cost. Since about half of all SSS providers are private hospitals, it is desirable that detailed accounting data be requested by SSS in the future.

### 4.5. Updating model features

As noted earlier, all model features (variables, formulae, etc.) can be modified if required or deemed necessary. This applies notably for the expenditure models (HCFM), which may need amendment to reflect changes in benefit provisions or a change in scheme financing arrangements. It is recommended that all major modifications be discussed and agreed upon with all stakeholders.

It is also noted that the worksheets of the expenditure models are read-only, apart from the data input fields (highlighted in grey), this to prevent a loss in functionality following accidental modification of formulas or other elements of the model. The password protection can be removed via the menu 'Tools' (Select item 'Protection', and then 'Unprotect Sheet') if modifications need to be carried out. The password for each model corresponds to the name of the respective institution in charge of the scheme (NHSO, SSO, and CSMBS).

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## Annex A

### Factor model for unit cost

#### Methodology

In the basic model configuration total expenditure of the three schemes is broken down as follows:

$$\begin{aligned} Exp_t^{(TOT)} &= Exp_t^{(OP)} + Exp_t^{(IP)} + Exp_t^{(other)} \\ &= \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(OP)} \cdot c_t^{(OP)} + \sum_{x,s} pop_{x,s,t} \cdot u_{x,s,t}^{(IP)} \cdot cmi_{x,s,t}^{(DRG)} \cdot c_t^{(IP)} + Exp_t^{(other)} \end{aligned} \quad (1)$$

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:

$$c_t = c_t^{(lab)} + c_t^{(drg)} + c_t^{(ND)} + c_t^{(oth)} \quad (2)$$

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

$c_t^{(ND)}$  is the component reflecting the cost of medical non-durables other than drugs as supplied to patients in year t

$c_t^{(oth)}$  is the component relating to other recurrent costs (e.g., non medical material, utilities, food, 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:

$$\frac{dc_t}{c_t} = \frac{dc_t^{(lab)}}{c_t} + \frac{dc_t^{(drg)}}{c_t} + \frac{dc_t^{(ND)}}{c_t} + \frac{dc_t^{(oth)}}{c_t}$$

Since the relative share of cost factors can be assumed fairly stable over time, we can write:

$$\frac{dc_t}{c_t} \approx \frac{c_t^{(lab)}}{c_t} \cdot d\ln(c_t^{(lab)}) + \frac{c_t^{(drg)}}{c_t} \cdot d\ln(c_t^{(drg)}) + \frac{c_t^{(ND)}}{c_t} \cdot d\ln(c_t^{(ND)}) + \frac{c_t^{(oth)}}{c_t} \cdot d\ln(c_t^{(oth)}) \quad (3)$$

However, since we cannot assume the relative share of factor inputs to be identical for out-patient and in-patient care, we need to distinguish between OP and IP cost, hence:

$$\begin{aligned} c_t^{(OP)} &= c_t^{(OP/lab)} + c_t^{(OP/drg)} + c_t^{(OP/ND)} + c_t^{(OP/other)} = \dots, \text{ and:} \\ c_t^{(IP)} &= c_t^{(IP/lab)} + c_t^{(IP/drg)} + c_t^{(IP/ND)} + c_t^{(IP/other)} = \dots \end{aligned} \quad (4)$$

For modelling the change in factor inputs, it is suggested to disaggregate factor cost into unit 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 factor cost component in average OP unit cost in year t.  
 $c_t^{(lab)}$  is the weighted average unit cost of labour in year t.<sup>33</sup>  
 $\lambda_t^{(OP/lab)}$  is the input intensity of labour per outpatient contact, i.e., the weighted average volume of labour input (i.e., time) per OP contact in year t.<sup>34</sup>

Consequently:

$$dc_t^{(OP/lab)} = \lambda_t^{(OP/lab)} \cdot dc_t^{(lab)} + c_t^{(lab)} \cdot d\lambda_t^{(OP/lab)}$$

And thus:

$$\frac{dc_t^{(OP/lab)}}{c_t^{(OP/lab)}} = \frac{\lambda_t^{(OP/lab)} \cdot dc_t^{(lab)}}{\lambda_t^{(OP/lab)} \cdot c_t^{(lab)}} + \frac{c_t^{(lab)} \cdot d\lambda_t^{(OP/lab)}}{\lambda_t^{(OP/lab)} \cdot c_t^{(lab)}} = d\ln(c_t^{(lab)}) + d\ln(\lambda_t^{(OP/lab)}) \quad (5)$$

Where  $d\ln(c_t^{(\dots)})$  denotes the incremental change of factor cost in relative terms (% p.a.)

Equation (3) becomes:

$$\begin{aligned} \frac{dc_t^{(OP)}}{c_t^{(OP)}} &= \frac{dc_t^{(OP/lab)}}{c_t^{(OP)}} + \frac{dc_t^{(OP/drg)}}{c_t^{(OP)}} + \frac{dc_t^{(OP/ND)}}{c_t^{(OP)}} + \frac{dc_t^{(OP/oth)}}{c_t^{(OP)}} \\ &= \frac{c_t^{(OP/lab)}}{c_t^{(OP)}} \cdot \frac{dc_t^{(OP/lab)}}{c_t^{(OP/lab)}} + \frac{c_t^{(OP/drg)}}{c_t^{(OP)}} \cdot \frac{dc_t^{(OP/drg)}}{c_t^{(OP/drg)}} + \frac{c_t^{(OP/ND)}}{c_t^{(OP)}} \cdot \frac{dc_t^{(OP/ND)}}{c_t^{(OP/ND)}} + \frac{c_t^{(OP/oth)}}{c_t^{(OP)}} \cdot \frac{dc_t^{(OP/oth)}}{c_t^{(OP/oth)}} \\ &= \frac{c_t^{(OP/lab)}}{c_t^{(OP)}} \cdot (d\ln(\lambda_t^{(OP/lab)}) + d\ln(c_t^{(lab)})) + \frac{c_t^{(OP/drg)}}{c_t^{(OP)}} \cdot (d\ln(\lambda_t^{(OP/drg)}) + d\ln(c_t^{(drg)})) + \dots \end{aligned} \quad (6)$$

Since expenditure and unit cost are projected annually we can write:

$$\tilde{c}_{t+1}^{(OP)} = c_t^{(OP)} \cdot (1 + \tilde{i}_{t+1}^{(OP)})$$

<sup>33</sup> Weighting based on the relative cost of the different labour input factor categories, i.e., doctors, nurses, pharmacists, etc.

<sup>34</sup> Ibid

With:

$$\tilde{t}_{t+1}^{(OP)} = \left[ \frac{c_t^{(OP/lab)}}{c_t^{(OP)}} \cdot \left( \frac{\Delta \tilde{\lambda}_{t+1}^{(OP/lab)}}{\lambda_t^{(OP/lab)}} + \frac{\Delta \tilde{c}_{t+1}^{(lab)}}{c_t^{(lab)}} \right) + \frac{c_t^{(OP/drg)}}{c_t^{(OP)}} \cdot \left( \frac{\Delta \tilde{\lambda}_{t+1}^{(OP/drg)}}{\lambda_t^{(OP/drg)}} + \frac{\Delta \tilde{c}_{t+1}^{(drg)}}{c_t^{(drg)}} \right) + \dots \right] \quad (7)$$

- Where:
- $\tilde{c}_{t+1}^{(OP)}$  is the unit cost for OP care as projected for the year t+1
  - $\tilde{t}_{t+1}^{(OP)}$  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 intensity of labour input per outpatient contact as assumed for the year t+1 (from the year t), i.e., the average staff time per OP contact
  - $\Delta \tilde{c}_{t+1}^{(lab)}$  is the amount of change in unit labour cost for the year t+1 (from the previous year t)
  - $\Delta \tilde{\lambda}_{t+1}^{(OP/drg)}$  is the change in intensity of drug inputs per outpatient contact as assumed for the year t+1 (from the previous year t)
  - $\Delta \tilde{c}_{t+1}^{(drg)}$  is the amount of change in unit drug cost as projected for the year t+1 (from the previous year t)

For the formulation of the assumptions required when using formula (7), it is recommended to take into account the following factors:

- The trend observed in recent years for the respective parameters
- The overall economic outlook (see economic projection)
- The existence of future supply constraints (e.g., on total labour inputs) that may contain the overall increase of inputs factors
- The existence of targets values for certain variables.

In summary, the proposed methodology consists of the following steps:

1. Calculation of cost per service unit (output), i.e.,  $c^{(OP)}$  and  $c^{(IP)}$ , for the base year  $t_0$
2. Allocation of input factor cost  $c^{(lab)}$ ,  $c^{(drg)}$ , ... to OP and IP to obtain factor input costs  $c^{(OP/lab)}$ ,  $c^{(IP/lab)}$ ,  $c^{(OP/drg)}$ ,  $c^{(IP/drg)}$ , ...
3. Formulation of assumptions on rate of increase of inputs (unit cost and factor input intensities) based on past trends, future economic outlook, future supply constraints and/or policy targets (→ benchmarks).





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## Annex B

### Allocation rules for capitation budgets (2007)

#### B.1. Social Security Scheme

The capitation fee of SSS is negotiated annually by the SSO Medical Committee with the contracted service providers. The capitation fee comprises a basic amount and two separate increments reflecting service utilization (for OP and IP care), and the prevalence of high risk / high cost patients respectively. The allocation of the three components is explained below:

##### a) Basic amount

The basic capitation amount is paid to each provider on a monthly basis; it is calculated based on the average number of persons registered at the beginning and end of the month with the respective provider. Algebraically we can write:

$${}^k B_t^{(m)} = {}^k pop_t^{(m)} \cdot (C_t / 12)$$

Where:  ${}^k B_t^{(m)}$  is the basic capitation amount payable to provider k in month m of year t

${}^k pop_t^{(m)}$  is the average number of persons registered with provider k in month m of year t

$C_t^{(B)}$  is the basic annual amount of capitation fee payable in year t

##### b) Utilization incentive

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 paid annually based on a composite ‘utilization 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 composite 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 average number of persons registered with provider k in month i of year t

The utilization index is calculated for all providers and then grouped in deciles. In the year 2007 the amount of utilization incentive payable was determined as follows:

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

THB 40/person/year for the 4<sup>th</sup> decile

THB 100/person/year for 10<sup>th</sup> decile (highest 10% of UI)

Algebraically we can thus write for the year 2007:

$${}^kU_t = \text{Min}(30, {}^k\pi_t \cdot 10)$$

Where:  ${}^kU_t$  denotes the amount of utilization incentive paid to provider  $k$  in year  $t$   
 ${}^k\pi_t$  refers to the respective decile of the utilization index

The average amount of utilization incentive disbursed in 2007 amounted to about THB 55.

### c) Risk adjustment

The risk adjustment component of the capitation fee is payable twice a year; it is divided in 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 a cumulative ‘chronic disease score’ index, which reflects the cost of OP contacts provided to chronic disease patients by the respective provider over the past 6 months. Algebraically the OP risk adjustment for provider  $i$  writes as follows:

$${}^kRA_{t,j}^{(OP)} = \left( {}^kcds_t^{(j)} / \sum_k {}^kcds_t^{(j)} \right) \cdot pop_t^{(j)} \cdot (205/2) \cdot 0.55$$

Where:  ${}^kRA_{t,j}^{(OP)}$  is the OP risk adjustment for provider  $k$  in semester  $j$  of year  $t$   
 ${}^kcds_t^{(j)}$  is the cumulative chronic disease score reported by provider  $k$  in semester  $j$  of year  $t$   
 $pop_t^{(j)}$  is the average number of persons registered with all providers in the semester  $j$  of year  $t$

The IP portion of the risk adjustment is calculated in a similar manner based on the cumulative DRG case-mix index reported by each provider over the past 6 months. Algebraically the IP risk adjustment is calculated as follows:

$${}^kRA_{t,j}^{(IP)} = \left( {}^karw_t^{(j)} / \sum_k {}^karw_t^{(j)} \right) \cdot pop_t^{(j)} \cdot (205/2) \cdot 0.45$$

Where:  ${}^kRA_{t,j}^{(IP)}$  is the IP risk adjustment paid to provider  $k$  in the semester  $j$  of year  $t$   
 ${}^karw_{t,j}$  is the cumulative amount of adjusted relative DRG weights reported by provider  $k$  in semester  $j$  of year  $t$   
 $pop_t^{(j)}$  is the average number of persons registered with all providers during semester  $j$  of year  $t$

## B.2. Universal Coverage Scheme

1. The overall UC capitation budget approved by BoB is first broken down by type of care into the following categories:

- 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<sup>35</sup> (NFL)

2. The budgets for OP and IP care are then allocated further to the following benefit 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 SSS36 (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?)
  - 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.).

