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Report 2

The calculation of capitation fees and the estimation of provider payments Initial review (2006)

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List of abbreviations

COHI	Central Office for Healthcare Information
COICOP	United Nations Classification of Individual Consumption According to Purpose
CSMBS	Civil Servants' Medical Benefit Scheme
EU	European Union
HWS	Health and Welfare Survey
IHPP	International Health Policy Programme
ILO	International Labour Organization or International Labour Office
IPHC1/2	Inpatient high costs, category1/2, respectively
MCRD	Medical Coordination and Rehabilitation Division (SSO)
MoC	Ministry of Commerce
MoF	Ministry of Finance
MoPH	Ministry of Public Health
NHA	National Health Accounts
NHSO	National Health Security Office
NSO	National Statistical Office
SEC/SOC	Social Security Department of the ILO
SSO	Social Security Office
SSS	Social Security Scheme
SUR	Services Utilization Rate
UC	Universal Health Care Scheme
WCS	Workmen's Compensation Scheme

Reports produced under the Project

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
User Manual

Report 7B A Common Health Care Financing Model (II) for the main health purchasing agencies
- Universal Coverage Scheme
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- Civil Servants' Medical Benefits Scheme, and

Projection Module for the National Health Accounts
Documentation of work and progress

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.
Note on Implementation

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

Foreword

Since May 2003 the European Union (EU) has been committed to supporting health care reform in Thailand through the **Health Care Reform Project** (THA/AIDCO/2002/0411). The support and assistance of EU followed Thailand's bold initiative towards achieving full population coverage in health care when, in 2001, Universal Health Care was written into law with the introduction of what became popularly known as the "30 Baht" scheme. Under the scheme full access to health services became available to all Thai citizens.

A separate component was established within this project to address issues relating to the **Financial Management of the Health Care System**[1] which is being executed by the Social Security Department of the International Labour Office, Geneva (THA/05/01/EEC). Technical assistance activities under the project have been on-going since spring 2006 and will continue until mid-2009.

Specific activities were scheduled under the ILO component, to be documented in a series of technical reports. One of the very first activities scheduled was a review of "present financial procedures". This review was to be delivered as two separate reports on:

1) the present state of the statistical reporting system; and

2) the calculation of capitation fees and payment systems in Thailand's health system.

(Further specification of tasks can be found under ILO 2005, p. 8.)

The present report addresses item (2) above, i.e. the calculation of capitation fees and the provider payment systems.

In March 2006 Mr. Wolfgang Scholz, senior economist at ILO-SECSOC, undertook a three week mission to Bangkok, Thailand. This report is based on the findings of that mission, which was substantially supported by the project implementation team located at the National Health Security Office (NHSO) headquarters, Nonthaburi, headed by their international and national directors, Messrs. Tenambergen and Joungudonsuk. The author is especially grateful to Mr. Samrit Srithamrongsawat who patiently listened and answered questions, and to the tireless Ms. Kanjana Tisayaticom, mission assistant.

This report draws further substance from discussions held with Ms. Taweesri Greetong and Mr. Thaworn Sakunphanit, both NHSO officials who, during 2005-2006 were students on the Social Protection Financing (SPF) Masters course at the Graduate School of Governance in Maastricht, Netherlands. They helped to clarify many open issues during their visit to ILO headquarters, Geneva, from 31 July to 4 August 2006 and kindly gave permission to use, for the purposes of this report, information contained in their recently finalized Master theses (see list of references).

It should be noted that this report is intentionally "draft" in nature given the point at which it was written and the complexity of the tasks to be fulfilled under the ILO component. Many issues addressed here therefore would require further in-depth research and clarification during later stages of the project. Indeed, it was intended in the project outline that this and other initial reports would be reviewed or complemented by further reports during the course of the project, one of the objectives being a fully-fledged design proposal for a financial monitoring system for Thailand's health sector.

[1] EU: Financial Agreement between the European Community and the Kingdom of Thailand, Health Care Reform Project (THA/AIDCO/2002/0411), section 2.1.2 on Financial Management.

The attentive reader will realize that this report contains a number of “unresolved” issues requiring further clarification; clarification which can only be achieved with project progress. The contents of the report have nevertheless been checked and counterchecked several times; we may thus assume that the factual information contained herein is correct and serves as a solid platform from which to launch further investigations and recommendations. Any remaining flaws, of course, should be attributed to the author.

1. Introduction

This report focuses on two institutions, the National Health Security Office (NHSO) and the Social Security Office (SSO). It is these two institutions that employ a capitation policy for both their budget estimation procedures and the provider payment mechanism. As the SSO is contribution financed, the capitation mechanism plays a role mainly with respect to the way it allocates available resources to providers; it is on this aspect we focus in this report. For the NHSO, the estimation of the capitation fee(s) plays a role on both sides of the budget, revenue and expenditure. Precision in projecting the overall capitation rate is crucial for the Universal Health Care (UC) scheme's revenue position; the allocation of overall resources of different providers is a problem of fine-tuning and balancing out their various needs, and interests. Of course, the revenue and expenditure aspects of (overall and disaggregated) capitation estimation are not independent of each other. However, once the overall capitation is fixed and, thus, the budget known, there is a degree of freedom in the allocation of the capitation amount to different providers.

The UC scheme (commonly known as the "30 Baht" scheme) offers any Thai citizen, who does not belong to the Social Security Scheme (SSS) or the Civil Servants' Medical Benefit Scheme (CSMBS), full access to health services provided by designated district-based networks of providers (consisting of health centres, district hospitals and cooperating provincial hospitals). Those eligible have to register with the networks and obtain a free insurance card. Drugs on prescription are, likewise, free of charge. The UC is financed by general tax and individual co-payment of 30 Baht (approximately US$0.75) for each outpatient visit or hospital admission. Providers of health care and services are paid by means of nationally administered capitation.

The SSS covers only private employees, *excluding* any dependents, and is financed by contributions on a tripartite basis through employers, employees and the government. It uses a contract (with providers) model and pays them based on capitation and price lists.

To complete the picture, the CSMBS is mentioned here. It covers civil servants and civil service retirees, *including* their dependents (parents, spouse, and children during their first 18 years). It is financed out of general taxation, does not use any capitation mechanism, but retrospectively reimburses health providers' fees for service. For this reason (no capitation), the CSMBS, as private providers (clinics), is excluded from further investigation in the context of this report.

The above three schemes cover all Thai citizens. Nevertheless, five per cent, or around three million people living within the country, remain uninsured under the schemes and have to cover health care costs from their own resources ("out of pocket"). Non-covered persons comprise mainly non-nationals (Greetong, 2006).

Around five million people are being covered (fully or partially) through private voluntary health insurance (Greetong, 2006), which retrospectively reimburses providers' fees. Those privately insured comprise nationals who are, thus, entitled to coverage under either of the above schemes, but who, for whatever reason, prefer private health insurance coverage (including "topping up" through private insurance), and non-nationals (see above).

Table 1. Health coverage by category, 2005

Category / scheme	Number of persons (million)
UC (30-Baht), registered	47
Social security (SSS)	8
CSMBS (Civil servants' medical benefits scheme)	4
Other schemes	1
Unregistered persons	2
Total population	62
UC (registered plus unregistered)	49

Source: NHSO, rough indicative figures.

Capitation

For clarity, some explanation of the notion "capitation" is necessary. Customarily, it has been used to describe a poll tax, i.e. a direct uniform tax imposed on each person, including the amount so levied. Secondly, the notion indicates a uniform payment payable on a per capita basis [as an (annual) fee] to a defined health service provider (doctor, hospital, etc.) for each patient enrolled under a health plan (Webster's, 1993).

In compliance with standard usage within the Thai health reform context, capitation is being used, in this report, to describe two alternative methods that have both been applied by the NHSO since the onset of UC. The first method estimates the total amount of financial resources needed in order to cover the scheme's expected costs, i.e. its budget. The other is being used to allocate the available budgetary resources to those health service providers participating in UC, i.e. the method determining the allocation of available resources to the providers.

In other words, in this report we look at capitation from two different angles. The first is the method used for the short-term projection of resources required and the second is the calculation used to determine the allocation of these resources to the providers.

2. Estimating capitation of UC and SSS (2002 to 2006)

2.1. Estimating capitation of the UC scheme

Estimation of the UC budget is based on the average medical costs per member of the scheme — capitation — and is multiplied by the expected number of members in order to determine the overall resources available to the NHSO for operating the scheme. Once the capitation is approved by the respective legal bodies, i.e. once it is legally fixed, the income risk of the NHSO is almost solely related to the actual number of members of the scheme: if this number is higher than estimated, then actual income of the NHSO will be higher; it will be lower if the number of members is lower than projected. The contributions paid by UC members per episode of treatment (30 Baht) add to the resources available but, due to evasion and exemptions, they are only of minor importance.

While the NHSO, after budget approval, broadly knows the resources available for its operations, it is, of course, not "safe" on the expenditure side. This depends on actual cost and volume developments in the health sector (provider costs, utilization rates, others). From a purely budgetary point of view, as the UC budget is "closed end"[2] with respect to capitation (not with respect to members), such developments might not be considered important, as any financial shortcomings have to be borne by "others" (providers, patients, etc.). However, budgetary shortcomings must be of concern to the NHSO (and health policy in general) because of their possible negative impact on patients' short-term access to the health system. Therefore, it is of importance for the NHSO administration to have a good overview of possible short-term cost developments per health provider, including other direct and indirect medical cost drivers. In other words, the budgeting process not only has to address the revenue aspects, but also its expenditure aspects (allocation to providers). We address these aspects in detail in chapter 3.2.

For estimation (projection) purposes, the capitation has been broken down into the following six benefits and three measures of compensatory cost components:

(i) Patient [OP] care (benefit);

(ii) In-patient [IP] care (benefit);

(iii) High cost care [HC] (benefit);

(iv) Accident and emergency care [AE] (benefit);

(v) Rehabilitation measures and equipment [D] (benefit);

(vi) Emergency medical services [EMS] (benefit);

(vii) Prevention and promotion [PP] (measures);

(viii) Capital replacement [C] (tangible investment compensating depreciations);

[2] A closed-end (global) budget is understood here as a budget with pre-defined services, cases and costs per case. If it turns out that demand for services is higher than budgeted, in theory no additional funds will be made available (by contrast: open-end budget, where, in case of unforeseen demand, additional resources are made available). Politically, closed-end budgets are not always sustainable.

(ix) No-fault liability [NF] (compensation in case of non-desired outcome of treatment).

The reason for this breakdown is merely practical: it reflects the main areas of expenditure from an administrative point of view (reflects one practical segmentation [out of potentially many] of the health system's operations; some OECD Health Account classification may have played a role in the above structure); equally, this breakdown allows for an understandable estimation approach that, given the prevailing scarcity of UC system statistical data, can be accepted by the system's stakeholders as a rational basis for taking budget decisions.

For the components OP and IP, the average cost per scheme member is calculated by taking into account the unit costs u_i (e.g. unit OP cost per visit of scheme member to hospital) and the morbidity rate m_i (e.g. the average number of OP visits of scheme member per year). The per capita costs of the other components are directly estimated using ad hoc methods and institutional administrative knowledge. Hence, the rate of capitation is estimated by the following formula (ILO 2002):

Capitation [Baht per year per member] =

$$= u_{OP}m_{OP} + u_{IP}m_{IP} + cap_{HC} + cap_{AE} + cap_{D} + cap_{ES} + cap_{PP} + cap_{C} + cap_{NF}$$

Multiplication of *Capitation* by the annual average number of scheme members results in the estimate for the UC's total annual budget (excluding NHSO administration). The actual monthly number of its members is known to the UC scheme (NHSO) with a time lag of not more than two months. In other words, the Ministry of Public Health (MoPH), Ministry of Finance (MoF) and NHSO know the exact amount to be transferred to the UC scheme with a time lag of two months, which is one important indicator showing a high degree of efficiency of the system's administration.

2.1.1. Data basis, data estimation and data projection methods

Under the above formula, the validity of the projection depends essentially on the quality of the base data and the assumptions and methods applied for data projections. For the purpose of calculating the capitation for years 2002 to 2006, the following data sources and methods were used (Annex I, table 1).

2.1.1.1. Estimation of annual average costs per out-patient (OP average cost)

In the period 2002 to 2006, estimating OP average costs started with the *number of cases of sickness per year per scheme member*. This information was taken from the Health and Welfare Survey of Thailand (HWS), now carried out every two years. The last available [3] survey dates back to 2003 (NSO, 2003). The HWS 2003 shows that the average UC scheme member was sick around five (exactly 4.976) times during the year. In 72.7 per cent of these cases they went to a health facility, i.e. were registered as out-patients. In other words, every 1,000 UC members who were sick during the course of the year 2003 contacted/registered with a facility 3,539 times as OPs. The HWS gives a breakdown of those visits by type of facility, i.e. it answers the question as to how many of those visits were made to health centres (1,295), district hospitals (1,080), provincial hospitals (420), private clinics (605), private hospitals (124), and to a hospital in case of referral (15).

After the number of visits to the different health providers is known, the next crucial step concerns information with respect to costs per visit ("OP unit costs per case [per visit]").

[3] At the time this report was drafted (December 2006).

Multiplication of the unit costs by the number of cases provides the average cost per UC member per year.

Information on OP unit costs was taken from various sources (2002 to 2006).