<sup>35</sup> 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.

<sup>36</sup> For medical care related to childbirth, a qualifying period of 9 month of membership applies for SSO

3. The budget allocations for OP/IP ‘add-on’ benefits, ‘disease management’ benefits, and OP ‘investigation’ (laboratory) services are determined by projecting the benefit expenditure for the respective benefits as follows:

$$E\tilde{x}p_{t+1}^{(OP/B_i)} = p\tilde{o}p_{t+1} \cdot \tilde{u}_{t+1}^{(OP/B_i)} \cdot \tilde{c}_{t+1}^{(OP/B_i)}, \text{ and}$$

$$E\tilde{x}p_{t+1}^{(IP/B_i)} = p\tilde{o}p_{t+1} \cdot \tilde{u}_{t+1}^{(IP/B_i)} \cdot \tilde{c}_{t+1}^{(IP/B_i)}$$

(where the ‘tilde’ refers to projected values)

A budget is allocated accordingly, hence for OP and IP care:

$$B_{t+1}^{(OP/B_i)} = E\tilde{x}p_{t+1}^{(OP/B_i)}, \text{ and } B_{t+1}^{(IP/B_i)} = E\tilde{x}p_{t+1}^{(IP/B_i)}$$

4. Calculation of the total budget for GOP (capitation) and GIP care (DRG).

The global budget for general OP care is obtained by deducting from the total allocated OP budget the budgets allocated for OP add-on items, disease management, and OP investigation:

$$B_{t+1}^{(GOP)} = B_{t+1}^{(OP)} - \sum_i B_{t+1}^{(OP/B_i)} - B_{t+1}^{(OP/inv)}$$

The global budget for general IP care is obtained by deducting from the total allocated IP budget the total budget estimated 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 the global GOP budget to provinces based on:

a) Age structure in each province (for 90% of total GOP budget) by applying cost weights  $w_i$  by age group as follows:

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 then determined as follows:

$${}^{(age)}_j B_{t+1}^{(GOP)} = 0.9 \cdot B_{t+1}^{(GOP)} \cdot \left( \sum_i w_i \cdot {}^i p\tilde{o}p_{t+1}^{(j)} / \sum_i w_i \cdot {}^i p\tilde{o}p_{t+1}^{(tot)} \right)$$

Where:

${}^{(age)}_j B_{t+1}^{(GOP)}$  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:

$${}^{(age)}_j \hat{cap}_{t+1}^{(GOP)} := 0.9 \cdot {}^{(age)} \bar{cap}_{t+1}^{(GOP)} \text{ if } {}^{(age)}_j cap_{t+1}^{(GOP)} < 0.9 \cdot {}^{(age)} \bar{cap}_{t+1}^{(GOP)}, \text{ and}$$

$${}^{(age)}_j \hat{cap}_{t+1}^{(GOP)} := 1.1 \cdot {}^{(age)} \bar{cap}_{t+1}^{(GOP)} \text{ if } {}^{(age)}_j cap_{t+1}^{(GOP)} > 1.1 \cdot {}^{(age)} \bar{cap}_{t+1}^{(GOP)}$$

With:

$${}^{(age)}_j cap_{t+1}^{(GOP)} = {}^{(age)}_j B_{t+1}^{(GOP)} / {}_j pop_{t+1}$$

Where

${}^{(age)}_j cap_{t+1}^{(GOP)}$  is the per capita budget in province  $j$

${}^{(age)}_j \bar{cap}_{t+1}^{(GOP)}$  is the average per capita budget for all provinces

${}^{(age)}_j \hat{cap}_{t+1}^{(GOP)}$  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:

$${}^{(ut)}_j B_{t+1}^{(GOP)} = 0.1 \cdot B_{t+1}^{(GOP)} \cdot \left( {}^{(j)}_n^{(GOP)}_t / {}^{(tot)}_n^{(GOP)}_t \right)$$

Where:

${}^{(ut)}_j B_{t+1}^{(GOP)}$  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:

$${}_j B_{t+1}^{(GOP)} = {}^{(age)}_j B_{t+1}^{(GOP)} + {}^{(ut)}_j B_{t+1}^{(GOP)}$$

The capitation fee for province  $j$  is thus given as follows:

$${}_j cap_{t+1}^{(GOP)} = {}_j B_{t+1}^{(GOP)} / p\tilde{o}p_{t+1}^{(j)}$$

Where  ${}_j cap_{t+1}^{(GOP)}$  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  $t+1$ :

$${}^{(R_i)}_n^{(arw)}_{t+1} = {}^{(R_i)}_p\tilde{o}p_{t+1} \cdot {}^{(R_i)}_u\tilde{u}_{t+1}^{(GIP)} \cdot {}^{(R_i)}_c\tilde{m}_{t+1}$$

c. Allocation of GIP budget to regions in proportion to projected ARWs:

$${}^{(R_i)}_B_{t+1}^{(GIP)} = B_{t+1}^{(GIP)} \cdot \left( {}^{(R_i)}_n^{(arw)}_{t+1} / \sum_i {}^{(R_i)}_n^{(arw)}_{t+1} \right)$$

GIP budgets allocated to regions are closed-end; hence the region-specific DRG base rates are determined implicitly at the end of the year.

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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.<sup>37</sup>

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).<sup>38</sup> 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.

<sup>37</sup> 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.

<sup>38</sup> 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.

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## Annex C

### Health care financing models

#### *Description of model components*

##### 1. Demographic and labour force module

###### a. Population projection model

(See files: 'pop', 'mort', 'fert', and 'control')

The ILO population projection model consists of four 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') and mortalities by age and sex (see file 'mort'). 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

###### 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 sheet 'pop')
- Labour force participation rates by age/sex, base year
- Rate 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 (M/F)

###### 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, in real and nominal terms, and GDP deflator, base year
- Labour force and employment (from Labour force TH)
- Consumer Price Index (CPI), base year
- Average wage, total, and public/private sectors

### Assumptions:

- Assumed rate of GDP increase (if official forecast available)
- Assumed future rate of increase of GDP per employed
- Assumed annual rate of CPI increase
- Assumed rate of elasticity of wage growth to GDP/employed

### Output variables:

- Projected GDP, in real terms and nominal, and GDP deflator
- Projected future CPI and annual rate of CPI increase
- Projected average wage, national average and for public/private employees

## 3. **Coverage modules**

### a. Social Security Scheme (*See File: 'CovPoP SSS'*)

The purpose of the coverage module is the projection of the SSS-insured population by single age and male/female. The module comprises the following variables:

### Input variables:

- Insured population by age and sex, base year
- Number of private employees (non agriculture) by age and sex, base year (from *Labour Force TH*)

### Assumptions:

- Assumed ratio of non-agricultural private sector employees in total employed
- Assumed future 'coverage rate' (ratio of HI registered to NA private sector empl.)

### Output variables:

- Base year 'coverage rate' by age and sex
- Projected coverage (persons) by age and sex

### b. Civil Servants' Medical Benefits Scheme (*See File: 'CovPoP CSMBS'*)

The purpose of the coverage module is the projection of the CSMBS-insured population by single age and male/female, 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 for all categories, base year



- Mortality rates by single age for male/female 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 number of beneficiaries by category, age and sex

c. Universal coverage (*See File: 'CovPoP UC'*)

The purpose of this 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:

Input variables:

- Insured UC population by age and sex, base year
- Projected total population by single age and sex (from sheet 'pop')
- Projected beneficiaries of CSMBS and SSS by age and sex (see above)

Assumptions:

- Assumed 'coverage rate' among the 'residual' population for M/F

Output variables:

- Base year 'coverage rate' by age and sex (in % of the residual population)
- Projected number of UC beneficiaries by age and sex

#### 4. Expenditure modules for health

a. Social Security Scheme (*See File: 'HCF Model SSS'*)

The purpose of this 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 (if relevant)
- Base year utilization rate by age/sex for OP/IP
- Base year cost per capita by age/sex for specific benefits
- Base year case-mix index for IP, in aggregate and by age/sex

Assumptions:

- Assumed annual increase of utilization rates for GOP/GIP (or target rate)
- Assumed annual increase of unit cost for GOP/GIP
- Assumed future increase of the case-mix index per admission
- Assumed unit cost increase for other benefits

- Assumed utilization increase for other benefits

Output variables:

- Projected expenditure by item and in aggregate
- Projected number of contacts, admissions, and ARWs
- Projected unit cost for OP, IP, and of DRG base-rate
- Projected cost structure by input cost factor
- Projected expenditure by capita, all benefits
- Projected capitation fee

b. Civil Servants' Medical Benefits Scheme (*See File: 'HCF Model CSMBS'*)

The purpose of this 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, average cost per capita, and pay-as-you-go cost rate. 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 (or target rate)
- Assumed increase of the case-mix index per admission by age/sex
- Assumed unit cost increase for other items
- Assumed utilization rate 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 IP base-rate
- Projected cost structure by cost factor
- Projected expenditure by capita, all benefits
- Projected capitation fee

c. Universal Coverage Scheme (*See File: 'HCF Model UC'*)

The purpose of this module is the projection of future expenditure of the UC 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 (i.e., the 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



## Annex D

### List of model variables

File name	Variable description	Type of variable	Location	
			worksheet	cells
<b>Pop</b>	- Base-year population	<i>INPUT</i>	'INPUT'	C6:D106
	- Projected population males	<i>OUTPUT</i>	'PopM'	B5:AU105
	- Projected population females	<i>OUTPUT</i>	'PopF'	B5:AU105
	- Projected population total	<i>OUTPUT</i>	'PopT'	B5:AU105
<b>Fert</b>	- Base year fertility rates	<i>INPUT</i>	'INPUT fert'	C7:C41
	- Total fertility rate for future years (assumed)	<i>ASSUMPTION</i>	'Fert'	B41:AU41
	- Projected fertility rates	<i>OUTPUT</i>	'Fert'	A5:AU39
<b>Mort</b>	- Base year LEB for males and females	<i>INPUT</i>	'LEB'	C13, C15
	- Base year mortality pattern, m & f	<i>INPUT</i>	'MortM calc', and 'MortF calc'	H5:S105
	- LEB for future years, males and females	<i>ASSUMPTION</i>	'LEB'	D13:L13, and D15:L15
	- Projected mortality rates by age and sex	<i>OUTPUT</i>	'MortM' and 'MortF'	B5:AU105
<b>Control</b>	- Base year for population projection	<i>INPUT</i>	'CONTROL'	B2
	- Sex ratio of newborns	<i>INPUT</i>	'CONTROL'	B4
	- Calculation basis for population	<i>INPUT</i>	'CONTROL'	B6
<b>Labour Force TH</b>	- Labour force participation rates	<i>INPUT</i>	'LF part INPUT'	E8:F108
	- Unemployment rate, base year	<i>INPUT</i>	EmplM, EmplF	B4
	- Unemployed rate for future years	<i>ASSUMPTION</i>	EmplM, EmplF	C4:O4
	- Labour Force male & female	<i>OUTPUT</i>	LabfM, LabfF, LabfTot	B4:AU104
	- Employed, male & fem.	<i>OUTPUT</i>	EmplM, EmplF	B4:AU104
<b>ECON TH</b>	- GDP, real and nominal, GDP deflator	<i>INPUT</i>	'INPUT ECO'	C8:C13
	- CPI headline, base year and earlier	<i>INPUT</i>	'INPUT ECO'	C15:C16
	- Average wage, national, public, and private	<i>INPUT</i>	'INPUT ECO'	C19:C21
	- Population and Labour Force base year and proj.	<i>INPUT</i>	'INPUT DEM'	C9:Q12