For the estimation of the *2002* budget, unit cost rates were calculated on the basis of research undertaken in one province (1999); the respective information on (public) district and provincial hospitals was taken from the same survey restricted, however, to the Northern provinces in the administrative areas 8 to 10. The OP unit costs for private clinics and hospitals were assumed to be equal to those of public district and provincial hospitals. No estimation was undertaken for the OP unit costs in referral cases.

For the *2003* budget, OP unit costs for health centres were increased on the basis of the composite index (medCPI; labour cost). For district and provincial hospitals the median unit costs from the MOPH "Report #5" (2001) of the MoPH were assumed to be representative estimates. The cost estimates for private clinics and hospitals were based on a survey of 24 selected private hospitals. The (typically high) costs in the case of referral hospitals were estimated based on information received from seven teaching hospitals (medical schools).

In the estimation framework of the *2004* budget, all of the above 2003 OP unit costs were, in a summarized way, increased by assumed medical inflation of 2.9 per cent. [4]

For the *2005 budget*, OP unit costs of the health centres were based on the 2003 estimate (as in budget 2004); however, inflation adjustment for 2004 was replaced by the true value (7.42 per cent instead of 2.9 per cent) and inflation for 2005 was assumed to be 4.08 per cent. For district hospitals, the estimate was again based on "Report No 5" (2001); however, instead of the median (as in 2003), now the 70th percentile [5] was taken and adjusted by the same inflation rates as applied in the case of health centres. For provincial hospitals, median unit costs of "Report No 5" (2001) were adjusted by the same inflation rates. For private clinics and hospitals and referral hospitals, the results of a quick 2004 survey were used as a basis and adjusted by the same inflation rates as above. The notion of inflation has to be understood as the composite index (medCPI and labour cost).

Finally, for the *2006 budget* — public health facilities — the same method was used as for the 2005 budget: past estimated inflation rates were replaced by observed values and revised estimates; new inflation rates (for 2006) were assumed. Assumed inflation rates were replaced by revised ones for private facilities and referral hospitals, no new inflation rate (for 2006) was assumed, implicitly assuming inflation in private hospitals to be zero in 2006.

Annual OP *average* costs have been estimated for all budget years by multiplying the number of outpatient visits [by facility] by the OP unit cost per visit [by facility]. Summing up facilities [health centres, district hospitals, provincial hospitals, private clinics, private hospitals, and referral hospitals] provides an estimate of the average costs per outpatient per budget year. For the years 2003 and 2004 results were increased by a factor 1/0.97 =

[4] All inflation rates are annual rates: average index of calendar year t divided by average index of calendar year t-1.

[5] In descriptive statistics the pth percentile is a value for a data series equal to the p/100 quantile, where quantiles are points taken at regular intervals from the cumulative distribution function of a variable. Accordingly, the 70th percentile is the value that "cuts off" the lowest 70 per cent of observations – only 30 per cent are higher. (e.g., Wonnacott and Wonnacott 1990, p. 28.)

1.031, based on the argument that the HWS 2001 was carried out at a time when outpatient contacts with hospitals were below normal.

2.1.1.2. Estimation of annual average costs per in-patient (IP average cost)

According to the HWS, in 1996 and 2001, between 1.5 and 2 per cent of all sickness cases of UC members ended with hospital admission, i.e. members became in-patients. In other words, out of every 1,000 cases of UC members becoming ill during a given year: in 1996, 66 hospital admissions took place; and, in 2001, 76 admissions. These rates were applied to the budget estimations for the years *2002* (66), *2003* (76), and *2004* (76).

For the purpose of budget years *2005 and 2006*, an exponential function was estimated, based on information from the HWS 1999 to HWS 2003; it was used for trend extrapolation to 2005; the 2005-value (90 admissions per 1,000 UC members), thus derived, was also applied to the 2006 budget. Based on HWS information, total admission numbers (per 1,000 members) were allocated to district, provincial and private hospitals (2002 budget); starting with the 2003 budget, referral hospitals were included (based on data collected from seven teaching hospitals).

The IP unit costs of public hospitals were estimated, for *2002*, on the basis of research (1999 — referring to the Northern provinces in the regions 8-10). The costs of private hospitals were assumed to be equal to the costs of provincial hospitals. IP unit costs for referral hospitals were not estimated.

For *2003 and 2004*, IP unit costs for district hospitals were assumed to be equal to 14 times their OP unit costs and for provincial hospitals the equivalent multiplier was assumed to be 18. IP unit costs for private and referral hospitals were estimated from 24 private hospital data and seven teaching hospitals (medical schools), respectively.

The IP unit costs for district and provincial hospitals were estimated, for *2005 and 2006*, by the same method used for 2003 and 2004. The multipliers were, however, replaced by 16.01 and 19.03, for district and provincial hospitals, respectively. In 2005, the costs for private IP cases were estimated on the basis of data received from 17 private hospitals; for 2006, the value for 2003 was taken as a basis and inflated (until 2006) by inflation (composite index). Equally, costing for referral hospitals was based on the 2003 value and inflated for the budget years 2005 and 2006 alike, by applying the observed/estimated composite index.

In the next step, the number of admissions by different facilities (as described) is multiplied by the IP unit costs (as described) in order to calculate the annual *average* costs, in Baht/year, by district hospitals, provincial hospitals, private hospitals and referral hospitals. Summing-up of these four facilities results in the total IP average costs per year. Total IP unit costs can now be calculated residually through dividing IP average costs by the number of admissions.

2.1.1.3. Estimating the capitation amounts of the other budget components

Most of these values were estimated on the basis of ad hoc assumptions, as follows:

(i) High cost, and accident and emergency cases

These costs were estimated, for the 2002 budget, on the basis of information provided by the SSO. For the following budget years, these costs were assumed to be included in the IP average cost estimates.

(ii) Dental care

Not calculated separately for 2002. In 2003, these costs were exogenously estimated and assumed to be equal to the 2003 value, in the 2004 to 2006 budgets.

(iii) Prevention and Promotion

For the first budget, 2002, this capitation amount was set equal to 20 per cent of the sum of OP and IP capitation. For 2003, prevention and promotion expenditure of the budget of the MoPH was taken as a guideline. In 2004, the value was left unchanged from the 2003 value. In 2005 and 2006, the 2003 value was inflated by the same inflation rates as mentioned before.

(iv) Capital replacement

In all years this was assumed to be equal to 10 per cent of the sum of (i) to (iii); except for a slight variation in 2002.

(v) Emergency medical services

Ad hoc estimate in 2002; left unchanged over all years.

(vi) Rehabilitation

No estimate.

(vii) No-fault liability

No estimate for the years 2002 to 2004. In 2005 and 2006 set by an ad hoc decision of the NHSO committee, estimates were based on historical data.

2.1.2. The estimation procedure

A comparison between budget estimates (capitation amounts) proposed by the NHSO and the amounts finally approved by the government shows a significant mismatch.

Table 2. NHSO UC budget estimates and government approved capitation rates

	Unit	2002	2003	2004	2005	2006
Budget estimate by NHSO (initial proposal at the beginning of calendar year)	Baht/year	1'202	1'414	1'447	1'717	1'842
Budget estimate approved by the Bureau of Budget (for preparation of Budget Act for fiscal year*)	Baht/year	1'202	1'202	1'202	1'308	1'659
		(2001/2002)	(2002/2003)	(2003/2004)	(2004/2005)	(2005/2006)
Approved budget according the Budget Act for fiscal year	Baht/year	1'202	1'202	1'202	1'308	1'308
		(2001/2002)	(2002/2003)	(2003/2004)	(2004/2005)	(2005/2006)
Additional budget granted by the Government during fiscal year	Baht/year	0	0	106	88	351
		(2001/2002)	(2002/2003)	(2003/2004)	(2004/2005)	(2005/2006)
Final approved expenditure of the UC scheme in fiscal year	Baht/year	1'202	1'202	1'308	1'396	1'659

*Fiscal year = October t to September t + 1.

There are a number of reasons for the mismatch. One was the formal budgeting process. Usually, the NHSO provides a first estimate in the form of an initial proposal at the

beginning of the calendar year. For example, the NHSO proposes a value in January or February. This proposal concerns the following fiscal year, starting in October of the same year. The proposal is then taken as a basis for the negotiations within the government. These negotiations not only concern the accuracy of the proposal (correctness of calculations and assumptions) but also, predominantly, its implications for the overall budget of the government. After all, the UC competes with other programmes for scarce resources (tax). The main institutional focus within this process is on the Bureau of Budget (BoB), which reports directly to the Prime Minister. At some point during the course of these negotiations, the BoB, which is responsible for the planning of the whole government's budget and its presentation to parliament in due course, usually fixes the capitation amount without consulting the NHSO or other stakeholders of the UC scheme. The amount, as fixed by the BoB, has in the past always been approved by parliament. This is not surprising given that the Budget Act is the government's annual core law and the UC is just one, although important, element of many within the total budget. As a result of this procedure, the gap between capitation according to Budget Act and capitation as considered necessary by the NHSO, has been growing significantly since the outset of the scheme. During 2003/2004 it became obvious that providers of health services were running, and would run further, into severe financial difficulties if the BoB continued its policy of significantly underestimating the actual amounts needed. [6] Thus, for the first time in the fiscal year 2003/2004, the UC was empowered by the Budget Act to negotiate for additional resources during the fiscal year; as a result, the government granted an additional capitation amount of 106 Baht. The same procedure took place during the fiscal year 2004/2005, resulting in an additional capitation amount of 88 Baht. As a result of this development, the gap between the amount proposed by the NHSO and the approved amount was narrowed to some extent. The Budget Act 2005/2006 was the first time that the capitation amount approved by the BoB (and the parliament) was significantly increased. This increase was apparently high enough to make negotiations for significant additional resources (as in the two preceding fiscal years) unnecessary.

In short, one important reason for the significant deviation between proposal and approval can be found in the formalities of the budget process and in the fact that the UC competes for scarce resources.

Another reason can be seen in the statistical – not so much in the methodological – weakness of the NHSO proposals. The above description of the historical estimation process clearly indicates the NHSO's search for a solid information base (see the improvements made during the estimation process for UC budgeting 2007). However, with respect to important base variables, in the past, this search showed a significant degree of "ad hoc-ishness", which might have had negative effects on the calculation's legitimacy as perceived by the other institutions participating in the government's budgeting process.

First, the NHSO had to rely on the bi-annual HWS. Sample surveys show a certain sociological picture at a given date of the year. The statistical information provided by the HWS is ample, but their core deficiency is that they are administratively cumbersome and have not been specifically designed for the purpose of budgetary projections. For budget projections, which are generally characterized by a need for up-to-date information, often on a monthly basis, the information contained in the HWS has to be considered outdated.

[6] It must be stated, however, that the BoB (like many health financing experts in Thailand) had good reasons to assume that the health system (providers) had accumulated significant productivity reserves and, thus, would be able to cover the additional population at low cost. Although such considerations may be based on correct observations, those hoping for the actual availability of such productivity reserves within short time were obviously overly optimistic.

Second, the unit cost estimates (OP and IP) were based on best information available. Nevertheless, this information must be considered weak as an input to a UC budget model. Again, the time span between the reference period covered by that information (the input) and the budget year (capitation proposal) is long. The problem of out of date information can be seen especially with respect to OP unit costs, the estimation of which is occasionally (not regularly and systematically) based on a statistical source (HWS 1999; MoPH Report no 5; sample of 24 private hospitals; quick survey) but, also very much depends upon interpolation techniques and assumptions in order to cover statistical "white spots". For example, the NHSO relies very much on (projecting) a medical inflation index (a subset of the CPI). In chapter 2.1.3.2 we check whether this index can be considered a realistic representative for unit cost developments.

The interpolation problem also came to the fore in the case of hospital admission rates. Whenever available, the rate was calculated from HWS data — at the budgeting frontier; however, the last observed value was often more or less outdated and, thus, more or less useful to explain actual and immediate future developments (budget). Thus, the NHSO used, for the budget proposals 2005 and 2006, an exponential trend function, based on (only) three past observations: HWS 1999, HWS 2001 and HWS 2003. From a modelling point of view, it is obvious that such an approach, despite its mathematical sophistication, has only a limited explanatory power: instead, one could also have used the Delphi method (a good guess).

There were/are other deficiencies. For example, the almost complete lack of statistics with respect to information on private hospitals' unit costs, which are not being dealt with here in detail.

Considering all these deficiencies of information, it is not surprising that the BoB (and possibly other institutions involved in the budgeting process, overall and in detail) did not feel "unsafe" when deviating (even substantially) from the NHSO's budget proposals – this despite all NHSO's reasonable attempts to make its proposals methodologically as watertight as possible. The statistical base was weak and methodological sophistication could hardly make up for statistical deficiencies.

It can be concluded from the budget developments in the years 2004 to 2006 (table 2) that only the most obviously pressing fiscal needs of the UC scheme or, rather, the scheme's contracted providers, led to a change of the BoB's position (the government's position in general), finally resulting in financial resources more in line with the budget estimates initially proposed by the NHSO.

It has become more and more obvious that the mismatch between the NHSO budget proposal and BoB budget approval must be overcome. Otherwise, from a financial efficiency point of view, the resources bound within the NHSO for budgeting purposes would have to be considered redundant, i.e. they could be used instead for other, more obvious, purposes. The respective changes can only come through introducing a comprehensive statistical data collection and dissemination system that is accepted, in its quality and relevance for budgeting purposes, by all institutions participating in Thailand's annual budgeting process. A first important move in this direction was made in the context of the 2007 budget estimation procedure (see below).

2.1.3. Adequacy of data sources

In summarizing the above, one could say that the NHSO has, over the past five years, tried to apply a methodological framework of mixed sophistication to a complex projection problem, while only having access to a weak and insufficient data base for this purpose.

Despite the systemic weakness of statistical information, the NHSO's efforts to introduce a minimum degree of sophisticated modelling were not, and still are not, superfluous. The contrary is true. Firstly, good methodology helps to argue consistently within the political discourse among UC stakeholders. Secondly, more importantly in the context of this report, modelling — even when lacking empirical evidence — helps to clarify the theoretical foundations of projecting the UC scheme's finances. The theoretical considerations employed in modelling, in turn, determine the statistical programme[7] required for exactly that purpose.

Consistency of modelling is not sufficient, however, to achieve consensus on the result. This is proven by the obvious and significant mismatch between annual NHSO proposals and BoB approvals. Theoretical modelling only leads to results accepted (and acceptable) by all stakeholders if based on solid statistical data. This is the core reason why Thailand's health system needs an integrated statistical information system that can also be used as a basis for the system's expenditure and revenue. Without going into further detail, it should be mentioned here that "solid statistical data" intends to characterize as acceptable only such statistical information that measures, as exactly as possible, what is prescribed by theory. With respect to the financial monitoring of Thailand's health system, this implies that an adequate, integrated statistical information system must comprise all data required for the purpose of financial monitoring. A proposal on how such a system could and should be designed in Thailand is being made in a separate report[8] (ILO, 2006; Sakunphanit, 2006).

2.1.3.1. The HWS as a budgeting data source

The HWS is one of 39 surveys being carried out by the NSO at usually regular intervals.

The central administration of the NSO, located in Bangkok, is complemented by regional statistical offices in the 75 provinces of the country. Total staff, including temporary employees, comprise around 2,500 persons[9] allocated at a ratio of around 60:40 to the regional and central offices, respectively.

At central level, the NSO is divided into eight centres/bureaus /divisions which undertake the office's operational work according to revolving statistical and master plans. Among these, it is the Economics and Social Statistics Bureau, divided into six Statistics Groups, which is responsible for conducting censuses and surveys on economic and social issues, including the HWS (NSO 2005).

The HWS is characterized as follows (NSO 2005):

[7] One of the more famous examples where theory determined a statistical programme is the United Nation's System of National Accounts, which is being applied by almost all UN member states at common rules. Initial theory came from economic circuit theory, macro-economic income distribution theory and macro-economic growth theory. These theoretical frameworks systematically influenced statistical programmes, i.e. they introduced the theoretical variables ("income", "labour", "capital", etc) to be empirically measured ("GDP"; "labour force"; "capital stock"; etc), and concepts as to how these variables should interrelate.

[8] See ILO/Thailand Report 1: *Statistical reporting: Structures, methodologies, data and outputs. Initial review,* and Report 9: *A data reporting framework,* under ILO/EU Financial Management of the Thai Health Care System (THA/05/01/EEC).

[9] Actually the number of staff varies substantially with respect to temporary employees, according to work load. On 31 March 2004, the NSO employed a total staff of 3,150, whereas at 5 August 2005 total number of staff was only 2,467. (NSO Without Date; (p. 3), and NSO 2005; p. 9).

First reference year:		1974
Periodicity:		Quinquennial since 1974
		Biennial since 2003
Reference time:		12 months prior to the survey (date)
Coverage:		Private households
Sample size:		Around 26,500 households (~ taking 2 out of every 1,000 households [rough estimate])
Method of data collection:		Face to face interview.
Items covered:	Basic data:	Age,
		Sex,
		Marital status,
		Education,
		Occupation.
	Illnesses:	Disease(s),
		Person who diagnosed the disease(s),
		Length of time kept from regular activities,
		Type of treatment on the first day of disease,
		Type of the last or (most) recent treatment,
		Taking or using drugs or medicine,
		Reasons for so doing,
		Ever had injury or accident,
		Cause of injury / accident,
		Admission to hospital(s),
		Health payment,
		Claim for reimbursement (health insurance),
		(Other) source of health payment.
Data presentation:		Regional, Kingdom (nationwide).

Frequency of the HWS was recently increased in order to satisfy “increased demand for quality information on the actual number of people with the right to obtain ... health insurance — identified by possession of a ‘golden card’ ” (Opanapunt and Porapakkham 2005). Most of the additional demand came from the MoPH (and NHSO), which wished to solve a number of uncertainties that had emerged since the outset of the UC scheme. In particular, higher accuracy and actuality of the number of those eligible under the UC scheme was crucial as it influenced the calculations with respect to the correct amount of capitation of competing institutions (NHSO, BoB, others). Aiming at correct numbers was also necessary in order to get a better base from which to start from in the case of budget projections.

Initially, it was planned to execute the HWS on an annual basis (Opanapunt and Porapakkham, 2005). This would have enabled analysts to create time series of consistently structured data, necessary as an information base in the case of time series based application of budget projections. Meanwhile, however, the HWS is being executed (only) on a bi-annual basis, leading to, and leaving unresolved, some of the problems as discussed earlier in this report.

Another problem of using the HWS for budgeting purposes lies within the intrinsic statistical problems of samples, i.e. their design, in general. It is not the purpose of this report to review the survey practice of the NSO. It is assumed that the NSO carries out its surveys according to best statistical practice. However, the problems of sample design comprise questions of coverage, sample size, sampling (probability sampling, quota sampling), stratification, response rates, substitution of non-respondents, the questionnaires, checking and weighing of data, treatment of missing data, and the like (Eurostat, 2003) — which all pose specific problems to be solved in order to guarantee representativeness with respect to the whole population, and accuracy. In particular, those problems should be carefully taken into account when using the survey results for budgeting purposes. In other words, budget estimates based on surveys should be treated with caution. [10]

2.1.3.2. Medical inflation as a unit cost indicator

The inflation index used for UC capitation is a composite index, which combines a medical CPI (see below) and an index reflecting the increase of government officials' per-capita salaries.

The salary index is estimated by the BoB; it is assumed, in the capitation estimation, that its increase reflects increases in total per capita labour costs in the health sector.

Within the composite index the relative weights for the medical CPI and for labour costs were set at 49:51 in 2006; these weights reflected the estimated primary allocation of public hospitals' current expenditure on non-labour and labour costs.

Salary development of government officials may indeed be a good co-indicator for unit cost developments in Thailand's health system, given that employment in the health system consists almost solely of public servants (doctors, nurses). The crucial component to be checked for adequately reflecting unit cost developments, thus, is the medical CPI, which — according to the above weights — determines half the result.

Table 3 contains the structure of the medical CPI, the base data of which are being collected by the Ministry of Commerce (MoC). Item No. 98 of the CPI, is broken down into items No. 99 and 111. No. 99 consists of the components 100, 104 and 109. No. 100 is broken down into 101 to 103; No. 104 into 105 to 108; and No. 109 is equivalent to 110. No. 111 is broken down into two components, 112 and 113.

[10] Anecdotal information: The statistical problems of the German Household Budget Survey (EVS), comprising around 74,000 households or 0.2 per cent of the population, are well known. Nevertheless, because no other applicable information source was available, it was used for estimating the impact on the federal government budget of the 2005 labour market reform. Although sophisticated estimation techniques had been used, it transpired, during budget execution in 2005, that budgetary implications had been highly underestimated: actual federal expenses under the reform programme were significantly higher than budgeted for in the Budget Act.

Table 3. Composition of the medical CPI

No.	Description
98	Medical and personal care
99	Medical care
100	*Drugs and medical care commodities*
101	Drugs
102	Medical care commodities
103	Medical care services
104	*Out-patient expenditure*
105	Examination fees
106	Dental fees
107	Eye check-up fees
108	Others
109	*In-patient expenditure*
110	Expenditure on hospital services
111	Personal care
112	*Personal care items*
113	*Personal care services*

Item No. 98 has a weight within the overall CPI of around six per cent over the last three "baskets" (2537/1994, 2541/1998, 2545/2002 – Annex I, table 3).

Only Item No. 99 was used for the composite index.

Item No. 100 is consistent to a large extent with group *06.1 Medical Products, Appliances and Equipment* of the United Nations Classification of Individual Consumption According to Purpose (COICOP) (UN, 2004). Group 06.1 covers medicaments and equipment and other health related products "purchased by individuals or households, either with or without a prescription, usually from dispensing chemists, pharmacists or medical equipment suppliers. They are intended for consumption or use *outside* a health facility or institution" (UN, 2004, p. 473). [11]

Item No. 101 is presumably consistent with group 06.1.1 Non-durable pharmaceutical products and group 06.1.2 Non-durable other medical products.

No. 102 should be consistent with group 06.1.3 Durable therapeutic appliances and equipment.

No. 103 relates to group 06.2.1 Medical services, which include services of orthodontic specialists.

Item No. 104 (containing items No. 105 to 108) should be consistent with group 06.2 Outpatient services which "covers medical, dental and paramedical services delivered to outpatients by medical, dental and paramedical practitioners and auxiliaries. The services may be delivered at home, in individual or group consulting facilities, dispensaries or the outpatient clinics of hospitals and the like. Outpatient services include the medicaments, prostheses, medical appliances and equipment and other health-related products supplied directly to outpatients by medical, dental and paramedical practitioners and auxiliaries". To which extent consistency exists has still to be clarified.

[11] Products directly supplied to out-patients by practitioners or to in-patients by hospitals and the like are included in out-patient services or hospital services (UN, 2004, p. 473).

Item No. 109, which is identical with item No. 110, is the equivalent to group *06.3 Hospital services*. They include:

- ***Basic services:*** administration; accommodation; food and drink; ambulance transport; provision of medicines and other pharmaceutical products, etc., and

- ***Medical services:*** Services of physicians, surgeons, dentists; medical analyses; physiotherapists, speech therapists, etc.

For further details on products included in all groups mentioned see: UN, 2004, p. 473.

The extent to which the medical CPI of the MoC complies with the items listed (proposed) in the COICOP will be checked later in the project. For this purpose, further investigation is necessary with respect to the practice of CPI data collection and management in Thailand.

Only then can a judgment be made as to whether the medical CPI can be considered as reflecting a "good" approximation of non-labour cost development in the health sector, or whether, not only for mere budgetary purposes, improvements in the methods used and practice applied in the CPI (medical CPI) should be recommended.

For the time being, we assume that the BoB (at least implicitly, i.e. by evidence of capitation fixing) does not consider the medical CPI a fully valid indicator for 50 per cent of health unit cost developments, as assumed in the NHSO capitation calculation. Whether such "mental" reservation is justified or not, will be discussed in due course during the project.

The annual growth rate of the medical CPI has been calculated, thus far, as the average index of calendar year t divided by the average index of calendar year t-1. *Calendar* year indices have been used because, in the past, monthly data had not been provided. Meanwhile, the MoC provides the medical CPI on a monthly basis, i.e. parallel to the regular monthly publications of the CPI. This will, in future, allow for calculating an average medical CPI for the *fiscal* year and, thus, help to improve the methodological framework of the capitation estimation.

2.1.3.3. Other observations

One impact of the BoB's significant undercutting of the NHSO estimates was that the UC scheme was criticized, among other things, for:

- being under financed, particularly for inpatient care;

- not having taken into account in its budgets, population ageing and increasing admission numbers; and

- reduced investments (Srithamrongsawat and Torwatanakitkul, 2005).

We are not (yet) in a position to judge (December 2006) as to whether the "suspicion" of under-financing was/is justified. However, independent of this question, the deficiencies in the budgeting process, the mutual non-acknowledgement of budget estimates and methods, may in the public eye be seen negatively with respect to the UC scheme, not to any of the other actors of the game. It is, therefore, of the utmost importance that the NHSO/UC further develop a sound and convincing data and methods base. With time and experience on comparisons between projections and outcomes, the NHSO has a chance to significantly improve its position in the annual budgetary negotiation process, but only if it sticks to solid estimation procedures that, with high probability, produce realistic

projections. It is one of the aims of this project to support the NHSO in its respective endeavours.

2.2. Estimating capitation of the SSO

The SSO's situation of estimating its health budget is significantly different from that of the NHSO. The NHSO aims at producing a capitation proposal to be used as a basis for the amount of money to be claimed by the government (tax payer) as necessary for its operations. The revenue of the SSO is not a claim on the government budget, but on "the economy", which determines the number of its contributors and their wages on which contributions must be paid.

The SSO's budgetary problem, therefore, is first to estimate its overall expected revenue and then to use (part of) it to be allocated in a "rational" way to the health providers in compliance with the law, taking into account the interests of SSS members. Thus, the budgetary concern of the SSO is to avoid health becoming a deficit on its overall system (which includes pensions and other benefits).