	- Employment, base year and projected	<i>INPUT</i>	‘INPUT DEM’	C13:Q15
	- GDP growth at constant prices (years t+1, t+2)	<i>ASSUMPTION</i>	‘ASSUMPTIONS’	C8:D8
	- Rate of increase of GDP/empl., year t +3,...	<i>ASSUMPTION</i>	‘ASSUMPTIONS’	E11:O11
	- Future rate of CPI increase	<i>ASSUMPTION</i>	‘ASSUMPTIONS’	C14:O14
	- Elasticity of wage growth to lab. prod. growth	<i>ASSUMPTION</i>	‘ASSUMPTIONS’	C17:O21
	- Projected GDP, nominal, real, and GDP deflator	<i>OUTPUT</i>	‘OUTPUT’	C8:P13
	- Projected LF and Employment	<i>OUTPUT</i>	‘OUTPUT’	C16:P17
	- Projected GDP/employed, real and nominal	<i>OUTPUT</i>	‘OUTPUT’	C21:P23
	- Projected CPI and rate of CPI increase	<i>OUTPUT</i>	‘OUTPUT’	C27:P28
	- Projected average wage, nat. public and private	<i>OUTPUT</i>	‘OUTPUT’	C31:P37
<b>CovPop UC</b>	- Base year	<i>INPUT</i>	‘INPUT’	D2
	- UC population by age and sex, base year	<i>INPUT</i>	‘INPUT’	C9:D109
	- Population, tot., SSS, and CSMBS by age/sex	<i>INPUT</i>	‘OUTPUT’	C9:P23
	- UC coverage rate (M/F)	<i>ASSUMPTION</i>	‘OUTPUT’	D34:P35
	- Projected UC target pop. by age/sex	<i>OUTPUT</i>	‘TPop M’, ‘TPop F’	B5:O105
	- Projected UC coverage, male & female by age	<i>OUTPUT</i>	‘CovPop M’, ‘CovPop F’	B5:O105
<b>CovPop SSS</b>	- Nr. of insured by age, and sex, base year	<i>INPUT</i>	‘CovPop INPUT’	H6:I61
	- Nr of employed & private employees, base year	<i>INPUT</i>	‘ASSUMPTIONS’	E11:E13, E17, E18, E22, E24
	- Future share of private EEs in total employed	<i>ASSUMPTION</i>	‘ASSUMPTIONS’	E16:W16
	- Future overall SSS coverage rate for M/F	<i>ASSUMPTION</i>	‘ASSUMPTIONS’	F32:W33
	- Projected SSS coverage by age and sex	<i>OUTPUT</i>	‘CovPop M’, ‘CovPop F’	B25:T80
<b>CovPop CSMBS</b>	- Insured by category, age, and sex, base year	<i>INPUT</i>	‘INPUT’	D7:W107
	- Dependency ratios by age and type, base year	<i>INPUT</i>	‘category ADIST’	B7:CI90
	- Mortality by age/sex, base year and projected	<i>INPUT</i>	‘Mort M’, ‘Mort F’	B5:AU105
	- Rate of increase, active population	<i>ASSUMPTION</i>	‘OUTPUT’	D16:AT16
	- Sex ratio of actives M/F	<i>ASSUMPTION</i>	‘OUTPUT’	D22:AT24

	- Projected coverage by category, age, and M/F	<i>OUTPUT</i>	‘CovPop Male’, ‘CovPop Female’	C6:U106
<b>HCF Model UC</b>	- UC expenditure by type of benefit, base year	<i>INPUT</i>	‘INPUT expenditure’	C8:F21
	- OP and IP unit cost	<i>INPUT</i>	‘INPUT unit cost’	C10:D10
	- OP and IP cost composition	<i>INPUT</i>	‘INPUT unit cost’	C19:C25, C35:C41
	- Aggregate OP & IP utilization data, base year	<i>INPUT</i>	‘INPUT utilization’	E5:F9
	- OP & IP utilization rates by age & sex, base year	<i>INPUT</i>	‘INPUT utilization’	C21:F121
	- Average case-mix index per admission by sex	<i>INPUT</i>	‘INPUT utilization’	E11:F11
	- Annual cost per capita by age & sex for PP care	<i>INPUT</i>	‘P & P’	T25:T125, T128:228
	- Target utilization rates by age & sex, OP & IP	<i>ASSUMPTION</i>	‘INPUT utilization’	K21:N121
	- Target pattern, case-mix index by age & sex	<i>ASSUMPTION</i>	‘INPUT utilization’	O21:P121
	- Assumed increase of utilization rates, OP & IP	<i>ASSUMPTION</i>	‘INPUT assumptions’	E11:P11, E14:P14
	- Assumed future increase of CMI	<i>ASSUMPTION</i>	‘INPUT assumptions’	E17:P17
	- Assumed future rate of cost increase, OP & IP	<i>ASSUMPTION</i>	‘INPUT assumptions’	E20:P21
	- Assumption on cost increase input factors	<i>ASSUMPTION</i>	‘INPUT assumptions’	E32:P37
	- Assumptions on volume increase for input factors	<i>ASSUMPTION</i>	‘INPUT assumptions’	E40:P53
	- Assumption on unit cost increase for other items	<i>ASSUMPTION</i>	‘INPUT assumptions’	E79:P87
	- Assumptions on UR increase for other items	<i>ASSUMPTION</i>	‘INPUT assumptions’	E90:P98
	- Composite rate of OP/IP unit cost increase	<i>OUTPUT</i>	‘INPUT assumptions’	D72:P73
	- Composite rate of cost increase for other items	<i>OUTPUT</i>	‘INPUT assumptions’	D101:P109
	- Projection results for expenditure by item	<i>OUTPUT</i>	‘OUTPUT’	C7:P21
	- Projection results for OP & IP utilization, CMI	<i>OUTPUT</i>	‘OUTPUT’	C32:P48
	- Pojection results for OP & IP unit cost & structure	<i>OUTPUT</i>	‘OUTPUT’	C70:P101
	- Projection results per capita cost, all benefits	<i>OUTPUT</i>	‘OUTPUT’	C51:P65
	- Projected capitation fee	<i>OUTPUT</i>	‘OUTPUT’	C66:P66
<b>HCF Model SSS</b>	- SSS expenditure by type of ben., M/F, base year	<i>INPUT</i>	‘INPUT expenditure’	C9:E32
	- Total insured earnings, base year	<i>INPUT</i>	‘INPUT expenditure’	E33

	- OP/IP unit cost by hosp. type	<i>INPUT</i>	‘INPUT unit cost’	C12:E17
	- OP/IP exp. composition by hospital type	<i>INPUT</i>	‘INPUT unit cost’	C28:E74
	- Aggr. utilization OP/IP by hosp type, base year	<i>INPUT</i>	‘INPUT utilization’	E5:G38
	- OP/IP utilization rates by age & sex, base year	<i>INPUT</i>	‘INPUT utilization’	C43:F143
	- DRG case-mix index by age/sex, base-year	<i>INPUT</i>	‘INPUT utilization’	G43:H143
	- Annual cost per capita by age/sex, other Benefits	<i>INPUT</i>	‘Accident’, ‘HD’, ‘Emergency’, etc.	T12:T112, T115:T215
	- Target utilization rates by age & sex, OP & IP	<i>ASSUMPTION</i>	‘INPUT utilization’	K43:N143
	- Target pattern, case-mix index by age & sex	<i>ASSUMPTION</i>	‘INPUT utilization’	O43:P143
	- Assumed increase of utilization rates, OP & IP	<i>ASSUMPTION</i>	‘INPUT assumptions’	D9:P10
	- Assumed future increase of CMI	<i>ASSUMPTION</i>	‘INPUT assumptions’	D13:P13
	- Assumed future rate of cost increase, OP & IP	<i>ASSUMPTION</i>	‘INPUT assumptions’	D16:P17
	- Assumptions on cost increase for input factors	<i>ASSUMPTION</i>	‘INPUT assumptions’	D28:P33
	- Assumption on volume change of input factors	<i>ASSUMPTION</i>	‘INPUT assumptions’	D37:P52
	- Assumption on unit cost increase for other items	<i>ASSUMPTION</i>	‘INPUT assumptions’	D79:P94
	- Assumption on UR increase for other items	<i>ASSUMPTION</i>	‘INPUT assumptions’	D97:P112
	- Assumption on cost increase for other BL	<i>ASSUMPTION</i>	‘INPUT assumptions’	D134:P136
	- Projected expenditure by item and total	<i>OUTPUT</i>	‘OUTPUT’	D8:P32
	- Projection results for OP & IP utilization, CMI	<i>OUTPUT</i>	‘OUTPUT’	D46:P62
	- Projected OP/ IP unit cost & cost structure	<i>OUTPUT</i>	‘OUTPUT’	D98:P129
	- Projected per capita cost, all benefits	<i>OUTPUT</i>	‘OUTPUT’	D65:P86
	- Projected capitation fee	<i>OUTPUT</i>	‘OUTPUT’	D90:P95
<b>HCF Model CSMBS</b>	- Expenditure by type of benefit, base year	<i>INPUT</i>	‘INPUT expenditure’	C8:F25
	- OP/IP expenditure composition by factor	<i>INPUT</i>	‘INPUT expenditure’	C32:D36, E32:F36
	- Aggr. utilization data OP/IP, DRG, base year	<i>INPUT</i>	‘INPUT utilization’	E5:H17
	- OP/IP utilization rates by age/sex, base year	<i>INPUT</i>	‘INPUT utilization’	C25:F125
	- DRG case-mix index by age/sex, base-year	<i>INPUT</i>	‘INPUT utilization’	G25:H125
	- Annual cost per capita checkups by age & sex	<i>INPUT</i>	‘OP checkups’	T12:T112, T115:215



	- Target utilization rates by age & sex, OP & IP	<i>ASSUMPTION</i>	‘INPUT utilization’	K25:N125
	- Target pattern, case-mix index by age/sex	<i>ASSUMPTION</i>	‘INPUT utilization’	O25:P125
	- Assumed increase of utilization rates, OP/IP	<i>ASSUMPTION</i>	‘INPUT assumptions’	D9:P10
	- Assumed future increase of CMI	<i>ASSUMPTION</i>	‘INPUT assumptions’	D13:P13
	- Assumed future rate of cost increase, OP & IP	<i>ASSUMPTION</i>	‘INPUT assumptions’	D16:P17
	- Assumptions on cost increase for input factors	<i>ASSUMPTION</i>	‘INPUT assumptions’	D29:P33
	- Assumption on volume change of input factors	<i>ASSUMPTION</i>	‘INPUT assumptions’	D36:P47
	- Ass. on unit cost incr. for other items	<i>ASSUMPTION</i>	‘INPUT assumptions’	D71:P80
	- Assumption on UR incr. for other items	<i>ASSUMPTION</i>	‘INPUT assumptions’	D83:P92
	- Assumption on cost increase for other BL	<i>ASSUMPTION</i>	‘INPUT assumptions’	D110:P111
	- Projection expenditure by ben. item and total	<i>OUTPUT</i>	‘OUTPUT’	D7:P25
	- Projected utilization, OP/IP and ARWs	<i>OUTPUT</i>	‘OUTPUT’	D39:P49
	- Projected unit cost OP/IP & cost structure	<i>OUTPUT</i>	‘OUTPUT’	D65:P88
	- Projected per capita cost, all ben. and total	<i>OUTPUT</i>	‘OUTPUT’	D53:P61
	- Projected PAYG cost rate	<i>OUTPUT</i>	‘OUTPUT’	D30:P30



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## Annex E

### EXCEL model worksheets - HCFM

1. <u>Universal Coverage Scheme (EXCEL file 'HCF Model CSMBS')</u> .....	55
a) Model settings: <i>sheet 'CONFIG'</i>	
b) Input sheets:	
- Base year expenditure: <i>worksheet 'INPUT expenditure'</i>	
- Base year utilization data: <i>worksheet 'INPUT utilization'</i>	
c) Assumptions: <i>worksheet 'ASSUMPTIONS'</i>	
d) Results: <i>worksheet 'OUTPUT'</i>	
2. <u>Social Security Scheme (EXCEL file 'HCF Model UC')</u> .....	60
a) Model settings: <i>sheet 'CONFIG'</i>	
b) Input sheets:	
- Base year expenditure: <i>worksheet 'INPUT expenditure'</i>	
- Base year cost structure data: <i>worksheet 'INPUT unit cost'</i>	
- Base year utilization data: <i>worksheet 'INPUT utilization'</i>	
c) Assumptions: <i>worksheet 'ASSUMPTIONS'</i>	
d) Results: <i>worksheet 'OUTPUT'</i>	
3. <u>Civil Servants' Medical Benefits Scheme (file 'HCF Model SSS')</u> .....	66
a) Model settings: <i>sheet 'CONFIG'</i>	
b) Input sheets:	
- Base year expenditure: <i>worksheet 'INPUT expenditure'</i>	
- Base year utilization data: <i>worksheet 'INPUT unit cost'</i>	
- Base year utilization data: <i>worksheet 'INPUT utilization'</i>	
c) Assumptions: <i>worksheet 'ASSUMPTIONS'</i>	
d) Results: <i>worksheet 'OUTPUT'</i>	

# CSMBS Health Care Financing Model

## MODEL CONFIGURATION

### *Choose settings for expenditure projection:*

STEP 1: Select base year for projections:


*Go to sheet 'INPUT expenditure' and enter base year expenditure data*

STEP 2: Set projection horizon (end/target year):


*Go to sheets 'CovPop M/F' and insert scheme coverage for projection period*

STEP 3: Select method for projecting OP utilization rates:


*Go to sheet 'INPUT assumptions' to enter assumptions on OP utilization rates*

STEP 4: Select method for projecting IP utilization rate :


*Go to sheet 'INPUT assumptions' to enter assumptions on IP utilization rates*

STEP 5: Select method for projecting IP expenditure:


*Go to sheet 'INPUT utilization' to enter DRG-related base-year data*

STEP 6: Select method for projecting the DRG case-mix index :

*Go to sheet 'INPUT assumptions' and enter assumptions on CMI increase*

STEP 7: Select method for setting cost increase :

*Go to sheet 'INPUT assumptions' and insert assumptions for Factor Model*

*Go to sheet 'OUTPUT' for viewing projection results*

STEP 8: Print settings and projection results:

# INPUT SHEET 1: BASE YEAR EXPENDITURE DATA AND COST STRUCTURE, CSMBS

Data for the fiscal year:

2007

Expenditure/budget by benefit item	Male	Female	share of male	Total
1) Outpatient care (total)	14,059,620,656	16,772,880,783	45.6%	30,832,501,439
Medical checkups	727,002,176	587,934,312		1,314,936,488
Hemodialysis	700,810,000	689,430,000	50.4%	1,391,460,000
High cost cancer drugs	-	-		-
Medical instruments	-	-		-
HIV/AIDS	-	-		-
General outpatient care	12,631,808,480	15,495,516,471		28,127,324,951
Other benefit OP (if any)	-	-		-
2) Inpatient care (total)	7,730,318,976	7,918,231,024	49.4%	15,648,550,000
Room and board	1,036,050,956	1,171,650,057		2,207,701,013
Medical instruments	691,754,727	695,231,526		1,386,986,254
Per diems for non acute and subacute care	-	-		-
General inpatient care (DRG)	6,002,513,293	6,051,349,441	49.8%	12,053,862,733
Other benefit IP (if any)	-	-		-
<b>SUBTOTAL</b>	21,789,939,633	24,691,111,806	46.9%	46,481,051,439
Administration cost				35,000,000
Other cost (if any)				-
<b>TOTAL EXPENDITURE</b>				<b>46,516,051,439</b>

## Composition of cost

Cost factors (from billing data)	Outpatient care		Inpatient care	
	Amount	share in total	Amount	share in total
Service charges	1,363,802,525	4.8%	4,104,340,261	34.1%
Essential drugs given	11,089,341,999	39.4%	2,310,725,486	19.2%
Non essential drugs	7,647,686,356	27.2%	2,310,725,486	19.2%
Medical consumables & laboratory	6,489,070,209	23.1%	3,326,866,114	27.6%
Other cost	1,537,423,861	5.5%	-	0.0%
<b>TOTAL</b>	28,127,324,951	100.0%	12,053,862,733	100.0%

## Daily allowances (per diems)

Acute care	600
Non-acute and sub-acute care	-

## INPUT SHEET 2: BASE YEAR DATA BENEFIT UTILIZATION, CSMBS

UTILIZATION DATA	2007	Male	Female	total	% male
Outpatient contacts (total)		8,391,722	11,608,278	20,000,000	42.0%
Annual checkups		873,707	580,253	1,453,960	
Hemodialysis (OP) visits		347,756	378,331	726,087	
HIV/AIDS		-	-	0	
Other benefit OP (if any)		-	-	0	
General OP contacts (GOP)		7,170,259	10,649,694	17,819,953	
Total admissions (IP)		313,191	380,015	693,206	
Adjusted relative weights (ARWs)		423,883	449,506	873,388	
Hospital days (total)		2,158,984	2,327,384	4,486,368	
Days of non-acute care					
GOP utilization rate (contacts/pers/year)		4.131	5.253	4.716	
GIP utilization rate (adm/per/year)		0.154	0.172	0.163	
Case-mix index (ARWs per adm.)		1.353	1.183	1.260	

### Base-year utilization rates and case-mix index by age/sex cohort

Age	Utilization rates				Case-mix index	
	OP		IP			
	M	F	M	F	M	F
0	4.374	5.215	0.519	0.408	0.756	0.802
1	3.321	3.595	0.361	0.268	0.500	0.469
2	2.781	2.807	0.263	0.202	0.494	0.476
3	2.355	2.227	0.176	0.151	0.521	0.497
4	2.024	1.813	0.128	0.104	0.543	0.525
5	1.767	1.526	0.098	0.079	0.629	0.539
6	1.566	1.334	0.092	0.073	0.559	0.577
7	1.408	1.207	0.080	0.066	0.610	0.628
8	1.280	1.121	0.065	0.048	0.559	0.570
9	1.171	1.057	0.067	0.051	0.620	0.531
10	1.073	1.000	0.066	0.054	0.564	0.596
11	0.981	0.941	0.061	0.049	0.694	0.673
12	0.890	0.873	0.055	0.042	0.636	0.747
13	0.799	0.798	0.050	0.041	0.782	0.715
14	0.709	0.718	0.055	0.043	0.874	0.790
15	0.624	0.643	0.051	0.046	0.944	0.747
16	0.549	0.585	0.057	0.059	1.062	0.751
17	0.491	0.565	0.057	0.066	1.066	0.658
18	0.461	0.603	0.054	0.066	1.081	0.715
19	0.470	0.729	0.049	0.064	1.167	0.783
20	0.533	0.974	0.139	0.287	1.347	0.637
21	0.858	2.183	0.066	0.216	0.923	0.745
22	1.019	2.422	0.052	0.195	1.236	0.744
23	1.150	2.599	0.057	0.226	1.278	0.719
24	1.253	2.725	0.062	0.212	1.017	0.771
25	1.332	2.808	0.065	0.229	1.103	0.761
26	1.391	2.857	0.054	0.206	1.126	0.779
27	1.434	2.878	0.058	0.226	1.320	0.791
28	1.463	2.879	0.053	0.221	1.110	0.808
29	1.482	2.865	0.056	0.218	1.069	0.814

### INPUT SHEET 3: ASSUMPTIONS AND UNIT COST FACTOR MODEL

Fill-in only cells highlighted in grey where necessary

ASSUMPTIONS ON OP & IP CARE	2008	2009	2010	2011	2012
<b>a) Specify increase of utilization rates for OP/IP care (if uniform increase assumed)</b>					
OP care (contacts/person)	2%	1%	1%	1%	1%
IP care (admissions/person)	4%	1%	1%	1%	1%
<b>b) Specify annual increase of case-mix index (if uniform increase)</b>					
DRG case-mix index (ARWs/admission)	-1.59%	2.0%	2.0%	2.0%	2.0%
<b>c) Specify assumption on unit cost increase for OP and IP care (SEE FACTOR MODEL)</b>					
Rate of OP unit cost increase	See below: Factor Model				
Rate of IP unit cost increase (Cost/ARW)	See below: Factor Model				

<b>Economic Benchmark Variables (from economic and labour force module)</b>					
CPI increase	6.9%	5.8%	4.7%	3.6%	2.5%
Average labour cost increase (employees)	8.0%	7.5%	7.8%	6.7%	5.6%
Labour cost increase in public sector	11.0%	6.0%	6.0%	6.0%	6.0%

#### FACTOR MODEL FOR OP/IP UNIT COST

<b>a) Specify unit cost increase/decrease of input factors</b>					
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	Assume CPI	6.9%	5.8%	4.7%	3.6%
<b>b) Specify assumed change of input intensity for OP cost factors (volume change of input factors per OP contact)</b>					
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%
<b>c) Specify assumed change of input intensity for IP cost factors (volume change of input factors per admission or per ARW respectively)</b>					
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%
<b>OP input factor cost increase/decrease (combined effect of change in price and input intensity of cost factors)</b>					
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%
<b>IP input factor cost increase/decrease (combined effect of change in price and input intensity of cost factors)</b>					
Service charges		0.0%	0.0%	6.0%	6.0%
Essential drugs		3.5%	3.5%	3.5%	3.5%
Non essential drugs		8.9%	7.8%	6.7%	5.5%
Medical consumables & laboratory		1.0%	1.0%	4.6%	3.5%
Other cost		5.8%	4.7%	3.6%	2.5%
<b>Aggregate rate of cost increase/decrease</b>					
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%

#### ASSUMPTIONS FOR OTHER BENEFITS

<b>a) Specify assumed rate of unit cost increase/decrease for other benefits</b>					
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					

## HCF MODEL CSMBS: EXPENDITURE PROJECTION

	<b>BASE YEAR PROJECTION</b>					
<b>BENEFIT EXPENDITURE (mio THB)</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b>Outpatient care</b>	<b>30,832.50</b>	<b>38,803.34</b>	<b>46,355.96</b>	<b>52,042.53</b>	<b>57,384.90</b>	<b>61,633.51</b>
Annual checkups	1,314.94	1,334.57	1,354.89	1,376.40	1,538.11	1,603.43
Hemodialysis	1,391.46	1,754.05	2,020.44	2,227.52	2,582.47	2,715.71
High cost cancer drugs	-	-	-	-	-	-
Medical instruments OP	-	-	-	-	-	-
HIV/AIDS (drugs & diagnostics)	-	-	-	-	-	-
General OP care	28,127.32	35,714.71	42,980.64	48,438.61	53,264.32	57,314.38
Other benefit OP (if any)	-	-	-	-	-	-
<b>Inpatient care</b>	<b>15,648.55</b>	<b>16,101.14</b>	<b>17,259.19</b>	<b>18,479.07</b>	<b>20,376.15</b>	<b>22,059.14</b>
Room and board (per diems)	2,207.70	2,308.96	2,347.44	2,387.73	2,716.65	2,885.05
Medical instruments IP	1,386.99	1,386.99	1,440.98	1,496.80	1,710.44	1,820.38
Non acute and sub-acute care (per diems)	-	-	-	-	-	-
General inpatient care (DRG payments)	12,053.86	12,405.20	13,470.78	14,594.54	15,949.06	17,353.71
Other benefit IP (if any)	-	-	-	-	-	-
<b>TOTAL BENEFIT EXPENDITURE</b>	<b>46,481.05</b>	<b>54,904.48</b>	<b>63,615.15</b>	<b>70,521.59</b>	<b>77,761.05</b>	<b>83,692.65</b>
Administration cost	35.00	37.10	39.33	41.69	44.19	46.84
Other cost	-	-	-	-	-	-
<b>TOTAL EXPENDITURE</b>	<b>46,516.05</b>	<b>54,941.58</b>	<b>63,654.48</b>	<b>70,563.28</b>	<b>77,805.24</b>	<b>83,739.49</b>
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%
<b>PAYG cost ratio</b>						
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
<b>COVERAGE</b>						
Registered persons	4,241,076	4,276,991	4,283,944	4,293,656	4,309,804	4,334,924
Male	2,031,245	2,039,956	2,043,310	2,047,981	2,055,596	2,067,426
Female	2,209,831	2,237,035	2,240,634	2,245,676	2,254,208	2,267,498
<b>UTILIZATION</b>						
Outpatient visits	20,000,000	20,785,333	21,323,659	21,855,979	22,382,312	22,926,509
Annual checkups	1,453,960	1,477,322	1,500,874	1,524,887	1,550,093	1,576,968
Hemodialysis cases	726,087	915,295	1,054,300	1,162,359	1,225,067	1,256,852
General OP contacts	17,819,953	18,392,717	18,768,486	19,168,733	19,607,152	20,092,689
IP admissions	693,206	725,000	737,082	749,733	763,923	779,848
IP adjusted relative DRG weights (ARWs)	873,388	898,845	935,353	973,789	1,015,423	1,060,479
Total hospital days	4,486,368	4,692,136	4,770,329	4,852,205	4,944,044	5,047,105
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
<b>COST PER CAPITA (THB per person)</b>						
Outpatient care (total)	6,942.2	8,662.5	10,349.2	11,602.0	12,715.8	13,591.4
Annual medical checkups	310.0	312.0	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	8,350.4	10,033.0	11,281.4	12,358.9	13,221.5
Inpatient care	3,689.8	3,764.6	4,028.8	4,303.8	4,727.9	5,088.7
Other benefits	-	-	-	-	-	-
<b>SUBTOTAL</b>	<b>10,631.9</b>	<b>12,427.1</b>	<b>14,378.0</b>	<b>15,905.8</b>	<b>17,443.6</b>	<b>18,680.1</b>
Administration cost	0.0	0.0	0.0	0.0	0.0	0.0
<b>TOTAL</b>	<b>10,631.9</b>	<b>12,427.1</b>	<b>14,378.0</b>	<b>15,905.8</b>	<b>17,443.6</b>	<b>18,680.1</b>
<b>COST STRUCTURE</b>						
<b>Unit cost OP (cost/contact)</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Service charges	1,541.6	1,941.8	2,290.0	2,527.0	2,716.6	2,852.5
Essential drugs given	74.7	74.7	74.7	74.7	79.2	84.0
Non essential drugs	607.8	753.8	849.9	914.7	961.0	994.9
Medical consumables & laboratory	419.2	624.8	841.9	988.1	1,095.6	1,173.5
Other cost	355.7	394.8	424.4	445.6	473.2	489.9
Unit cost OP composition (%)	84.3	93.7	99.1	103.8	107.5	110.2
<b>Unit cost OP composition (%)</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>




## UC Health Care Financing Model

### MODEL CONFIGURATION


#### *Choose settings for expenditure projections:*

STEP 1: Select base year for projections:

2007 


*Go to sheet 'INPUT expenditure' and enter base year expenditure data*

STEP 2: Set projection horizon (end/target year):

2020 


*Go to sheets 'CovPop M/F' and insert scheme coverage for projection period*

STEP 3: Select method for setting base year unit cost for OP/IP:

Endogenous (from expenditure) 


*Proceed to step 4*

STEP 4: Select method for projecting OP utilization rates:

Uniform increase (in % p.a.) 