The calculation of the annual capitation fee under the SSO is based on the following formula:

$$\text{Capitation fee} = (C_O * U_O) + (C_i * U_i),$$

where:

Capitation fee = average scheme cost per scheme member,

C_O = Cost per OP visit

U_O = OP utilization rate (= Number of outpatient visits per member, per year)

C_i = Cost per IP bed day

U_i = IP admission rate (= Number of admissions per member, per year)

The above formula is derived from the observation that total scheme costs can be described by the following identity:

Cost of scheme per member * number of members

= costs per outpatient visit * number of outpatient visits

+ cost per inpatient bed day * number of bed days

Cost per inpatient stay can further be calculated as follows:

Costs per inpatient bed day = Cost of bed per day * number of bed days

In the first year of SSS operations the fee was set as follows:

Capitation fee = (150 Baht/Op visit * 3.0 visits)

+ (500 Baht/admission * 0.5 bed days

= 700 Baht/member (per year)

In the following years it evolved as follows:

Capitation fee SSO as paid to providers:

1991–1995	700 Baht/member
1996–1997	800 Baht/member
1998–2000 (Aug)	1'000 Baht/member for the first 50'000 registered 900 Baht/ member for each registered over 50'000
2000 (Sep)–2002	1'100, and
since 2003	1'250 Baht/member.

The above rates are the result of the annual budgeting process, i.e. the fees have all been set prospectively — retrospective adjustments according to "true" provider costs have not been undertaken. Indeed, this is not necessary as the capitation logic does not require such a measure, as long as it can be assumed that the previous year's fee was sufficient.

Ex-ante setting the annual capitation fee consequently requires forecasting four variables:

Cost rates:

C_O = Cost per OP visit

C_i = Cost per IP admission, and

Utilization rates:

U_O = OP utilization rate

U_i = IP admission rate

A variety of techniques are available to carry out such forecasts; those used by the SSO, or rather its advisory committee, are not known in detail; the above sequence of rates strongly insinuates, however, that the annual fixings were not primarily based on such formal techniques, but also on ad hoc settings/considerations. It is an objective of this project to assist the SSO in developing a formal and comprehensive technical tool (model) that allows for the short-, medium- and long-term projection of the SSO capitation fees.

There are additional payments requiring budget estimates:

(a) payment for injury and emergency cases;

(b) payment for high cost special services;

(c) payment as incentive to enhance hospital utilization;

(d) payment on basis of risk adjusted capitation;

Ad (a) payment for injury and emergency care.

Public hospitals receive reimbursement on a fee-for-service (FFS) basis both for outpatients and inpatients, in the latter case covering only billings related to activities undertaken within the first 72 hours (only IP cases; after that time the case is handled under normal treatment).

Private hospitals' outpatient treatments are reimbursed on an FFS basis, using fixed fee schedules. At present standard treatment is reimbursed at a rate of 1,000 Baht/visit.

Additional amounts are foreseen for special services to outpatients, such as:

- Ultrasound 1'000 Baht/case;
- CT-Scan 4'000 Baht/case;
- MRI 8'000 Baht/case.

For inpatients, reimbursement to private hospitals is also based on FFS (within 72 hours), for example:

- Standard treatment 2'000 Baht/day;
- Operation (< 1 hour) 8'000 Baht/time;
- Electro encephalography 350 Baht/case.

Ad (b) Payment for high cost special services.

This budget covers reimbursement of the following 14 items based on fixed fee schedules:

- Acute renal failure
- Chemotherapy and radiotherapy
- Open-heart surgery
- Percutaneous balloon valvuloplasty
- Coronary bypass
- Coronary dilatation using PTCA (percutaneous transluminal coronary angioplasty) or "balloon dilation"
- Implantation of prosthesis and instrumentation
- Brain surgery
- Cryptococcal Meningitis Treatment (medicine only)
- HIV/AIDS (ART and LAB investigation)
- Atrial Septal Defect Closure (ASD; hole in the heart)

- End state of renal failure
- Bone marrow transplant
- Corneal transplant (eye)

Ad (c) Payment for utilization incentive.

This budget aims at enhancing the utilization of hospitals for SSS members; it is equally an incentive to statistical reporting. Conditions for hospitals being entitled to this payment are:

- monthly submission of utilization data
- at least seven months of utilization data to be transmitted per year
- utilization data comprise individual reporting on:
- all OP visits
- all IP admissions
- length of stay of all IP cases.

Hospitals are ranked by an index calculated on basis of the following formula:

(OP visits + (IP admissions * LOS * 4.97)) / Average number of insured

(annualised)

with: LOS = average length of stay per admission

Payment of the budget is carried out on a yearly basis, ex-post.

Ad (d) Payment for risk adjusted capitation.

The purpose of this budget is to take a better account of the special risks to which SSO contractors might be exposed. Risk adjusters used are:

- Score of 25 chronic diseases
- RW of Diagnosis Related Groups (DRGs) (all admissions).

They are used as follows:

Allocation on OP is calculated on the basis of

(score of chronic diseases of hospital / score of chronic diseases of all hospitals) * number of insured persons * [205 Baht (2006)] * 0.55.

Allocation on IP is calculated on the basis of

(RW of all admissions of hospital) / (RW of all admissions of all hospitals) * number of insured persons * [205 Baht (2006)] * 0.45.

At present the average rate (over all hospitals) is 205 Baht/registered member/year.

In 2006, the number of contracting hospitals under the SSO was 269, of which there were:

- 150 public hospitals;
- 119 private hospitals; and
- 2,464 subcontractors.

Further details on the budget allocation mechanism/techniques used by the SSO can be found in chapter 4.3.

3. NHSO capitation calculation for the fiscal year 2007 – statistical and methodological improvements

The NHSO is aware of the statistical and methodological deficiencies previously described. For this reason, in its 2007 budgeting process, an important first move was undertaken to replace the HWS with data from the NHSO's electronic data bank. In other words, the NHSO clearly aims to support its capitation estimations with hard evidence.

The single steps of the 2007 capitation calculation can be summarized as follows.

3.1. Data sources

- survey data were replaced with administrative reporting and inpatient utilization data;
- calculation of the AE/HC budgets was separated from capitation for OP/IP;
- population data is a mix of the standard population database and the population registered under the UC;
- system utilization data are being estimated on the basis of:
    i. the HWS 2003, 2004, 2005;
    ii. administrative reporting data (OP & IP) 2003–2005;
    iii. individual IP records 2005;
    iv. the database on AE/HC recovery claims 2005;
- cost data are derived from:
    i. the administrative financial reports of 817 district and provincial hospitals;
    ii. the administrative reports of university and other public hospitals, of private hospitals and clinics;
    iii. databases on cost-recovery claims on individual IPs.

3.2. Methodology

1. Adjustment of IP admissions: hospitals reporting less than 12 months are adjusted to full year;
2. Comparison of administrative hospital reports and individual records (in NHSO database): hospitals reporting fewer admissions than indicated by individual records are upward-adjusted to the number according to individual records;

3. 108 non-reporting hospitals: admissions were estimated on the basis of the individual records (in NHSO database); [12]

4. Estimate the number of UC beneficiaries;

5. Estimate number of inpatient admissions;

6. Forecast the utilization rate;

7. Estimate the total numbers of OP visits and IP admissions;

8. Estimate HC/AE;

9. Calculate service unit cost;

10. Calculate budget lines and total budget;

11. Calculate OP & IP capitation and total capitation.

Formally, the capitation estimate for 2007 is based on the following model structure consisting of fourteen Excel sheets. We are aware that, for reasons of time constraints, the file, when transferred to the ILO, was not cleaned of "noise" stemming from the modelling phase, which implies that some of the following observations relate exactly to such remaining "noise" and should, thus, not be overemphasized (see **Annex II** for a more detailed description).

1. Sheet a. Unit cost

Data sources for the unit cost in 2005 of Private Hospitals (Priv H), District Hospitals (District H), and Provincial Hospitals (Prov H) are provided. Since there is insufficient data for 2005, survey data from 2003 is included. There are two different data sets for the district and provincial hospitals.

2. Sheet b. CPI 2537-2544 (NHA)

This analyses the past health inflation rate based on 1998, and forecasts the rate.

3. Sheet c. Unit cost inflation

This calculates the unit cost inflation as a combination of health CPI and labour cost development.

4. Sheet d. Unit cost for capitation

This presents the statistic and forecast of unit cost in Baht per OP visit and Baht per IP case using a "quick costing". Computations using the median and the 70th percentile are being mixed.

[12] 234,703 "recuperated" admissions.

5. Sheet e. HWS 2546 only UC

This computes OP and IP utilization rates for 2003. Data are based on the HWS 2546 (2003); includes the population registered and covered by UC. (The Primary care unit is neglected on computations.)

6. Sheet f. Forecast use rate 48

This analyses different regression models in order to forecast the utilization rate by episode/visits (inpatients/outpatients). Regression is based on three observation points.

7. Sheet g. Capitation 45-50 high bound

This computes OP and IP capitation amounts (by episodes and visits, respectively) based on the HWS 2003 data. Capitation rate is defined as the estimated cost for each insured person to be covered under the UC scheme. The rate is multiplied by the total UC-covered population in order to estimate the total estimated cost for one year (budget). Two methods — average cost and percentile cost — are mixed.

8. Sheet h. Capitation

This computes the curative care cost for all covered patients, and the total capitation rate based on sheet 7 g. capitation 45-50 high bound. Other costs are added to those computed in sheet 7 g. capitation 45-50 high bound. (The evolution of the population does not match the population used in other sheets.)

9. Sheet g2. Capitation OP&IP report

This is similar to sheet 7 g. capitation 45-50 high bound. OP and IP capitation is calculated, alternatively, on the basis of the data in the OP & IP report.

10. Sheet h2. Capitation report

This is similar to sheet 8 h. capitation. It computes the curative care cost for all UC-covered patients and the total capitation rate based on sheet 9 g2. capitation OP & IP report. Other costs are added to those computed in sheet 9 g2. capitation OP & IP report. (The population in this sheet does not match the population size used in other sheets.)

11. Sheet i. Compare data

This is used to compare the capitation amounts calculated for OP/IP using different approaches:

HWS (7 sheet g. capitation 45-50 high bound *and* 8 sheet h. capitation) and the Input & Output report (9 sheet g2. capitation OP&IP report *and* 10 sheet h2. capitation report).

DRG version 3.5 is introduced. Using this data, the accident and emergency costs (A&E) as well as the high costs are projected until 2010.

12. Sheet j. Summary

This recaps all previous sheets. (Some of the recapped results differ from the results obtained in previous sheets.)

13. Sheet k. Disease Management

This provides information on different disease groups and their costs for 2007. This information is not linked to other sheets.

14. Sheet l. Final

This calculates the capitation rate per capita, including high costs (HC) and accident and emergency (A&E) costs. The last part of the sheet has the same structure as 8 sheet h. capitation and 10 h2. Capitation report. (The increase rate of OP visits may be computed with the OP utilization rate and not the IP utilization rate.)

On basis of the above method, the capitation amount for 2007 has been recently estimated as shown in the following table (the figures for 2006 show the present 2005/2006 budget).

The advantage of the above modelling approach clearly lies in the fact that it uses, to the extent possible, UC institutional data sources, which helps to gain credibility of results as some of the insecurities stemming from usage of survey data, is removed. Therefore, it can be expected that the above estimate (1,992 Baht per UC member per FY 2006/7) is close to actual costs.

We believe the model could be a good platform from which to start a process of developing a version to be commonly used by the NHSO and the SSO.

Table 4. Capitation rate of the UC fiscal years 2006 and 2007

Item	2006	2007 (s)
Normal outpatient services (OP)	582.80	719.87
Normal in-patient services (IP)	460.35	545.00
Prevention and promotion (PP)	224.89	252.57
Accident and emergency cases (AE)	52.07	83.69
High cost cases (HC)	190.0	217.82
Dental care	2.31	2.31
Emergency medical services (EMS)	6.00	10.00
Rehabilitation (disabled persons)	4.00	4.00
Capital replacement	129.25	156.64
Remote area	7.00	NA
No fault liability	0.53	0.53
Total capitation	1'659.00	1'992.00

4. Allocating the budget to providers ("provider payment")

4.1. The problem

At first glance, the problem of provider payment has already been solved during the budget estimation process: standard-wise, the budget is estimated for the different principal programmes and, from a merely technical point of view, the allocation to providers during budget execution "just" follows actual demand during the fiscal year (according to providers' invoices).

There are, however, several impacts of the capitation method on providers, which have financial implications and which, if not taken into account, may not only put providers' operations (especially those of some classes of hospitals) more generally at risk but, also negatively affect service delivery and consequently, patient satisfaction. Therefore, allocation of the budget on a *fair* basis to the providers of health care and services is one of the main health policy problems.

We briefly recapitulate here the most obvious financial impacts of the UC scheme, caused by allocation problems, on providers and patients, which have been described in detail by Srithamrongsawat and Torwatanakitkul (2005).

During the first few years, the relatively sudden change from supply-based allocation (= providers received public resources according to their costs, i.e. salaries, medical costs, energy, etc.) to demand-based allocation (= resources were transferred according to the number of persons registered with each provider, where each registered person was given equal weight through a flat capitation amount [Baht], independent of the respective person's characteristic probability of becoming a patient) resulted in a mismatch between resources and costs.

Provincial hospitals using intense and often complicated medical treatments and, hence, a relatively high number of health personnel in relation to their registered population, received comparatively low budgets, while hospitals with relatively low medical treatment intensity, e.g., provincial hospitals in the North-eastern provinces, as well as district hospitals in general, employing relatively low numbers of health personnel in relation to their registered population, had high budgets.

As a result, many hospitals had to ask for support from the contingency fund to be able to continue their operations, especially to pay the salaries of their personnel. The contingency fund had been established by the government in order to cover financial problems that might arise as a consequence of the reform.

Overall, about 60 per cent of all provincial hospitals experienced some financial difficulties in the first year, of these only 10 per cent were in the Northeast. Out of all district hospitals, 16 per cent experienced the same problem (in 2002), of these only three per cent were in the Northeast.

One measure introduced in 2003 in order to ease financial pressure (and, thus, the need for restructuring their health services delivery operations) was that hospitals were given the option to receive capitation amounts on an "exclusive" or "inclusive" basis.

"Exclusive" means that the capitation amount paid would only cover preventive medicine, health promotion and primary health care. Collection of funds for secondary and tertiary health care would be left to the provinces, which would pay hospitals for inpatient

treatment on the basis of weighted allocations under a national budget (see: Tangcharoensathien, Viroj and Pongpisut Joungudonsuk, 2004).

By contrast, "inclusive" means that the capitation amount transferred covered all costs, i.e. primary, secondary and tertiary care, as well as preventive medicine and health promotion.

The above has to be distinguished from contracting public hospitals that are allowed to receive their salaries directly from the MoPH (as they did before contracting with UC), instead of paying salaries out of capitation amounts received. Through this option, hospitals could make sure that staff salaries would safely be paid, independently of any financial effects (constraints) of the capitation mechanism. In short, for the time being, capitation amounts received are exclusive of salaries. This policy will change from 2007 onward when the NHSO will directly allocate the budgets to the provinces including salaries.

Only a few provincial hospitals continued to be affected by financial constraints after they had opted for exclusive capitation. Also fewer district hospitals in Thailand's central and southern regions reported financial problems; in the North-eastern region, however, the number of hospitals that had opted for exclusive capitation and that were now experiencing financial constraints, sharply increased. This — to some extent surprising — effect was partially a reaction to the previous "over financing" of inclusive capitation, which had led to significant cost expansion.

Apart from requesting resources from the contingency fund, generating more revenue from other sources was another means to mitigate hospitals' financial constraints.

The CSMBS was the most common source employed by most public hospitals to generate more revenue, due to its unregulated retrospective fee-for-service payment system.

The SSS was seen as another source for generating additional provider income. The SSS is less attractive than the CSMBS because it also uses a capitation method, but the SSS capitation rate was/is more attractive than that of the UC due to its relatively low service utilization rate.

Service utilization rate (SUR)

The SUR distinguishes between outpatients and inpatients. SSS beneficiaries are young and middle aged adults. In these age groups, health services' utilization is typically much lower than during (early) childhood and in old age. This is also the case in Thailand. A point of discussion, however, is that the SUR for those young and middle aged adults is higher under the UC than SSS.

The SUR is defined as number of visits per member per year. Table B1 shows the SUR of UC compared to SSS.

Table B1. Comparison of SURs of SSS and UC

	2002	2003	2004	2005	2006
UC					
OP visits/member	2.869	2.845	2.845	3.539	3.539
IP visits/member	0.066	0.076	0.076	0.090	0.090
SSS					
OP visits/member	2.5400	2.5400			
IP visits/member	0.0443	0.0465			

Source: SSO 2004; Greetong, 2006 (by communication of NHSO).

Tables B2 and B3 show a breakdown of service utilization among different categories of main contractors of the SSS.

Table B2. OP utilization of SSS

Out patient service	Main contractor	2002	2003	Percent change
Number of visits	Public hospitals	6,076,477	6,923,018	12.23
	Medical schools	586,354	572,498	-2.42
	Private hospitals	10,261,706	12,248,265	16.22
	Total	16,924,537	19,743,781	14.28
SUR (visits/member)	Public hospitals	2.50	2.49	-0.40
	Medical schools	2.02	1.73	-16.76
	Private hospitals	2.61	2.63	0.76
	Average	2.54	2.54	0.00
Price per visit (Baht)	Public hospitals	165.96	175.88	5.64
	Medical schools	374.28	532.08	29.66
	Private hospitals	334.33	353.30	5.37
	Average	275.26	296.27	7.09
Price per member (Baht)	Public hospitals	414.16	438.09	5.46
	Medical schools	756.11	922.62	18.05
	Private hospitals	873.96	929.64	5.99
	Average	700.48	753.38	7.02

Source: SSO 2004 (by communication of NHSO, 2006).

Table B3: IP utilization of SSS

In patient service	Main contractor	2002	2003	Percent change
Number of admissions	Public hospitals	100,793	123,065	18.1
	Medical schools	8,123	11,290	28.0
	Private hospitals	184,909	226,622	18.4
	Total	293,825	360,977	18.6
SUR (admissions/member)	Public hospitals	0.0414	0.0443	6.5
	Medical schools	0.0280	0.0342	18.2
	Private hospitals	0.0471	0.0487	3.2
	Average	0.0443	0.0465	5.0
Average length of stay (days)	Public hospitals	5.03	5.13	2.0
	Medical schools	8.28	8.10	-2.3
	Private hospitals	3.94	4.10	3.9
	Average	4.43	4.58	3.1
Price per admission (Baht)	Public hospitals	5,618.62	6,389.10	12.1
	Medical schools	20,476.40	20,803.24	1.6
	Private hospitals	13,502.88	15,001.01	10.0
	Average	10,991.07	12,246.49	10.2
Price per member (Baht)	Public hospitals	232.58	282.90	17.8
	Medical schools	573.06	711.37	19.4
	Private hospitals	636.04	730.34	12.9
	Average	485.58	569.36	14.7

Source: SSO 2004 (by communication of NHSO, 2006).

The SUR affects the SSS capitation indirectly during the budget negotiation process based on the fact that SSS SUR, both in numbers (volumes) and prices to be accounted per member were/are lower than in the UC scheme. As a consequence, the SSS faces less pressure from hospitals than NHSO with respect to capitation. Tables 2 and 3 show the same effect indirectly, when comparing the costs (prices) of medical schools with public hospitals. Due to their high costs per member (accordingly: per OP visit; per admission) they forced the SSO to pay risk-adjusted capitation instead of flat rate capitation, and to add an increasing number of fee for service items every year.

The SSO, unlike the NHSO, has a good reporting system established with hospitals (see tables 2 and 3). Therefore, SSO is in a position to compare the capitation (and other expenditure) with the price of services as costed by each category of hospital. In general, the existence of such a system is highly welcome. However, the major pitfall of the actual reporting system to the SSO is the price (cost) schedule of hospitals. Hospitals do have the authority (by law) to establish their own price-for-service schedule. However, the costing mechanisms are opaque and predominantly driven by the hospitals' financial needs. There is no control system established — or available to the SSO — that would allow for a rationality/efficiency check of those price lists. As a result, the costing system — the price lists — of hospitals is a "black box", and the SSO is in a weak position when bargaining the capitation.

Immigrants' labour insurance was another potential source, similar to the SSS, but it was usually available only in provinces recruiting immigrants.

In other words: those resources not directly available through the capitation mechanism of the NHSO were often acquired by proportionally tapping other public sources.

In general, big hospitals with specialists and state-of-the-art technology equipment were better off, as they have a greater intake of patients and, accordingly, a greater capability of generating additional revenue from other sources (see above) than small district hospitals. [13]

(Only) some hospitals, in implementing cost saving measures, allowed: payment in arrears; adhered strictly to the National Essential Drug List when prescribing drugs for UC beneficiaries; made use of generic and locally manufactured drugs, instead of imports; adjusted working time arrangements (reducing costly overtime); cut non-medical expenses; and/or postponed investments in medical equipment, construction and training.

Hospitals with low reserves and limited capability to generate revenue from other sources may be forced to reduce quality and quantity of services.

The limitation of new investments is also expected to have a negative impact on the quality of hospital care. It has been argued that the NHSO should be more pre-emptive by setting aside adequate funds for investment in new medical technology.

One of the expectations of the capitation payment mechanism was that "enriched" provinces/hospitals might solve the problem of chronic understaffing, especially in the North-eastern provinces. This expectation was not met. A number of reasons for this failure have been discussed, pre-dominantly among these, MoPH personnel policies. However, lack of sufficient resources earmarked for attractive pay packages for physicians and other qualified staff in rural areas, and other incentives for providers that would make remote areas more attractive, has obviously contributed to this programme failure.

The establishment of primary care units (PCUs) has improved services for people near their home; they facilitate physical access to, while reducing costs of, health care services -

[13] This was taken into account for the 2003 allocation.

particularly for those with chronic conditions, the poor and aged citizens in rural areas. However, quality of services must be improved further by recruiting professional nurses to these health centres. The development and execution of adequate training programmes for existing and future staff would be needed.

Generally, the flat rate capitation payment is an incentive for providers to give limited services to those needing expensive care, for example, senior citizens and patients with chronic conditions. At present, such tendencies are aggravated by the way resources are allocated to providers.

In order to overcome these and other described problems, age and other risk factors should be taken into account when calculating the capitation rate, to prevent adverse selection (e.g., hospitals seeking low risk beneficiaries for registration), and any bias in service provision.

At a later stage in the project, a proposal is expected that might help to put the budget allocation on such a "fairer" basis, acceptable to all stakeholders of the scheme, providing a formal mechanism for technical allocation of UC resources to the different provinces (providers), allowing for a "free flow" of the intended efficiency impact of the capitation payment method for health providers (hospitals), and maximizing patients' satisfaction.

4.2. Present allocation mechanism of the UC scheme

For the technical description of present allocation mechanisms at NHSO headquarter levels, 2005 is taken as an example.

In the fiscal year 2005, NHSO received a budget for the estimated/expected annual average number of 46 million beneficiaries at 1,396.30 Baht/capita. This budget, a total of 64,229.8 million Baht, was allocated to 10 mutually exclusive expenditure categories. Table 5 shows the allocation in Baht/capita.

Only a maximum of about 30 per cent of all expenditure is being managed by the NHSO directly, whereas the rest is allocated to providers through existing administrative channels of the MoPH.

Items 1 (OP) and 2 (IP)

OP and ***IP*** reflect the dominating bulk of expenditure allocated to contracted providers according to their respective numbers of registered members. Providers, knowing the total amount they can dispose of (this information being provided to them through the provincial MoPH offices), send their invoices to NHSO headquarters for reimbursement.

In outpatient cases the reimbursement is based on simple capitation: each patient (case) is treated equally.

In IP cases, the reimbursement is based on a DRG system, which was initially adapted from the USA (see, for example: HSI, 1987) and has recently been modified on the basis of the Australian DRG system. The reimbursement mechanism works as follows: hospitals report the cases treated in combination with the DRGs applied. Each DRG has attached to it a specific, pre-defined and nationwide weight. The weight, broadly speaking, reflects the intensity of care (the costs of treatment). Providers' invoices are checked by the Claims

Department of the NHSO;[14] for reimbursement, all DRG weights are summed up per contracting provider. The individual provider's share in per cent of DRGs in the total sum of DRGs is calculated. The share is then multiplied by the total funds available and the resulting amount (Baht) transferred.

Table 5. Expenditure by categories 2005

Type of benefit	Baht per capita	Recipient/management (explanations refer to 2005; 2006 some changes were introduced)
1. OP	533.01	Transfer to provincial offices of MoPH, acting as NHSO branch office, according to the number of beneficiaries per branch registered
2. IP	435.01	
3. Prevention and Promotion	210.00	NHSO contracts with agencies that provide supplies to health care facilities, money disbursement through MoPH according to the number of beneficiaries registered
4. Accident and Emergency	24.73	
4.1 OP	0.74	
4.2 IP (different provinces)	14.37	
4.3 First visit of new beneficiaries ("article 8 cases")	6.05	Managed directly by NHSO
4.4 Newborns	3.57	
5. High cost services	99.48	
6. Medical Emergency Services	6.00	Transfers to MoPH and provincial branches
7. Disability	4.00	
8. Capital replacement	76.8	
9. Add on budget (specific rural areas)	7.07	Managed directly by NHSO
10. No fault liability (article 41)	0.20	
Total expenditure per capita	1,396.3	

Source: NHSO, 2006 (by communication).

Item 3

Prevention and promotion benefit – PP is aimed at not only UC beneficiaries, but all Thai citizens (coverage goes beyond UC members). The budget has been estimated as follows:

Total expenditure for PP = Unit cost per capita (210 Baht/capita * 47 million)
= 9'870 million Baht

The use of the number of 47 million (instead of 46 million, see above) is due to the peculiarities of the overall budgeting process: the NHSO calculated PP by using total PP expenditure of the previous year times (1+inflation), and divided the result by 46 million. The resulting per capita value was approved by the BoB before fixing the estimate on UC coverage (approval: 47 million). In the negotiation process, neither BoB nor NHSO went back into details of PP per capita calculation again. Thus, NHSO received a PP budget higher than initially estimated.

Expenditure for prevention service was allocated to different programmes as shown in table 6.

[14] The COHI acts as a clearing house for providers' electronic claims for in-patient treatments of civil servants (the office is linked to around 950 hospitals).

Item 4

Accident and Emergency is allocated by the NHSO to four mutually exclusive categories. Each category is a closed-end global budget as reflected in table 7.