*Go to sheet 'INPUT assumptions' to enter assumptions on OP utilization rates*

STEP 5: Select method for projecting IP utilization rate :

Uniform increase (in % p.a.) 


*Go to sheet 'INPUT assumptions' to enter assumptions on IP utilization rates*

STEP 6: Select method for projecting IP expenditure:

Use DRG base-rate (cost/ARW) 


*Go to sheet 'INPUT utilization' to enter DRG-related base-year data*

STEP 7: Select method for projecting the DRG case-mix index :

Use CMI by age/sex & uniform change 

*Go to sheet 'INPUT assumptions' and enter assumptions on CMI increase*

STEP 8: Select method for setting cost increase :

Determine with Factor Model 

*Go to sheet 'INPUT assumptions' and insert assumptions for Factor Model*

*Go to sheet 'OUTPUT' for viewing projection results*

STEP 9: Print settings and projection results:

## INPUT SHEET 1: BASE YEAR EXPENDITURE DATA - UC

*Fill-in cells highlighted in grey where required*

Data for the fiscal year:

2007

<b>Expenditure/budget by benefit item</b>	<b>Male</b>	<b>Female</b>	<b>% male</b>	<b>Total</b>
Outpatient care	14,004,085,613	16,954,219,573	45.2%	30,958,305,186
Inpatient care	17,139,910,642	20,750,644,958	45.2%	37,890,555,600
Prevention and promotion (PP)	3,999,173,724	7,427,036,916	35.0%	11,426,210,640
Pregnancy PP programme	-	1,450,947,252		1,450,947,252
Other PP activities	3,999,173,724	5,976,089,664		9,975,263,388
Emergency medical transportation	230,330,000	230,330,000	50.0%	460,660,000
Disability care (medical instruments)	92,132,000	92,132,000	50.0%	184,264,000
Capital replacement cost	3,283,354,150	3,283,354,150	50.0%	6,566,708,300
Compensation for malpractice	12,207,490	12,207,490	50.0%	24,414,980
Care for non-registered				-
Other benefits 1				-
Other benefits 2				-
<b>SUBTOTAL 1</b>	<b>38,761,193,619</b>	<b>48,749,925,087</b>	<b>44.3%</b>	<b>87,511,118,706</b>
HIV/AIDS	1,927,800,000	1,927,800,000		3,855,600,000
Chronic Renal Failure	-	-		-
Other				-
<b>SUBTOTAL 2</b>	<b>40,688,993,619</b>	<b>50,677,725,087</b>	<b>44.5%</b>	<b>91,366,718,706</b>
Administration cost				811,200,000
<b>GRAND TOTAL</b>				<b>92,177,918,706</b>

## INPUT SHEET 2: BASE YEAR UNIT COST AND COST STRUCTURE - UC

Fill-in cells highlighted in grey where required

INPUT data for the fiscal year:

2007

a) Proceed to next step

	OPD	IPD*
For unit cost, see result in sheet 'OUTPUT'	270	8,500

\*Average cost per admission or per ARW, see settings STEP 6

b) Specify cost structure for OP care

COST STRUCTURE FOR GENERAL OP CARE		
Component	Share in total cost*	OP unit cost break-up
Labour cost	48.6%	125.9
Labour cost P	27.4%	71.1
Labour cost T	5.1%	13.3
Labour cost S	16.0%	41.4
Pharmaceuticals	19.0%	49.3
Medical consumables	10.0%	25.8
Other cost	22.5%	58.3
TOTAL	100.0%	259.4

\*Based on aggregate accounting data

c) Specify cost structure for IP care

COST STRUCTURE FOR GENERAL IP CARE		
Component	Share in total cost*	IP unit cost break-up
Labour cost	48.6%	4156.3
Labour cost P	27.4%	2348.0
Labour cost T	5.1%	440.4
Labour cost S	16.0%	1367.9
Pharmaceuticals	19.0%	1628.0
Medical consumables	10.0%	852.5
Other cost	22.5%	1922.8
TOTAL	100.0%	8,559.6

\*Based on aggregate accounting data

### INPUT SHEET 3: BASE YEAR UTILIZATION DATA - UC

<b>UTILIZATION DATA</b>	<b>2007</b>	<b>male</b>	<b>female</b>	<b>total</b>
Nr. of outpatient contacts		58,814,506	60,549,685	119,364,191
Chronic renal failure				
Other OP contacts				
Nr. of admissions (IP)		2,175,994	2,635,613	4,811,607
Nr. of hospital days		9,342,678	9,249,845	18,592,523
Total adjusted relative weights (ARWs)		2,216,994	2,209,684	4,426,679
Case-mix index (ARWs per adm.)		1.033	0.850	0.920
Average GOP utilization rate (cont/pers)		2.555	2.555	2.555
Average GIP utilization rate (adm/pers.)		0.095	0.111	0.103

#### Base-year utilization rates and case-mix index by age/sex cohort

Age	Utilization rates				Case-mix index	
	OP		IP			
	M	F	M	F	M	F
0	4.374	5.215	0.519	0.408	0.756	0.802
1	3.321	3.595	0.361	0.268	0.500	0.469
2	2.781	2.807	0.263	0.202	0.494	0.476
3	2.355	2.227	0.176	0.151	0.521	0.497
4	2.024	1.813	0.128	0.104	0.543	0.525
5	1.767	1.526	0.098	0.079	0.629	0.539
6	1.566	1.334	0.092	0.073	0.559	0.577
7	1.408	1.207	0.080	0.066	0.610	0.628
8	1.280	1.121	0.065	0.048	0.559	0.570
9	1.171	1.057	0.067	0.051	0.620	0.531
10	1.073	1.000	0.066	0.054	0.564	0.596
11	0.981	0.941	0.061	0.049	0.694	0.673
12	0.890	0.873	0.055	0.042	0.636	0.747
13	0.799	0.798	0.050	0.041	0.782	0.715
14	0.709	0.718	0.055	0.043	0.874	0.790
15	0.624	0.643	0.051	0.046	0.944	0.747
16	0.549	0.585	0.057	0.059	1.062	0.751
17	0.491	0.565	0.057	0.066	1.066	0.658
18	0.461	0.603	0.054	0.066	1.081	0.715
19	0.470	0.729	0.049	0.064	1.167	0.783
20	0.533	0.974	0.139	0.287	1.347	0.637
21	0.858	2.183	0.066	0.216	0.923	0.745
22	1.019	2.422	0.052	0.195	1.236	0.744
23	1.150	2.599	0.057	0.226	1.278	0.719
24	1.253	2.725	0.062	0.212	1.017	0.771
25	1.332	2.808	0.065	0.229	1.103	0.761

## UC HCFMODEL INPUT SHEET: ASSUMPTIONS AND UNIT COST FACTOR MODEL

Fill-in only cells highlighted in grey where necessary

	2008	2009	2010	2011	2012	2013	2014	2015
<b>1. Assumptions for OP and IP</b>								
<b>Specify rate of increase of age-specific utilization rates for general OP care</b>								
Assumed annual increase of utilization rate for O		2%	2%	2%	2%	2%	2%	2%
<b>Specify increase of utilization rate for IP care</b>								
Assumed annual increase of utilization rate for IP		2%	2%	2%	2%	2%	2%	2%
<b>Specify annual increase of case-mix index per admission</b>								
DRG case-mix index (ARWs/admission)		2%	2%	2%	2%	2%	2%	2%
<b>Proceed to FACTOR MODEL below</b>								
Rate of GOP unit cost increase	GO TO Factor Model	7%	7%	7%	7%	7%	7%	7%
Rate of IP unit cost increase (cost/adm)	Go TO Factor Model	7%	7%	7%	7%	7%	7%	7%
<b>Economic Benchmark Variables (from economic and labour force module)</b>								
CPI increase		5.0%	4.0%	3.5%	3.0%	2.5%	2.5%	2.5%
Average labour cost increase (employees)		6.4%	5.1%	5.1%	5.0%	5.0%	4.9%	4.8%
Labour cost increase in public sector		9.3%	7.5%	7.4%	7.3%	7.2%	7.2%	7.1%
<b>2. FACTOR MODEL FOR OP &amp; IP UNIT COST</b>								
<b>Specify unit cost increase of input factors</b>								
Labour cost (P)		6%	6%	6%	6%	6%	6%	6%
Labour cost (T)		6%	6%	6%	6%	6%	6%	6%
Labour cost (S)		6%	6%	6%	6%	6%	6%	6%
Drugs		6%	6%	6%	5%	5%	5%	5%
Medical consumables		5%	5%	5%	4%	4%	4%	4%
Other cost (use CPI?)		4%	4%	4%	3%	3%	3%	3%
<b>Specify assumed change of input intensity for OP cost factors (volume change of input factors per OP contact)</b>								
Labour cost (P)	See supply side module	2%	2%	2%	2%	2%	2%	2%
Labour cost (T)		2%	2%	2%	2%	2%	2%	2%
Labour cost (S)		2%	2%	2%	2%	2%	2%	2%
Drugs		1%	1%	1%	1%	1%	1%	1%
Medical consumables		1%	1%	1%	1%	1%	1%	1%
Other cost		0%	0%	0%	0%	0%	0%	0%
<b>Specify assumed change of Input intensity for IP cost factors (volume change of input factors per admission or per ARW respectively)</b>								
Labour cost (P)	See supply side module	2%	2%	2%	2%	2%	2%	2%
Labour cost (T)		2%	2%	2%	2%	2%	2%	2%
Labour cost (S)		2%	2%	2%	2%	2%	2%	2%
Drugs		1%	1%	1%	1%	1%	1%	1%
Medical consumables		1%	1%	1%	1%	1%	1%	1%
Other cost		0%	0%	0%	0%	0%	0%	0%
<b>OP input factor cost increase (combined effect of change in price and input intensity of cost factors)</b>								
Labour cost (P)		8%	8%	8%	8%	8%	8%	8%
Labour cost (T)		8%	8%	8%	8%	8%	8%	8%
Labour cost (S)		8%	8%	8%	8%	8%	8%	8%
Drugs		7%	7%	7%	7%	6%	6%	6%
Medical consumables		6%	6%	6%	5%	5%	5%	5%
Other cost		4%	4%	4%	3%	3%	3%	3%
<b>IP input factor cost increase (combined effect of change in price and input intensity of cost factors)</b>								
Labour cost (P)		8%	8%	8%	8%	8%	8%	8%
Labour cost (T)		8%	8%	8%	8%	8%	8%	8%
Labour cost (S)		8%	8%	8%	8%	8%	8%	8%
Drugs		7%	7%	7%	7%	6%	6%	6%
Medical consumables		6%	6%	6%	5%	5%	5%	5%
Other cost		4%	4%	4%	3%	3%	3%	3%
<b>Aggregate rate of cost increase</b>								
OP unit cost		7%	7%	7%	7%	7%	6%	6%
IP unit cost increase (cost/adm)		7%	7%	7%	7%	7%	6%	6%
<b>3. OTHER BENEFITS AND PROGRAMMES</b>								
<b>Specify unit cost increase for other benefits/programmes (in % p.a.)</b>								
Disease prevention and health promotion (P & P)		5%	5%	5%	5%	5%	5%	5%
Emergency transportation and paramedics		5%	5%	5%	5%	5%	5%	5%
Disability care (prosthesis)		5%	5%	5%	5%	5%	5%	5%
Compensation malpractice		5%	5%	5%	5%	5%	5%	5%
Care for the non-registered		5%	5%	5%	5%	5%	5%	5%
HIV/AIDS		5%	5%	5%	5%	5%	5%	5%
Chronic Renal Failure		5%	5%	5%	5%	5%	5%	5%
Other benefit 1		0%	0%	0%	0%	0%	0%	0%
Other benefit 2		0%	0%	0%	0%	0%	0%	0%
<b>Specify utilisation rate increase for other benefits/programmes (in % p.a.)</b>								
Disease prevention and health promotion (P & P)		5%	5%	5%	5%	5%	5%	5%
Emergency transportation and paramedics		5%	5%	5%	5%	5%	5%	5%
Disability care (prosthesis)		5%	5%	5%	5%	5%	5%	5%
Compensation malpractice		5%	5%	5%	5%	5%	5%	5%
Care for the non-registered		5%	5%	5%	5%	5%	5%	5%
HIV/AIDS		5%	5%	5%	5%	5%	5%	5%
Chronic Renal Failure		5%	5%	5%	5%	5%	5%	5%
Other benefit 1		0%	0%	0%	0%	0%	0%	0%
Other benefit 2		0%	0%	0%	0%	0%	0%	0%
<b>Aggregate rate of cost increase for other benefits/programmes (price and volume, in % p.a.)</b>								
Disease prevention and health promotion (P & P)		10%	10%	10%	10%	10%	10%	10%
Emergency transportation and paramedics		10%	10%	10%	10%	10%	10%	10%
Disability care (prosthesis)		10%	10%	10%	10%	10%	10%	10%
Compensation malpractice		10%	10%	10%	10%	10%	10%	10%
Care for non-registered		10%	10%	10%	10%	10%	10%	10%
HIV/AIDS		10%	10%	10%	10%	10%	10%	10%
Chronic Renal Failure		10%	10%	10%	10%	10%	10%	10%
Other benefit 1		0%	0%	0%	0%	0%	0%	0%
Other benefit 2		0%	0%	0%	0%	0%	0%	0%
<b>Specify rate of increase for other budget lines</b>								
Administration cost		10%	10%	10%	10%	10%	10%	10%

# HCF MODEL UC: PROJECTION RESULTS


		BASE YEAR PROJECTION					
		1	2	3	4	5	6
BENEFIT EXPENDITURE (mio THB)	2007	2008	2009	2010	2011	2012	2013
Outpatient care benefits	30 958,31	33 978,04	37 408,62	41 182,59	45 324,20	49 842,97	54 791,55
Inpatient care benefits	37 890,56	39 326,71	44 121,40	49 585,51	55 812,11	62 832,34	70 737,30
Prevention and promotion (PP)	9 975,26	11 095,73	12 362,53	13 798,95	15 381,94	17 157,30	19 116,13
Emergency medical care (paramedics)	460,66	507,88	559,94	617,33	680,60	750,37	827,28
Disability care (prosthesis)	184,26	203,15	223,97	246,93	272,24	300,15	330,91
Capital replacement cost	6 566,71	6 330,04	7 041,94	7 842,53	8 738,87	9 737,45	10 848,37
Compensation malpractice	24,41	26,92	29,68	32,72	36,07	39,77	43,85
Care for non-registered	-	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-	-
<b>SUBTOTAL</b>	<b>86 060,17</b>	<b>91 468,46</b>	<b>101 748,07</b>	<b>113 306,56</b>	<b>126 246,03</b>	<b>140 660,34</b>	<b>156 695,40</b>
HIV/AIDS	3 855,60	4 250,80	4 686,51	5 166,87	5 696,48	6 280,37	6 924,10
Chronic Renal Failure	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
<b>TOTAL BENEFIT EXPENDITURE</b>	<b>89 915,77</b>	<b>95 719,26</b>	<b>106 434,58</b>	<b>118 473,43</b>	<b>131 942,51</b>	<b>146 940,71</b>	<b>163 619,50</b>
Administration cost	811,20	892,32	981,55	1 079,71	1 187,68	1 306,45	1 437,09
<b>TOTAL EXPENDITURE</b>	<b>90 726,97</b>	<b>96 611,58</b>	<b>107 416,13</b>	<b>119 553,14</b>	<b>133 130,19</b>	<b>148 247,15</b>	<b>165 056,59</b>
<b>COVERAGE</b>							
Registered persons	46 672 434	46 693 793	46 744 647	46 792 685	46 827 540	46 822 717	46 796 680
Male	22 996 982	22 974 343	22 950 757	22 926 514	22 895 828	22 845 399	22 784 758
Female	23 675 452	23 719 450	23 793 890	23 866 170	23 931 712	23 977 318	24 011 922
<b>UTILIZATION</b>							
General OP visits	115 566 973	118 793 153	122 463 884	126 328 703	130 367 024	134 516 379	138 831 921
IP admissions	4 442 611	4 527 981	4 639 356	4 759 573	4 889 314	5 023 362	5 162 379
IP adjusted relative DRG weights (ARWs)	4 142 936	4 318 485	4 536 661	4 777 426	5 042 162	5 326 049	5 629 567
Total hospital days	18 592 523	18 949 800	19 415 912	19 919 022	20 461 995	21 022 991	21 604 786
OP contacts/person (avg)	2,48	2,54	2,62	2,70	2,78	2,87	2,97
IP admissions/person (avg)	0,095	0,097	0,099	0,102	0,104	0,107	0,110
Average case-mix index (ARWs/adm)	0,933	0,954	0,978	1,004	1,031	1,060	1,090
Length of stay (Hdays per admission)	4,185	4,185	4,185	4,185	4,185	4,185	4,185
<b>COST PER CAPITA (THB per person)</b>							
Outpatient care	663,3	727,7	800,3	880,1	967,9	1 064,5	1 170,8
Chronic Renal Failure	-	-	-	-	-	-	-
General Outpatient Care	-	-	-	-	-	-	-
Inpatient care	811,8	842,2	943,9	1 059,7	1 191,9	1 341,9	1 511,6
Prevention and promotion (PP)	213,7	237,6	264,5	294,9	328,5	366,4	408,5
Emergency medical care	9,9	10,9	12,0	13,2	14,5	16,0	17,7
Disability care (prosthesis)	3,9	4,4	4,8	5,3	5,8	6,4	7,1
Capital replacement cost	140,7	135,6	150,6	167,6	186,6	208,0	231,8
Compensation for malpractice	0,5	0,6	0,6	0,7	0,8	0,8	0,9
Care for non-registered	-	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-	-
Other benefits 1	-	-	-	-	-	-	-
<b>SUBTOTAL</b>	<b>1 843,9</b>	<b>1 958,9</b>	<b>2 176,7</b>	<b>2 421,5</b>	<b>2 696,0</b>	<b>3 004,1</b>	<b>3 348,4</b>
HIV/Aids	82,6	91,0	100,3	110,4	121,6	134,1	148,0
Other expenditure	-	-	-	-	-	-	-
<b>TOTAL (excl. admin cost)</b>	<b>1 926,5</b>	<b>2 049,9</b>	<b>2 276,9</b>	<b>2 531,9</b>	<b>2 817,6</b>	<b>3 138,2</b>	<b>3 496,4</b>
<b>UNIT COST STRUCTURE</b>							
<b>Unit cost OP (cost/contact)</b>	<b>267,9</b>	<b>286,0</b>	<b>305,5</b>	<b>326,0</b>	<b>347,7</b>	<b>370,5</b>	<b>394,7</b>
Labour cost	120,5	130,3	140,9	152,4	164,7	178,1	192,6
Labour P	53,6	57,9	62,6	67,7	73,2	79,2	85,6
Labour T	40,2	43,4	47,0	50,8	54,9	59,4	64,2
Labour S	26,8	29,0	31,3	33,9	36,6	39,6	42,8
Drugs	53,6	57,4	61,4	65,6	70,0	74,6	79,3
Medical consumables	40,2	42,6	45,2	47,8	50,6	53,3	56,2
Other cost	53,6	55,7	57,9	60,2	62,3	64,5	66,6
<b>Unit cost OP composition (%)</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>
Labour cost	45,0%	45,6%	46,1%	46,7%	47,4%	48,1%	48,8%
Labour P	20,0%	20,3%	20,5%	20,8%	21,1%	21,4%	21,7%
Labour T	15,0%	15,2%	15,4%	15,6%	15,8%	16,0%	16,3%
Labour S	10,0%	10,1%	10,3%	10,4%	10,5%	10,7%	10,8%
Drugs	20,0%	20,1%	20,1%	20,1%	20,1%	20,1%	20,1%
Medical consumables	15,0%	14,9%	14,8%	14,7%	14,5%	14,4%	14,2%
Other cost	20,0%	19,5%	19,0%	18,5%	17,9%	17,4%	16,9%
<b>Unit cost IP (cost per admission)</b>	<b>8 528,9</b>	<b>9 106,6</b>	<b>9 725,5</b>	<b>10 379,1</b>	<b>11 069,1</b>	<b>11 797,2</b>	<b>12 565,3</b>
Labour cost	3838,0	4149,6	4486,6	4850,9	5244,8	5670,7	6131,1
Labour P	1705,8	1844,3	1994,0	2156,0	2331,0	2520,3	2725,0
Labour T	1279,3	1383,2	1495,5	1617,0	1748,3	1890,2	2043,7
Labour S	852,9	922,1	997,0	1078,0	1165,5	1260,2	1362,5
Drugs	1705,8	1826,2	1955,1	2089,6	2229,4	2374,5	2524,7
Medical consumables	1279,3	1356,7	1438,8	1523,2	1609,8	1698,3	1788,6
Other cost	1705,8	1774,0	1845,0	1915,4	1985,1	2053,6	2120,9
<b>Unit cost IP composition (%)</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>
Labour cost	45,0%	45,6%	46,1%	46,7%	47,4%	48,1%	48,8%
Labour P	20,0%	20,3%	20,5%	20,8%	21,1%	21,4%	21,7%
Labour T	15,0%	15,2%	15,4%	15,6%	15,8%	16,0%	16,3%
Labour S	10,0%	10,1%	10,3%	10,4%	10,5%	10,7%	10,8%
Drugs	20,0%	20,1%	20,1%	20,1%	20,1%	20,1%	20,1%
Medical consumables	15,0%	14,9%	14,8%	14,7%	14,5%	14,4%	14,2%
Other cost	20,0%	19,5%	19,0%	18,5%	17,9%	17,4%	16,9%

## SSS Health Care Financing Model

### MODEL CONFIGURATION


#### *Choose settings for expenditure projections:*

STEP 1: Select base year for projections:

2007 


*Go to sheet 'INPUT expenditure' and enter base year expenditure data*

STEP 2: Set projection horizon (end/target year):

2020 


*Go to sheets 'CovPop M/F' and insert scheme coverage for projection period*

STEP 3: Select method for setting base year unit cost for OP/IP:

Endogenous (from expenditure) 


*Proceed to step 4*

STEP 4: Select method for projecting OP utilization rates:

Uniform increase (in % p.a.) 

*Go to sheet 'INPUT assumptions' to enter assumptions on OP utilization rates*

STEP 5: Select method for projecting IP utilization rate :

Uniform increase (in % p.a.) 


*Go to sheet 'INPUT assumptions' to enter assumptions on IP utilization rates*

STEP 6: Select method for projecting IP expenditure:

Use DRG base-rate (cost/ARW) 

*Go to sheet 'INPUT utilization' to enter DRG-related base-year data*

STEP 7: Select method for projecting the DRG case-mix index :

Use CMI by age/sex & uniform change 

*Go to sheet 'INPUT assumptions' and enter assumptions on CMI increase*

STEP 8: Select method for setting cost increase :

Determine with Factor Model 

*Go to sheet 'INPUT assumptions' and insert assumptions for Factor Model*

*Go to sheet 'OUTPUT' for viewing projection results*

STEP 9: Print settings and projection results:

QuickTime™ and a  
TIF (Uncompressed) decompressor  
are needed to see this picture.