Table 6. Prevention and promotion by programme allocation

Programme	Expenditure in million Baht (Baht/capita)	Executing agency
Vaccine for national vaccination programme	655.90 (10.35)	Transfer to Disease Control Department, MoPH
Baby health books[1]	7.38 (0.12)	
Pupil health books[2] (Screening pupils)	4.02 (0.06)	
Anti-retroviral drugs for pregnant women	20.54 (0.32)	Transfer to Health Department, MoPH
Family planning drugs (Norplant)	26.00 (0.41)	
Thalassemia screening test	49.64 (0.78)	
Congenital hypothyroid-ism screening test	81.50 (1.29)	Transfer to Medical Technology Department, MoPH
Prevention services in health care facilities	-.-- (13.33)	NHSO-transfer to provincial MoPH offices. Provincial branch offices are responsible for paying (reimbursing) PP activities within their administrative boundaries.
Prevention services in communities	-.-- (37.32)	

[1] The baby health book contains the names of the screening tests undertaken, and their dates, confirmed by the doctor/nurse during the child's first two years. [2] Equivalent to baby health books for (school) children above the age of two.

Source: NHSO, 2006 (by communication).

[Some inconsistencies remain, for example with estimates on previous page. These will be addressed and corrected at a later stage.]

Table 7. Accident and emergency expenditure

Type of expenditure	Baht/capita	Total (Baht)
— Outpatients Accident and Emergency	0.74	34'780'000
— In patient Accident and Emergency	14.37	675'390'000
— In patient (new beneficiaries)	6.05	284'350'000
— In patient (new born)	3.57	167'790'000

Source: NHSO, 2006 (by communication).

Payments are based on health care facilities' specific requests to the Claim Bureau of the NHSO. Payments cover the same services as those financed by the OP and IP budgets. For certain reasons they are not included in those budgets, but managed directly by NHSO, at headquarter level.

Item 5

High cost medical services are labelled "high cost" for historical and other reasons; in fact, it also comprises items that are not especially costly. The services under this item include:

Ambulatory cases

1. Chemotherapy and/or radiotherapy (cancer treatment);

2. Cryptococcal meningitis in HIV patients;

3. Peritoneal dialysis and/or haemodialysis in cases of acute renal failure (up to 60 days).

Inpatient cases

1. Case-based reimbursements, according to IPHC1:

    1.1. Treatment of specific diseases:

        1.1.1. Chemotherapy or/and radiotherapy (cancer treatment);

        1.1.2. Head injury with craniotomy;

        1.1.3. Open heart surgery, coronary bypass, percutaneous balloon valvulo-plasty;

    1.2. All inpatient episodes with a relative DRG weight >= 4.

2. Reimbursement of specific services, according to IPHC2:

    2.1. Cryptococcal meningitis in HIV patients;

    2.2. Peritoneal dialysis and/or haemodialysis in cases of acute renal failure (up to 60 days).

The NHSO administers these payments directly. Again, payments are based on health care facilities' specific requests to the Claim Bureau of the NHSO. NHSO divides the overall budget into four mutually exclusive categories. Each category is a closed-end global budget as indicated in table 8.

Table 8. High cost medical services

Type of expenditure	Baht/capita	Total (Baht)
— Out patient high cost	5.93	278'710'000
— In patient high cost (IP HC1)	80.86	3,800'420'000
— Specific services for inpatients (IP HC2)	2.95	138'650'000
— Durable equipment and artificial organs	9.74	457'780'000

Source: NHSO, 2006 (by communication).

Item 6

Medical Emergency Services (ES) include pre-hospital or pre-health facility services and ambulatory services as reflected in table 9. Accordingly, the budget includes payments to:

- dispatch centres, which coordinate the information between the first responder, the basic/advanced life support unit, and the hospital. For the time being, the MoPH is responsible for the dispatch centres;

- the toxicological centre of the Faculty of Medicine at Ramathibodi Hospital, which is responsible for providing advice on toxicological treatment nationwide via a hotline (#1330);

- local governments, which are responsible for any reimbursements to the first responder.

Table 9. Medical Emergency Services expenditure

Type of expenditure	Budget	Responsible unit
EMS administration:		
Administration and training	236,639,861	Transfer to MoPH.
Toxicological centre	6,950,000	Transfer to the Faculty of Medicine Ramathibodi Hospital.
Resuscitation equipment	15,000,000	Procured at NHSO, equipment transferred to local governments.
EMS services:		
Reimbursements	299,362,778	NHSO allocates budget to provincial branch offices. These are responsible for reimbursing EMS activities within their administrative boundaries.
Total	566,952,639	

Source: NHSO, 2006 (by communication).

Item 7

Rehabilitation measures are managed as indicated in table 10.

Table 10. Expenditure on rehabilitation measures

Type of expenditure	Million Baht	Note
Rehabilitation services	150.4	
Reimbursement of services and equipment	110.4	
Registration of disabled persons	30.0	Administered directly by the NHSO
Reform of hospital administration	10.0	
Transfer to MoPH for procurement of durable equipment for invalids	26.2	
Training invalids and informal caregivers	11.4	Transfer to NGOs

Source: NHSO, 2006 (by communication).

Item 8

Capital replacement is managed as indicated in table 11.

Table 11. Investment expenditure (including capital replacement)

Type of expenditure	Budget	Note
1. MopH hospitals	3'075,300,233	e.g. CT scan
2. Hospitals of other ministries	139,839,149	
3. Private hospitals	157,460,618	
4. Specific tertiary care investments	137,000,000	
5. Human resource development in tertiary health care facilities	90,000,000	
6. Human resource development in primary care health care facilities	10,000,000	
Total	3,609,600,000	

Source: NHSO, 2006 (by communication).

Item 9

Add on budget (specific rural areas) covers spending on OP and IP cases.

Item 10

No fault liability has been estimated by the NHSO on the basis of historical records. There was a specific budget for Tsunami victims, not included in the normal budget. The NHSO provided 100 million Baht for six provinces destroyed by the Tsunami.

4.3. Present allocation mechanism of the SSS

The SSO has used two payment mechanisms since its beginning. Contracted (registered) hospitals are paid by the SSO using (i) a capitation method (payment according to the number of members), and (ii) a system based on additional *fee-for-service* payments in case of specific services and medical equipment (see table 12, below).

Table 12. Medical expenditure (in kind) 2003

Item	Number of beneficiaries	Total expenditure (Baht)	Average (Baht/ episode)	Average (Baht/ capita)	Payment mechanism
	1	2	3	45	
1. Basic capitation	7,764,325	8,540,757,729	1,100	1,100.00	
2. Incentive to provide services and statistical data	7,764,325	432,206,903	56	55.67	Capitation
3. Payment for cases of high financial risk (= "risk adjustment")	7,764,325	1,164,648,781	150.00	150.00	
4. Special medical services and equipment	22,578	151,963,938	6,731	19.57	
5. Bone marrow transplantation	6	4,250,000	708,333	0.55	Fee for
6. Chronic renal failure	21,888	178,343,770	8,148	22.97	services with
7. Accident/emergency	84,144	200,314,021	2,380	25.08	ceiling
8. Dental care	1,048,448	209,691,038	200	27.01	

Source: NHSO, 2006 (by communication).

The first mechanism [(i)], the *capitation* method, is characterized by dividing the amount into four components:

(i) a basic capitation amount;

(ii) an amount intended to function as an incentive for providing good services to SSS members;

(iii) an amount intended to function as an incentive to provide data to the SSO (a statistical incentive); and

(iv) an additional amount for high financial risk beneficiaries.

Each component has its own budget.

In the year of SSS implementation (1991) only a basic single rate capitation amount (i) existed (at that time 700 Baht per member for public hospitals) [15] covering both ambulatory and inpatient services. The same capitation rate was equally applied to all contracting hospitals, public or private.

[15] For private hospitals not eligible to favourable tax treatment: 707 Baht/member.

Later, the SSO introduced the above two additional components (ii) and (iii) aiming at more and better services for members, and timeliness and good quality of data reporting from providers to the SSO.

However, it turned out that the three components (i) to (iii) were not sufficient to cope with the financial problems concerning the members with chronic disease. This group usually selects the (costly) medical schools for their treatment (see Box). Thus, an additional component (iv) was introduced in 2001 in order to pay for these "high financial risk" members.

The second mechanism [(ii)], the payment by *fee-for-service*, can be divided into five components as follows:

(i) payment for special high-cost medical services and equipment;

(ii) payment for bone marrow transplantation (maximum 750,000 Baht per case);

(iii) payment for end-stage chronic renal failure, hemodialysis, peritoneal dialysis, kidney transplantation, erythropoietin (hormone);

(iv) payment in case of accident/emergency; and

(v) payment for corneal transplants and dental interventions.

Each component is stipulated in a separate budget.

In the first year of SSS implementation, the SSO accepted reimbursement of only a limited list of treatments/applications that would incorporate use of (expensive) medical equipment [(i)]; the basis for reimbursement was the fee schedule of the CSMBS. However, in order to enhance providers' (hospitals') willingness to treat SSS members as preferentially as other patients (civil servants, private patients paying out of pocket, etc.), the SSO later decided to enlarge that list of expensive applications to include, for example, elective and emergency treatments using CT scans, brain surgery and cardiac surgery. Bone marrow transplantation, chronic renal failure and dental treatment had at first been excluded (1991). They were added after negotiations with scheme members and providers.

Formally, SSO payments to providers can be specified as follows:

PI (SSS) = raC + FFS

where

PI (SSS)	=	Provider income through SSS payments
raC	=	Gross risk adjusted capitation, and
FFS	=	Fee for service

and

raC	=	Basic capitation
	+	Incentive for utilization
	+	Incentive for data
	+	Risk adjustment

or

= (1) + (2) + (3) + (4) [table 12, upper part, columns 2-4];

and

FFS = Special medical services and equipments
+ Bone marrow transplantation benefit
+ Chronic renal failure benefit
+ Accident and emergency
+ Dental benefit

or

= (5) + (6) + (7) + (8) + (9) [table 12, lower part, columns 2-4].

With respect to estimating/projecting the single components for its budget, the SSO administration is only, to a limited extent, in a systematically better data (statistical) position than the UC scheme's administration. The most significant distinguishing feature seems to be that the SSO has higher autonomy in fixing its capitation amounts compared to the NHSO, which is totally dependent on the BoB's decisions.

With reference to 2003, the SSO's estimation procedure has been characterized as follows: [16]

Estimation of the *basic capitation* amount [(1)]

This amount is supposed to cover both "basic" outpatient and inpatient treatment. All treatments, except items enumerated in exclusion lists, are included.

As the SSO has no information on the financial accounts of its contracting hospitals, its Medical Coordination and Rehabilitation Division (MCRD) tries to estimate the unit costs of each type of the main contractor hospitals through adjusting historical price and volume data as stored in the database. Control calculations are also undertaken by the MCRD using direct surveys and results of external research (table 13).

Table 13. Estimation of cost of each type of hospital for the year 2003 using different methods

Method	Total cost of outpatient (Baht/visit)	Total cost of inpatient (Baht/visit)	Total cost per capita
1. Using historical volume and price data from hospital reports (estimating unit costs of public hospitals by using their price data times 1.45; private hospitals: own price reports)		676	1,590
2. Using direct survey		537	1,456
3. Using IHPP research on UC (unit cost 2002 adj. with CPI 2003)	1,058	349	1,407
4. Using IHPP research on UC (unit cost 2001 adj. with CPI 2002. Adj. with CPI 2003)	968	320	1,'88

Source: NHSO, 2006 (by communication).

[16] The following information was taken from documents provided by the NHSO; procedures have been similar in all years since.

Total per capita cost ("capitation") was then calculated as follows. First, for each type of main contractor hospital, the unit cost estimate for 2003 was multiplied by the utilization rate. This cost estimate was compared with SSS-induced hospital income in the same year. The differential between cost and income was used in order to adjust the capitation amount for hospitals in 2004.

While the above describes the estimation techniques as applied by the SSO, it has to be noted, however, that the final capitation amount for 2004 has been, and usually is, dependent on negotiations between the SSO and the providers.

Estimation of the amount for *enhancing services* [(2)]

The total budget of this part is equal to 56 Baht times the total number of scheme members. Hospitals providing more outpatient and inpatient services than normal receive additional payment, paid out at the end of the contracted year.

Estimation of the amount for *data provision* [(3)]

The total budget of this part is equal to 30 Baht times the total number of scheme members. Hospitals are being ranked according to their performance of data reporting. The higher a hospital is ranked, the higher the amount received. Payment is made at the end of the contracted year.

Estimation of the amount for *high financial risk* cases [(4)]

The total budget of this part is equal to 150 Baht times the total number of scheme members. The money is paid to hospitals at the end of the contracted year.

The formula used for the risk adjustment distinguishes between two mutually exclusive parts, outpatient and inpatient financial risks, i.e.

Total risk = Total outpatient financial risk + Total inpatient financial risk

High-risk beneficiaries are members who have a specific chronic condition, e.g. hypertension or diabetic-mellitus. The relative weight of each such risk (chronic disease) is an arbitrary number, which represents the relative expenditure of that risk in comparison to all other risks.

The total outpatient financial risk is calculated from the number of high-risk beneficiaries and the relative weight of each such risk as follows:

$$\text{Total outpatient financial risks} = \sum \text{Hospital outpatient risks,}$$

where

$$\text{Hospital outpatient risk} = \sum_{i=1}^{n} \{NCDi * RWCDi\}$$

with

NCD_i = Number of members with chronic disease$_i$, and

$RWCD_i$ = Relative weight of chronic disease$_i$.

The total of all inpatient financial risks is calculated as the relative weight of high cost cases within the sum of RW DRGs of that year.

Estimation of the amount for special medical services and equipment [(5)]

The total budget of this part is estimated from historical data. The SSS defines its own fee schedule to pay hospitals in these cases.

Estimation of the amount for *bone marrow transplantation* cases [(6)]

The total budget of this part is estimated from historical data. Hospitals are reimbursed by the SSO according to a fee schedule, where the maximum amount paid is defined by the SSO (ceiling). The patient has to pay the rest.

Estimation of the amount for *chronic renal failure* cases [(7)]

The total budget of this part is estimated from historical data. Hospitals are reimbursed by the SSO according to a fee schedule, where the maximum amount paid is defined by the SSO (ceiling). The patient has to pay the rest.

Estimation of the amount for *accident and emergency* cases [(8)]

The total budget of this part is estimated from historical data. The hospitals or insured persons are reimbursed by the SSO according to a fee schedule, where the maximum amount paid is defined by the SSO (ceiling). The patient has to pay the rest.

Estimation of the amount for *dental treatments* [(9)]

The total budget of this part is estimated from historical data. The insured persons are reimbursed by the SSO according to a fee schedule, where the maximum amount paid is defined by the SSO (ceiling). The patient has to pay the rest.

4.4. A tentative comparison of mechanisms

A quick comparison between the approaches used by the SSO (SSS) and the NHSO (UC) shows the following:

- The NHSO used SSO experience for designing its budgeting and payment mechanism.
- The NHSO uses capitation as the main payment method for outpatient treatments (the catalogue of the SSS does not comprise Prevention & Promotion activities).
- The UC scheme explicitly separates inpatient from outpatient cases, and pays inpatient cases on the DRG basis, while “capturing” high cost cases.
- By contrast, the SSS uses capitation for both categories of treatment, outpatient and inpatient. Within SSO-capitation [(1) + (2) + (3) + (4)] high costs are being “captured” through the risk adjustment of the basic rate.
- The UC “borrowed” the concepts of special medical services and equipment [(5)], and of accident and emergency benefits [(8)] from the SSS. The payment details, however, are different.
- The UC (still) does not include chronic renal failure treatment and transplantation in its benefits. It may have to do so in future.

5. Preliminary conclusions and next steps

The budgeting method as applied by the NHSO can be characterized as follows.

1. Until 2006 the process was based mainly on "soft" data. These data came from surveys, which were initially not implemented to derive statistical foundation for budget estimates (budgeting procedures), and from other, similar information sources. For most items, the estimates for budget year t had to be based on information sources referring to year t-2 or even t-3. Unit cost developments are projected with the help of a composite index consisting of a medical price index and labour cost. The weights of both variables in the composite index are around 50 per cent. Within the NHSO modelling procedure, it is unclear to what extent the goods and services contained in the basket of this index are reliable dummies for the cost development under UC contracted providers. A more detailed inspection of the medical CPI in cooperation with the MoC, undertaken in October 2006, gave rise to serious doubts. We see a need for undertaking separate research with respect to the development of a health non-labour cost index.

2. Since the budget estimate for 2007 (produced in early 2006), the NHSO for the first time used administrative (process) data in order to estimate core parameters. It remains to be seen to what extent this change in data source can contribute to establishing BoB's trust in the NHSO's budget proposals. In this respect, the indicators to be observed are the gaps between the forecast of the capitation rate by the NHSO, the budget-set rate by the BoB, and the rate's actual fixing. Expectations for those gaps narrowing are methodologically fostered (c.f. Table 2).

3. In its past, and because of still remaining partial statistical weaknesses, the budgeting process of NHSO is not unique. In many countries, including developed ones, budgeting has been, at least transitorily, in similar difficulties when new legislation of a comparable scope was implemented. [17]

4. A comparison of budget estimate and actually approved estimates shows a substantial mismatch between (high) proposal and (reduced) actual budget. The gap might, for the first time, be essentially reduced in 2007. Possible reasons have been discussed in chapter 2.1.3. The general philosophy of the NHSO's budgeting approach is to maximize the proposed (requested) budget. While knowing that the proposed budget will normally be downsized during the political budgeting process (BoB, Cabinet, Parliament), the NHSO aims at providing a "high estimate", hoping that resources finally approved will be sufficient (despite cuts) for a proper delivery of services through the health facilities contracting with UC. It is hoped that the design of the capitation estimation "tableau" (= items included, methods used) supports this aim.

5. Politically, the budgeting situation (and, thus, its methods applied) of the NHSO/UC is very different from the one of the SSO. The NHSO produces, with its budget estimate, a claim on the government budget, and only indirectly on the economic production (GDP) of the country. The SSO, by contrast, produces a direct claim on the economy. Its budget depends directly on labour market developments, wages etc.

6. While it is the problem of the NHSO to maximize its claim (the requested resources; the budget estimate), it is the problem of the SSO to minimize the claim, i.e. to steer

[17] For example, during German unification 1989/1990 and the first few years following, many core budget estimates for the "eastern parts" of the German social security system had to be based on assumptions from quite vague statistical and unproven behavioural information (Scholz, 1991).

its health expenditure in such a way that health providers are not eating into growing shares of the SSO's overall revenue (reserves), given the fact that the SSO also provides pensions and other benefits.

7. Historical development shows that both institutions only partially succeed in their intrinsic budgetary goals: the UC typically does not receive the resources it considers adequate; the SSO seems to be driven by providers' demands for ever increasing payments. Both developments seem to be interlinked to some extent: providers try to compensate UC austerity through over proportionally tapping SSO.

8. The last item especially points to a need to coordinate operations between NHSO and SSO. A beginning could be made through a joint effort to estimate capitation fees on a common basis (model; assumptions; data base). This point will be discussed further as the project progresses, and in subsequent reports.

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Annex I. Tables

Table AI.1. Sources and methods used for UC capitation 2002 to 2006

Item	Name	Unit	2002	2003	2004	2005	2006
	Out-patient care						
(1)	Incidence rate of sickness	cases/year	Health and Welfare Survey 1996	Health and Welfare Survey 2001		Health and Welfare Survey 2003	
(2)	Percentage of OP visit	per cent					
	of which:						
(2-1)	Health centers	per cent	As above				
(2-2)	District hospitals	per cent					
(2-3)	Provincial hospitals	per cent					
(2-4)	Private clinics	per cent					
(2-5)	Private hospitals	per cent					
(2-6)	Referral hospitals	per cent	-	External estimate			
(3)	OP visit	visits/year	=(1)*(2)			Linear function to 2005; HWS1999,2001,2003 base data (Y = 0.00856X + 2.683)	
	of which:						
(3-1)	Health centers	visits/year	=(3)*15.1%/66.1%, HWS1996	=(3)*22.2%/69.4%, HWS2001		=(3)*26.6%/72.7%, HWS2003	
(3-2)	District hospitals	visits/year	=(3)*12.9%/66.1%, HWS1996	=(3)*14.2%/69.4%, HWS2001		=(3)*22.2%/72.7%, HWS2003	
(3-3)	Provicial hospitals	visits/year	=(3)*15.5%/66.1%, HWS1996	=(3)*17.9%/69.4%, HWS2001		=(3)*08.6%/72.7%, HWS2003	
(3-4)	Private clinics	visits/year	=(3)*19.5%/66.1%, HWS1996	=(3)*12.0%/69.4%, HWS2001		=(3)*12.4%/72.7%, HWS2003	
(3-5)	Private hospitals	visits/year	=(3)*03.1%/66.1%, HWS1996	=(3)*02.6%/69.4%, HWS2001		=(3)*02.6%/72.7%, HWS2003	
(3-6)	Referral hospitals	visits/year		=(3)*00.5%/69.4%		=(3)*00.3%/72.7%	
(4)	OP unit cost	Baht/visit	=(5)/(3)				
	of which:						
(4-1)	Health centers	Baht/visit	Estimated from 1999 survey	Assumed increase of 3% from 2002capitation	=year2003*(1+inflation 2.9%)	=year2003 *(1+2004inflation,7.42%) *(1+2005inflation,4.08%) [see neighbouring cell 2006]	=year2000 *(1+2001inflation,3.2%) *(1+2002inflation,2.9%) *(1+2003inflation,10.43%) *(1+2004inflation,7.7%) *(1+2005inflation,6.99%) *(1+2006inflation,4.2%) [year2000 value assumed = 1999survey: 60 Baht]
(4-2)	District hospitals	Baht/visit	Estimated from 1999 survey (North provinces in Areas 8-10)	Median unitcost from Report no.5 2001(MOPH)		=70 percentile of unitcost from Report no.5 2003 (MOPH) *(1+2004inflation,7.42%) *(1+2005inflation,4.08%)	=70 percentile of unitcost from Report no.5 2003 (MOPH) *(1+2004inflation,7.7%) *(1+2005inflation,6.99%) *(1+2006inflation,4.2%)
(4-3)	Provincial hospitals	Baht/visit				=Median unitcost from Report no.5 2003(MOPH) *(1+2004inflation,7.42%) *(1+2005inflation,4.08%)	=Median unitcost from Report no.5 2003(MOPH) *(1+2004inflation,7.7%) *(1+2005inflation,6.99%) *(1+2006inflation,4.2%)
(4-4)	Private clinics	Baht/visit	Assumed equal to (4-2)	Estimated from private hospital data, 24 hospitals		=Median unitcost from Quick survey 2004 *(1+2004inflation,7.42%) *(1+2005inflation,4.08%)	=Median unitcost from Quick survey 2004 *(1+2004inflation,7.7%) *(1+2005inflation,6.99%)
(4-5)	Private hospitals	Baht/visit	Assumed equal to (4-3)				
(4-6)	Referral hospitals	Baht/visit		Estimated from teaching hospitals data, 7 hospitals			
(5)	OP average cost	Baht/year	Sum of (5-1) to (5-6)				
	of which:						
(5-1)	Health centers	Baht/year	=(3-1)*(4-1)	=(3-1)*(4-1)/0.97 (HWS was in low season of OP case (about 3%) so, OP cost was devided by 0.97)		=(3-1)*(4-1)	
(5-2)	District hospitals	Baht/year	=(3-2)*(4-2)	=(3-2)*(4-2)/0.97 (HWS was in low season of OP case (about 3%) so, OP cost was devided by 0.97)		=(3-2)*(4-2)	
(5-3)	Provincial hospitals	Baht/year	=(3-3)*(4-3)	=(3-3)*(4-3)/0.97 (HWS was in low season of OP case (about 3%) so, OP cost was devided by 0.97)		=(3-3)*(4-3)	
(5-4)	Private clinics	Baht/year	=(3-4)*(4-4)	=(3-4)*(4-4)/0.97 (HWS was in low season of OP case (about 3%) so, OP cost was devided by 0.97)		=(3-4)*(4-4)	
(5-5)	Private hospitals	Baht/year	=(3-5)*(4-5)	=(3-5)*(4-5)/0.97 (HWS was in low season of OP case (about 3%) so, OP cost was devided by 0.97)		=(3-5)*(4-5)	
(5-6)	Referral hospitals	Baht/year		=(3-6)*(4-6)/0.97 (HWS was in low season of OP case (about 3%) so, OP cost was devided by 0.97)		=(3-6)*(4-6)	
	In-patient care						
(6)	Hospital admission rate	cases/year	Health and Welfare Survey 1999	Health and Welfare Survey 2001		Exponential function to 2005; HWS1999,2001,2003 base data (Y = 0.0634 e 0.0353 X)	
	of which:						
(6-1)	District hospitals	cases/year	=(6)*33.2%, HWS1999	=(6)*30.04%, HWS2001		=(6)*55.32%, HWS2003	
(6-2)	Provicial hospitals	cases/year	=(6)*48.8%, HWS1999	=(6)*53.29%, HWS2001		=(6)*35.04%, HWS2003	
(6-3)	Private hospitals	cases/year	=(6)*18.0%, HWS1999	=(6)*10.0%, HWS2001		=(6)*8.75%, HWS2003	
(6-4)	Referral hospitals	cases/year		=(6)*6.67%, estimated from teaching hospital		=(6)*0.89%, estimated from teaching hospital	
(7)	IP unit cost	Baht/case	=(8)/(6) (residual)				
	of which:						
(7-1)	District hospitals	Baht/case	Estimated from 1999 survey (North provinces in Areas 8-10)	=(4-2)*14		=(4-2)*16.01	
(7-2)	Provincial hospitals	Baht/case		=(4-3)*18		=(4-3)*19.03	
(7-3)	Private hospitals	Baht/case	Assumed equal to (7-2)	Estimated from private hospital data, 24 hospitals		Estimated from private hospital data, 17 hospitals	=year2003 *(1+2004inflation,7.7%) *(1+2005inflation,6.99%) *(1+2006inflation,4.2%)
(7-4)	Referral hospitals	Baht/case		Estimated from teaching hospitals data, 7 hospitals		=year2003 *(1+2004inflation,7.42%) *(1+2005inflation,4.08%)	
(8)	IP average cost	Baht/year	Sum of (8-1) to (8-4)				
	of which:						
(8-1)	District hospitals	Baht/year	=(6-1)*(7-1)				
(8-2)	Provicial hospitals	Baht/year	=(6-2)*(7-2)				
(8-3)	Private hospitals	Baht/year	=(6-3)*(7-3)				
(8-4)	Referral hospitals	Baht/year	-	=(6-4)*(7-4)			
	Summary						
(A)	OP averge cost		=(5)*OP compliance rate				
(B)	IP average cost		=(8)*IP compliance rate				
(C)	High cost		Estimated from SSO data 1998-1999				
(D)	Accident and emergency		Estimated from SSO data 2000				
(E)	Denture			Estimation under dentist resource		Assumed equal to 2003capitation	
(F)	Prevention and promotion		=[0.2*SUM((A) to (B))]	Estimated from MOPH budget of PP 2001	Assumed equal to 2003capitation	=year2004 *(1+2004inflation,7.42%) *(1+2005inflation,4.08%)	=year2004 *(1+2004inflation,7.7%) *(1+2005inflation,6.99%) *(1+2006inflation2006,4.2%)
(G)	Capital repleacement		=[0.1*SUM((A) to (E))] -(H)	=[0.1*SUM((A) to (E))]			
(H)	Emergency medical services		Estimate	Assumed equal to 2002capitation			
(I)	Disability						
(J)	No-fault liability					Decision by the NHSO committee	
	Total		Sum of (A) to (J)				