# INPUT SHEET 1: BASE YEAR EXPENDITURE DATA - SSS

Fill-in cells highlighted in grey where required

Data for the calendar year:

2007

Expenditure by benefit item	Male	Female	Total	share of private
General Outpatient Care (capitation)	3,902,425,281	4,691,729,377	8,594,154,658	55.0%
General Inpatient Care (capitation)	3,315,959,109	2,788,286,538	6,104,245,647	60.0%
Subtotal Capitation	7,218,384,390	7,480,015,915	14,698,400,305	
High cost special services	175,924,547	157,957,623	333,882,169	
Accident	117,120,119	30,015,330	147,135,448	
Emergency	101,107,606	104,953,262	206,060,869	
Medical Instruments	13,264,014	8,044,798	21,308,813	
Hemodialysis	258,199,800	156,519,000	414,718,800	
Chronic peritoneal dialysis	1,766,327	791,130	2,557,457	
Renal failure drugs	46,438,536	28,861,896	75,300,432	
HIV/AIDS (drugs and lab.)	355,939,901	269,243,584	625,183,485	
Bone marrow transplant	4,153,846	13,846,154	18,000,000	
Kidney transplant	44,271,035	29,625,234	73,896,269	
Cornea transplant*	292,200	93,921	386,121	
Dental care	104,631,243	212,982,723	317,613,967	
Artificial teeth	13,501,239	24,580,693	38,081,932	
Care for nonregistered	1,723,549	2,092,805	3,816,354	
Other benefits	-	-	-	
SUBTOTAL 1	8,456,718,353	8,519,624,069	16,976,342,421	
Sickness cash benefits			198,624,070	
Other item (?)			-	
SUBTOTAL 2	8,456,718,353	8,519,624,069	16,976,342,421	
Administration cost			454,997,574	
GRAND TOTAL			17,431,339,996	
Total Insured earnings			780,531,000,000	



## INPUT SHEET 2: BASE YEAR UNIT COST AND COST STRUCTURE BY HOSPITAL TYPE

Fill-in cells highlighted in grey where required

Data for the calendar year:

2007

a) No action required here, proceed to point b)

Hospital type	Outpatient care*		Inpatient care**	
	Unit cost	Utilization share	Unit cost**	Utilization share
MOPH center hospitals	430	33.0%	1,630	25.0%
MOPH general hospitals				
MOPH community hospitals				
Teaching (University) hospitals	720	2.5%	2,800	25.0%
Other public hospitals	510	5.3%	1,800	25.0%
Private hospitals	800	59.2%	2,750	25.0%
Weighted average (utilization-weighted)	661	100.0%	2,245	100.0%

\*Cost per outpatient contact, excluding high cost

\*\*Insert cost per admission or cost per ARW (see settings, STEP 6), excluding high cost

b) Insert OP/IP cost structure data for all hospital types:

COST STRUCTURE OP/IP BY HOSPITAL TYPE				
MOPH HOSPITALS	Cost structure (average)*			
	OPD	Cost break-up OP	IPD	Cost break-up IP
Labour cost	45.0%	n.a.	45.0%	n.a.
Labour cost P	15.0%	n.a.	15.0%	n.a.
Labour cost T	15.0%	n.a.	15.0%	n.a.
Labour cost S	15.0%	n.a.	15.0%	n.a.
Pharmaceuticals	20.0%	n.a.	20.0%	n.a.
Medical consumables	15.0%	n.a.	15.0%	n.a.
Capital cost (depreciation)	10.0%	n.a.	10.0%	n.a.
Other cost	10.0%	n.a.	10.0%	n.a.
TOTAL	100.0%	n.a.	100.0%	n.a.
*Excluding high cost care, based on accounting data				
TEACHING (UNIVERSITY) HOSPITALS	Cost structure (average)*			
	OPD	Cost break-up OP	IPD	Cost break-up IP
Labour cost	45.0%	n.a.	45.0%	n.a.
Labour cost P	15.0%	n.a.	15.0%	n.a.
Labour cost T	15.0%	n.a.	15.0%	n.a.
Labour cost S	15.0%	n.a.	15.0%	n.a.
Pharmaceuticals	20.0%	n.a.	20.0%	n.a.
Medical consumables	15.0%	n.a.	15.0%	n.a.
Capital cost (depreciation)	10.0%	n.a.	10.0%	n.a.
Other cost	10.0%	n.a.	10.0%	n.a.
TOTAL	100.0%	n.a.	100.0%	n.a.
*Excluding high cost care, based on accounting data				
OTHER PUBLIC HOSPITALS	Cost structure (average)*			
	OPD	Cost break-up OP	IPD	Cost break-up IP
Labour cost	45.0%	n.a.	45.0%	n.a.
Labour cost P	15.0%	n.a.	15.0%	n.a.
Labour cost T	15.0%	n.a.	15.0%	n.a.
Labour cost S	15.0%	n.a.	15.0%	n.a.
Pharmaceuticals	20.0%	n.a.	20.0%	n.a.
Medical consumables	15.0%	n.a.	15.0%	n.a.
Capital cost (depreciation)	10.0%	n.a.	10.0%	n.a.
Other cost	10.0%	n.a.	10.0%	n.a.
TOTAL	100.0%	n.a.	100.0%	n.a.
*Excluding high cost care, based on accounting data				
PRIVATE HOSPITALS	Cost structure (average)*			
	OPD	Cost break-up OP	IPD	Cost break-up IP

### INPUT SHEET 3: BASE YEAR UTILIZATION DATA - SSS

Fill-in cells highlighted in grey where required

UTILIZATION DATA	male	female	Total	
BASE YEAR : 2007	male	female	M & F	Share in %
Total outpatient contacts (excluding high cost)	12,382,865	12,382,865	24,765,729	100.0%
MOPH hospitals	3,095,716	3,095,716	6,191,432	25.0%
Teaching (University) hospitals	3,095,716	3,095,716	6,191,432	25.0%
Other public hospitals	3,095,716	3,095,716	6,191,432	25.0%
Private hospitals	3,095,716	3,095,716	6,191,432	25.0%
Total admissions (excluding high cost)	219,086	271,934	491,020	100.0%
MOPH hospitals	54,772	67,984	122,755	25.0%
Teaching (University) hospitals	54,772	67,984	122,755	25.0%
Other public hospitals	54,772	67,984	122,755	25.0%
Private hospitals	54,772	67,984	122,755	25.0%
Total adjusted relative weights (ARWs)	235,643	213,708	449,351	100.0%
MOPH hospitals	58,911	53,427	112,338	25.0%
Teaching (University) hospitals	58,911	53,427	112,338	25.0%
Other public hospitals	58,911	53,427	112,338	25.0%
Private hospitals	58,911	53,427	112,338	25.0%
Total hospital days	921,075	866,121	1,787,196	
HIGH COST CARE				
No. of OP contacts (high cost only)			-	
No. of admissions (high cost only)			-	
REGISTERED (year average)	4,743,303	4,815,615	9,558,918	100.0%
MOPH hospitals	1,185,826	1,203,904	2,389,730	25.0%
Teaching (University) hospitals	1,185,826	1,203,904	2,389,730	25.0%
Other public hospitals	1,185,826	1,203,904	2,389,730	25.0%
Private hospitals	1,185,826	1,203,904	2,389,730	25.0%
GOP utilization rate (contacts/person)	2.611	2.571	2.591	
GIP utilization rate (adm/person)	0.046	0.056	0.051	
Case-mix index (ARWs per adm.)	1.076	0.786	0.915	
Average LOS (Hdays/adm)	4.20	3.19	3.64	

### Base-year utilization rates and case-mix index by age/sex cohort

Age	Utilization rates				Case-mix index	
	OP		IP		M	F
	M	F	M	F		
0	0.000	0.000	0.000	0.000	0.000	0.000
1	0.000	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.000
15	0.044	0.002	0.031	0.045	0.920	0.543
16	0.063	0.074	0.036	0.057	0.921	0.580
17	0.093	0.157	0.041	0.074	1.011	0.525
18	0.134	0.237	0.044	0.067	0.996	0.565
19	0.177	0.323	0.045	0.063	0.951	0.559
20	0.229	0.407	0.047	0.072	0.955	0.558
21	0.281	0.489	0.046	0.067	0.984	0.586
22	0.337	0.563	0.045	0.066	0.958	0.590
23	0.391	0.630	0.044	0.063	0.952	0.596
24	0.447	0.698	0.043	0.060	0.950	0.600
25	0.501	0.767	0.042	0.060	0.919	0.621

## SSS HCFM INPUT SHEET - ASSUMPTIONS AND UNIT COST FACTOR MODEL

Fill-in only cells highlighted in grey where necessary

ASSUMPTIONS OP/IP benefits	2008	2009	2010	2011	2012	2013
<b>A. Specify increase of utilization rates for OP/IP care (if uniform increase assumed)</b>						
OP care (contacts/person)	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
IP care (admissions/person)	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
<b>B. Specify annual increase of case-mix index (if uniform increase)</b>						
DRG case-mix index (ARWs/admission)	5.0%	5.0%	5.0%	2.0%	2.0%	2.0%
<b>C. Specify assumption on unit cost increase for OP and IP care</b>						
Rate of OP unit cost increase	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Rate of IP unit cost increase (Cost/ARW)	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
<b>Economic Benchmark Variables (from economic and labour force module)</b>						
CPI increase	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Average labour cost increase (employees)	8.8%	7.1%	6.6%	6.1%	5.6%	5.6%
Labour cost increase in public sector	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

### FACTOR MODEL FOR OP/IP UNIT COST

<b>D. Specify unit cost increase of input factors</b>						
Labour cost P	11%	6%	3%	3%	3%	3%
Labour cost T	11%	6%	3%	3%	3%	3%
Labour cost S	11%	6%	3%	3%	3%	3%
Drugs	2%	2%	2%	2%	2%	2%
Medical consumables	1%	1%	1%	1%	1%	1%
Capital cost (depreciation)	0%	0%	0%	0%	0%	0%
Other cost (use CPI?)	0%	0%	0%	0%	0%	0%
<b>E. Specify assumed change of input intensity for OP cost factors (volume change of input factors per OP contact)</b>						
Labour cost P	0%	0%	0%	0%	0%	0%
Labour cost T	0%	0%	0%	0%	0%	0%
Labour cost S	0%	0%	0%	0%	0%	0%
Drugs	0%	0%	0%	0%	0%	0%
Medical consumables	0%	0%	0%	0%	0%	0%
Capital cost (depreciation)	0%	0%	0%	0%	0%	0%
Other cost	0%	0%	0%	0%	0%	0%
<b>F. Specify assumed change of input intensity for IP cost factors (volume change of input factors per admission or per ARW respectively)</b>						
Labour cost P	0%	0%	0%	0%	0%	0%
Labour cost T	0%	0%	0%	0%	0%	0%
Labour cost S	0%	0%	0%	0%	0%	0%
Drugs	0%	0%	0%	0%	0%	0%
Medical consumables	0%	0%	0%	0%	0%	0%
Capital cost (depreciation)	0%	0%	0%	0%	0%	0%
Other cost	0%	0%	0%	0%	0%	0%
<b>OP input factor cost increase (combined effect of change in price and input intensity of cost factors)</b>						
Labour cost P	11%	6%	3%	3%	3%	3%
Labour cost T	11%	6%	3%	3%	3%	3%
Labour cost S	11%	6%	3%	3%	3%	3%
Drugs	2%	2%	2%	2%	2%	2%
Medical consumables	1%	1%	1%	1%	1%	1%
Capital cost (depreciation)	0%	0%	0%	0%	0%	0%
Other cost	0%	0%	0%	0%	0%	0%
<b>IP input factor cost increase (combined effect of change in price and input intensity of cost factors)</b>						
Labour cost P	11%	6%	3%	3%	3%	3%
Labour cost T	11%	6%	3%	3%	3%	3%
Labour cost S	11%	6%	3%	3%	3%	3%
Drugs	2%	2%	2%	2%	2%	2%
Medical consumables	1%	1%	1%	1%	1%	1%
Capital cost (depreciation)	0%	0%	0%	0%	0%	0%
Other cost	0%	0%	0%	0%	0%	0%
<b>Aggregate rate of cost increase</b>						
OP unit cost	6%	3%	2%	2%	2%	2%
IP unit cost increase (Cost/ARW)	6%	3%	2%	2%	2%	2%

### ASSUMPTIONS OTHER BENEFITS AND COSTS

<b>G. Specify annual rate of change (uniform) of unit cost for other benefits</b>						
High cost special services	3%	3%	2%	2%	2%	2%
Accident	0%	3%	2%	2%	2%	2%
Emergency	0%	3%	2%	2%	2%	2%
Medical Instruments	2%	3%	2%	2%	2%	2%
Hemodialysis (HD)	0%	3%	2%	2%	2%	2%
Chronic peritoneal dialysis (CPD)	2%	3%	2%	2%	2%	2%
Renal failure drugs	0%	3%	2%	2%	2%	2%
HIV/AIDS (drugs and lab.)	0%	3%	2%	2%	2%	2%
Bone marrow transplant	0%	3%	2%	2%	2%	2%
Kidney transplant	0%	3%	2%	2%	2%	2%
Cornea transplant*	0%	3%	2%	2%	2%	2%
Dental care	0%	3%	2%	2%	2%	2%
Artificial teeth	0%	3%	2%	2%	2%	2%
Care for the nonregistered	0%	3%	2%	2%	2%	2%
Other ben 1	0%	3%	2%	2%	2%	2%
Other ben 2	0%	3%	2%	2%	2%	2%
<b>H. Specify annual rate of change (uniform) of utilization rates for other benefits</b>						
High cost special services	3%	3%	3%	2%	2%	2%
Accident	3%	3%	3%	2%	2%	2%
Emergency	3%	3%	3%	2%	2%	2%
Medical Instruments	3%	3%	3%	2%	2%	2%
Hemodialysis (HD)	3%	3%	3%	2%	2%	2%
Chronic peritoneal dialysis (CPD)	3%	3%	3%	2%	2%	2%
Renal failure drugs	3%	3%	3%	2%	2%	2%
HIV/AIDS (drugs and lab.)	3%	3%	3%	2%	2%	2%
Bone marrow transplant	3%	3%	3%	2%	2%	2%
Kidney transplant	3%	3%	3%	2%	2%	2%
Cornea transplant*	3%	3%	3%	2%	2%	2%
Dental care	3%	3%	3%	2%	2%	2%
Artificial teeth	3%	3%	3%	2%	2%	2%
Care for the nonregistered	3%	3%	3%	2%	2%	2%
Other ben 1	3%	3%	3%	2%	2%	2%
Other ben 2	3%	3%	3%	2%	2%	2%

**HCF MODEL SSS: PROJECTION RESULTS**

	BASE YEAR PROJECTION					
	2007	2008	2009	2010	2011	2012
<b>BENEFIT EXPENDITURE (mio THB)</b>						
Outpatient care benefits	8 337,36	9 459,39	10 484,20	11 453,26	12 505,95	13 643,54
Inpatient care benefits	6 361,04	7 460,00	8 548,01	9 655,63	10 594,05	11 615,24
High cost special services	333,88	370,05	410,11	447,79	484,48	523,45
Accident	147,14	155,92	170,54	184,06	197,00	210,60
Emergency	206,06	219,46	240,95	260,93	279,78	299,86
Medical Instruments	21,31	23,63	26,49	29,27	32,04	35,03
Hemodialysis (HD)	414,72	448,45	498,77	547,16	594,07	643,64
Chronic peritoneal dialysis (CPD)	2,56	2,77	3,04	3,29	3,52	3,76
Renal failure drugs	75,30	81,42	90,54	99,31	107,77	116,72
HIV/AIDS (drugs and lab.)	625,18	668,06	734,72	795,45	852,26	911,16
Bone marrow transplant	18,00	19,08	20,84	22,45	23,93	25,49
Kidney transplant	73,90	79,03	87,16	94,76	102,26	109,59
Cornea transplant*	-	0,40	0,44	0,47	0,51	0,54
Dental care	317,61	338,10	370,31	399,63	426,84	455,16
Artificial teeth	38,08	40,67	45,02	48,99	52,72	56,78
Care for nonregistered	3,82	4,05	4,43	4,78	5,11	5,45
Other ben 1	-	-	-	-	-	-
Other ben 2	-	-	-	-	-	-
<b>SUBTOTAL</b>	<b>16 975,96</b>	<b>19 370,48</b>	<b>21 735,55</b>	<b>24 047,23</b>	<b>26 262,27</b>	<b>28 656,00</b>
CASH BENEFITS	198,62	222,71	245,32	268,75	292,83	317,33
Other	-	-	-	-	-	-
<b>TOTAL BENEFIT EXPENDITURE</b>	<b>17 174,58</b>	<b>19 593,19</b>	<b>21 980,87</b>	<b>24 315,98</b>	<b>26 555,10</b>	<b>28 973,33</b>
Administration Cost	455,00	515,07	572,79	633,45	696,65	761,91
<b>TOTAL EXPENDITURE</b>	<b>17 629,58</b>	<b>20 108,27</b>	<b>22 553,67</b>	<b>24 949,43</b>	<b>27 251,74</b>	<b>29 735,24</b>
<b>PAYG cost ratios</b>						
Sickness benefit (in-kind)	2,175%	2,192%	2,212%	2,213%	2,198%	2,192%
Sickness cash benefit	0,025%	0,025%	0,025%	0,025%	0,025%	0,024%
<b>TOTAL (incl. admin.)</b>	<b>2,259%</b>	<b>2,276%</b>	<b>2,295%</b>	<b>2,296%</b>	<b>2,280%</b>	<b>2,275%</b>
Total insurable earnings (mio THB)	780 531	883 589	982 603	1 086 654	1 195 069	1 307 031
<b>COVERAGE</b>						
Registered persons	9 558 918	9 855 395	10 132 367	10 410 668	10 690 294	10 971 315
Male	4 743 303	4 908 535	5 065 634	5 225 130	5 387 132	5 551 372
Female	4 815 615	4 946 860	5 066 733	5 185 538	5 303 162	5 419 943
<b>UTILIZATION</b>						
General OP visits	24 765 729	26 633 786	28 556 567	30 590 863	32 750 219	35 027 030
IP admissions	491 020	517 553	544 086	571 669	600 544	630 485
IP adjusted relative DRG weights (ARWs)	449 351	499 511	553 696	613 309	659 774	709 154
Total hospital days	1 787 196	1 883 770	1 980 344	2 080 737	2 185 836	2 294 817
OP contacts/person (avg)	2,59	2,70	2,82	2,94	3,06	3,19
IP admissions/person (avg)	0,051	0,053	0,054	0,055	0,056	0,057
Average case-mix index (ARWs/adm)	0,915	0,965	1,018	1,073	1,099	1,125
Length of stay (Hdays per admission)	3,640	3,640	3,640	3,640	3,640	3,640
<b>COST PER CAPITA (THB per person)</b>						
Outpatient care (general)	872,2	959,8	1 034,7	1 100,1	1 169,8	1 243,6
Inpatient care (general)	665,5	756,9	843,6	927,5	991,0	1 058,7
High Cost Special Services	34,9	37,5	40,5	43,0	45,3	47,7
Accident	15,4	15,8	16,8	17,7	18,4	19,2
Emergency	21,6	22,3	23,8	25,1	26,2	27,3
Medical instruments	2,2	2,4	2,6	2,8	3,0	3,2
Hemodialysis	43,4	45,5	49,2	52,6	55,6	58,7
Chronic peritoneal dialysis (CPD)	0,3	0,3	0,3	0,3	0,3	0,3
Renal failure drugs	7,9	8,3	8,9	9,5	10,1	10,6
HIV/AIDS	65,4	67,8	72,5	76,4	79,7	83,0
Bone marrow transplant	1,9	1,9	2,1	2,2	2,2	2,3
Kidney transplant	7,7	8,0	8,6	9,1	9,6	10,0
Cornea transplant*	-	0,04	0,04	0,05	0,047	0,049
Dental Care (incl. artificial teeth)	33,2	34,3	36,5	38,4	39,9	41,5
Artificial teeth	4,0	4,1	4,4	4,7	4,9	5,2
Care for nonregistered	0,4	0,4	0,4	0,5	0,5	0,5
Other ben 1	-	-	-	-	-	-
Other ben 2	-	-	-	-	-	-
<b>SUBTOTAL</b>	<b>1 775,9</b>	<b>1 965,5</b>	<b>2 145,2</b>	<b>2 309,9</b>	<b>2 456,6</b>	<b>2 611,9</b>
Cash benefit	20,8	22,6	24,2	25,8	27,4	28,9
Other cost	-	-	-	-	-	-
<b>TOTAL (excl. admin cost)</b>	<b>1 796,7</b>	<b>1 988,1</b>	<b>2 169,4</b>	<b>2 335,7</b>	<b>2 484,0</b>	<b>2 640,8</b>
<b>CAPITATION FEE</b>						
<b>Expenditure per capita</b>						
GOP cost per capita	872,2	959,8	1 034,7	1 100,1	1 169,8	1 243,6
GLIP cost per capita	665,5	756,9	843,6	927,5	991,0	1 058,7
Capitation fee (GOP + GLIP)	1 537,66	1 716,78	1 878,36	2 027,62	2 160,84	2 302,26
Basic capitation fee (implicit)	1 272,91	1 308,28	1 462,80	-	-	-
Utilization incentive	55,71	55,71	55,71	-	-	-
Risk adjustment	209,04	351,78	359,85	-	-	-
<b>COST STRUCTURE</b>						
	2007	2008	2009	2010	2011	2012
<b>Unit cost OP (cost/contact)</b>	<b>336,6</b>	<b>355,2</b>	<b>367,1</b>	<b>374,4</b>	<b>381,9</b>	<b>389,5</b>
Labour cost P	50,5	56,1	59,4	61,2	63,0	64,9
Labour cost T	50,5	56,1	59,4	61,2	63,0	64,9
Labour cost S	50,5	56,1	59,4	61,2	63,0	64,9
Drugs	67,3	68,7	70,0	71,5	72,9	74,3
Medical consumables	50,5	51,0	51,5	52,0	52,5	53,1
Capital cost (depreciation)	33,7	33,7	33,7	33,7	33,7	33,7
Other cost	33,7	33,7	33,7	33,7	33,7	33,7
<b>Unit cost OP composition (%)</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>
Labour cost P	15,0%	15,8%	16,2%	16,3%	16,5%	16,7%
Labour cost T	15,0%	15,8%	16,2%	16,3%	16,5%	16,7%
Labour cost S	15,0%	15,8%	16,2%	16,3%	16,5%	16,7%
Drugs	20,0%	19,3%	19,1%	19,1%	19,1%	19,1%
Medical consumables	15,0%	14,4%	14,0%	13,9%	13,8%	13,6%
Capital cost (depreciation)	10,0%	9,5%	9,2%	9,0%	8,8%	8,6%
Other cost	10,0%	9,5%	9,2%	9,0%	8,8%	8,6%
<b>DRG base rate (cost per ARW)</b>	<b>14 156,0</b>	<b>14 935</b>	<b>15 438,1</b>	<b>15 743,5</b>	<b>16 057,1</b>	<b>16 379,0</b>
Labour cost P	2123,4	2357,0	2498,4	2573,4	2650,6	2730,1
Labour cost T	2123,4	2357,0	2498,4	2573,4	2650,6	2730,1
Labour cost S	2123,4	2357,0	2498,4	2573,4	2650,6	2730,1
Drugs	2831,2	2887,8	2945,6	3004,5	3064,6	3125,9
Medical consumables	2123,4	2144,6	2166,1	2187,7	2209,6	2231,7
Capital cost (depreciation)	1415,6	1415,6	1415,6	1415,6	1415,6	1415,6
Other cost	1415,6	1415,6	1415,6	1415,6	1415,6	1415,6
<b>DRG base rate composition (%)</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>
Labour cost P	15,0%	15,8%	16,2%	16,3%	16,5%	16,7%
Labour cost T	15,0%	15,8%	16,2%	16,3%	16,5%	16,7%
Labour cost S	15,0%	15,8%	16,2%	16,3%	16,5%	16,7%
Drugs	20,0%	19,3%	19,1%	19,1%	19,1%	19,1%
Medical consumables	15,0%	14,4%	14,0%	13,9%	13,8%	13,6%
Capital cost (depreciation)	10,0%	9,5%	9,2%	9,0%	8,8%	8,6%
Other cost	10,0%	9,5%	9,2%	9,0%	8,8%	8,6%