Table AI.2. Sources and methods used for UC capitation 2007 (New Method)

	Item	Unit	2007 (New Method)
	Out-patient care		
(1)	Incidence rate of sickness	cases/year	
(2)	Percentage of OP visit	per cent	Sum (2-1) to (2-6)
	of which:		
(2-1)	Health centers	per cent	Report no.5, 2005
(2-2)	District hospitals		
(2-3)	Provicial hospitals		
(2-4)	Private clinics		
(2-5)	Private hospitals		
(2-6)	Referal hospiatls		
(3)	OP visit	visits/year	Sum (3-1) to (3-3)
	of which:		
(3.1)	General service	visits/year	= visits report no.5 (2005) * composit growth rate
(3.2)	AE service	visits/year	= visits NHSO claim system * composit growth rate
(3.3)	PUC service		
(3.4)	HC add on		
(3.5)	Medical instrument	visits/year	= visits 2006 plan * composit growth rate
(3.6)	Disease management		
(4)	OP unit cost	Baht/visit	Sumproduct (2-1) to (2-6) and (4-1) to (4-6)
(4.1)	of which:		
(4.1-1)	Health centers	Baht/visit	=year2005 * (1+2006inflation,4.22%) * (1+2007inflation,4.83%)
(4.1-2)	District hospitals	Baht/visit	=Mean unitcost report no.5 (2005) * (1+2006inflation,4.22%) * (1+2007inflation,4.83%)
(4.1-3)	Provicial hospitals		
(4.1-4)	Private clinics		
(4.1-5)	Private hospitals		
(4.1-6)	Referal hospitals		
(4.2)	AE service	Baht/visit	=Mean charges 2005 (MOPH) * (1+2006inflation,4.22%) * (1+2007inflation,4.83%)
(4.3)	PUC service	Baht/visit	
(4.4)	HC add on	Baht/visit	=Mean unitcost plan 2006 * (1+2007inflation,4.83%)
(4.5)	Medical instrument	Baht/visit	=Mean unitcost plan 2006 * (1+2007inflation material cost,1.8%)
(4.6)	Disease management	Baht/visit	=Mean unitcost plan 2006 * (1+2007inflation,4.83%)
(5)	OP average cost	Baht/year	Sum (5-1) to (5-6)
	of which:		
(5.1)	General service	Baht/year	=(3.1)*(4.1)
(5.2)	AE service	Baht/year	=(3.2)*(4.2)
(5.3)	PUC service	Baht/year	=(3.3)*(4.3)
(5.4)	HC add on	Baht/year	=sumproduct (3.4)*(4.4)
(5.5)	Medical instrument	Baht/year	=sumproduct (3.5)*(4.5)
(5.6)	Disease management	Baht/year	=sumproduct (3.6)*(4.6)
	In-patient care		
(6)	Hospital admission rate	cases/year	=(6.1) to (6.4)+(6.6) to (6.9)+(6.13)
	of which:		
(6.1)	IP AE	cases/year	=cases from NHSOclaim system * composit growth rate
(6.2)	IP PUC		
(6.3)	IP NB sick		
(6.4)	IP NB outside province		
(6.5)	IP act7		-
(6.6)	IP HC CHEMO	cases/year	=cases from NHSOclaim system * composit growth rate
(6.7)	IP HC CRANIO		
(6.8)	IP HC OPEN HEART		
(6.9)	IP DRG>=4		
(6.10)	IP addon		-
(6.11)	Instruments		
(6.12)	Disease Management		
(6.13)	Normal IP	cases/year	=(cases report no.5 * composit growth rate) - (6.1) to (6.4) - (6.6) to (6.9) - 6.12)

	Item	Unit	2007 (New Method)
contd.			
(7)	Average RW	RW/cases	
	of which:		
(7.1)	IP AE	RW/cases	NHSO claim system data 2005
(7.2)	IP PUC		
(7.3)	IP NB sick		
(7.4)	IP NB outside province		
(7.5)	IP act7		-
(7.6)	IP HC CHEMO	RW/cases	NHSO claim system data 2005
(7.7)	IP HC CRANIO		
(7.8)	IP HC OPEN HEART		
(7.9)	IP DRG>=4		
(7.10)	IP addon		-
(7.11)	Instruments		
(7.12)	Disease Management		
(7.13)	Normal IP	RW/cases	NHSO claim system data 2005
(8)	IP unit cost	Baht/rw	
	of which:		
(8.1)	IP AE	Baht/rw	=Agreed Baht/rw 2005 * (1+2006inflation,4.22%) * (1+2007inflation, 4.83%)
(8.2)	IP PUC		
(8.3)	IP NB sick		
(8.4)	IP NB outside province		
(8.5)	IP act7	Baht/rw	=Average charge/rw (NHSO claim system data 2005) * (1+2006inflation,4.22%) * (1+2007inflation, 4.83%)
(8.6)	IP HC CHEMO	Baht/rw	=Agreed Baht/rw 2005 * (1+2006inflation,4.22%) * (1+2007inflation, 4.83%)
(8.7)	IP HC CRANIO		
(8.8)	IP HC OPEN HEART		
(8.9)	IP DRG>=4		
(8.10)	IP addon	Baht/rw	=Mean unitcost/case plan 2006 * (1+2007inflation,4.83%)
(8.11)	Instruments	Baht/rw	=Mean unitcost/item plan 2006 * (1+2007inflation material cost,1.8%)
(8.12)	Disease Management	Baht/rw	=Mean unitcost/person plan 2006 * (1+2007inflation,4.83%)
(8.13)	Normal IP	Baht/rw	=Agreed Baht/rw 2005 * (1+2006inflation,4.22%) * (1+2007inflation, 4.83%)
(9)	IP average cost	Baht/year	Sum (9.1) to (9.18)
	of which:		
(9.1)	IP AE	Baht/year	=(6.1) * (7.1) * (8.1)
(9.2)	IP PUC	Baht/year	=(6.2) * (7.2) * (8.2)
(9.3)	IP NB ป่วย	Baht/year	=(6.3) * (7.3) * (8.3)
(9.4)	IP NB ต่างกองทุน	Baht/year	=(6.4) * (7.4) * (8.4)
(9.5)	IP act7	Baht/year	=(6.5) * (8.5)
(9.6)	IP HC CHEMO	Baht/year	=(6.6) * (7.6) * (8.6)
(9.7)	IP HC CRANIO	Baht/year	=(6.7) * (7.7) * (8.7)
(9.8)	IP HC OPEN HEART	Baht/year	=(6.8) * (7.8) * (8.8)
(9.9)	IP DRG>=4	Baht/year	=(6.9) * (7.9) * (8.9)
(9.10)	IP addon	Baht/year	=(6.10) * (8.10)
(9.11)	Instruments	Baht/year	=(6.11) * (8.11)
(9.12)	Disease Management	Baht/year	=(6.12) * (8.12)
(9.13)	Normal IP	Baht/year	=(6.13) * (7.13) * (8.13)
	Summary		
(A)	OP averge cost	Baht/year	=(5.1)
(B)	IP average cost	Baht/year	=(9.13)
(C)	High cost	Baht/year	=(5.4) to (5.6) + (9.6) to (9.12)
(D)	Accident and emergency	Baht/year	=(5.2) + (5.3) + (9.2) to (9.5)
(E)	Denture	Baht/year	Assumed equal 2003 to capitation
(F)	Prevention and promotion		-
(G)	Capital replacement	Baht/year	=10% of (A) to (B)
(H)	Emergency medical services	Baht/year	Assumed equal to 2002 capitation
(I)	Disability		-
(J)	No-fault liability	Baht/year	Commettee decision
	Total	**Baht/year**	**Sum (A) to (J)**

Table AI.3. Composition of basket of CPI

Category	Weights in per cent		
	2545 (2002)	2541 (1998)	2537 (1994)
TOTAL	100.00	100.00	100.00
Food and beverages	36.06	38.53	35.28
Apparel and foot-ware	3.40	3.65	5.61
Housing and furnishing	23.86	25.85	24.01
Medical and personal care	6.04	5.63	6.34
Transportation and communication	21.99	16.15	17.45
Recreation and education	5.82	6.72	7.80
Tobacco and alcoholic beverages	2.83	3.47	3.51
Non-food and beverages	63.94	61.47	64.72

Source: NHSO (August 2006) – taken from the website of the MoC.

Table AI.4. CPI and medical CPI, monthly

Period	2546/2003	2547/2004	2548/2005	2549/2006
CPI				
Jan	101.3	102.6	105.4	111.6
Feb	101.2	103.4	106.0	111.9
Mar	101.2	103.6	106.9	113.0
Apr	101.6	104.1	107.8	
May	102.0	104.5	108.4	
Jun	101.6	104.7	108.4	
Jul	101.6	104.8	110.4	
Aug	102.1	105.3	111.2	
Sep	102.0	105.7	112.0	
Oct	102.1	105.7	112.3	
Nov	102.2	105.3	111.5	
Dec	102.3	105.3	111.4	
Medical and personal care				
Jan	100.6	102.2	103.4	
Feb	100.5	102.1	103.4	
Mar	100.4	102.1	103.5	
Apr	100.4	102.1	103.8	
May	100.7	102.1	104.1	
Jun	100.7	102.2	104.3	
Jul	100.6	102.1	104.5	
Aug	100.6	102.2	104.6	
Sep	100.7	102.4	104.7	
Oct	101.8	103.1	104.7	
Nov	101.9	103.2	104.8	
Dec	102.2	103.3	104.9	
Medical care				
Jan	100.2	103.2	104.9	
Feb	100.2	103.2	104.9	
Mar	100.2	103.2	104.9	
Apr	100.3	103.2	105.0	
May	100.9	103.2	105.2	
Jun	101.0	103.3	105.4	
Jul	101.0	103.2	105.5	
Aug	101.0	103.3	105.6	
Sep	101.1	103.5	105.7	
Oct	103.1	104.8	105.7	
Nov	103.1	104.8	105.8	
Dec	103.2	104.9	105.9	
Personal care				
Jan	100.8	101.2	102.0	
Feb	100.7	101.0	102.0	
Mar	100.5	101.1	102.2	
Apr	100.4	101.0	102.7	
May	100.5	101.1	103.0	
Jun	100.5	101.1	103.2	
Jul	100.3	101.1	103.6	
Aug	100.2	101.0	103.6	
Sep	100.5	101.3	103.8	
Oct	100.6	101.5	103.9	
Nov	100.7	101.7	104.0	
Dec	101.2	101.8	104.1	

Source: MoC.

Annex II. The NHSO capitation model 2450 to 2453 (2007 to 2010)

Formal description and observations

Foreword

The following description of the NHSO capitation model was provided by Ms Severine Gaille, a PhD student and academic assistant at the University of Lausanne, Haute Ecole de Commerce, Actuarial Department, and a small team of fellow (PhD) students. The work was based on the Excel file (spreadsheet) model as provided by the NHSO to Mr Wolfgang Scholz, senior economist at the ILO, on the occasion of his mission to Bangkok in February/March 2006. The description follows the (logical) sequence of the model structure (links between sheets).

The initial text of Ms Gaille's report was only slightly edited by Mr Wolfgang Scholz. We are aware of the fact that the spreadsheet model, when transferred to the ILO, still contained "noise" stemming from the modelling phase. In other words, it had not been cleaned before transfer. Some of the following descriptions/comments might relate to such "noise".

1. Sheet a: Unit cost

1.1. Short description

Data sources for the unit costs in 2005 of Private Hospitals (Priv H), District Hospitals (District H), and Provincial Hospitals (Prov H) are provided. Missing data are complemented/added from HWS 2003 data (two different data sets for district and provincial hospitals).

1.2. Hypothesis (assumed by the model)

- Due to lack of information on service utilization, HWS 2003 was used for 2005.

1.3. Full description

- The first part shows the funding sources: budget and non-budget, and the expenditures: Labour Cost (LC) and Medical Cost (MC) in each type of hospital.
- The second part reports the proportion of IPs and OPs.
- The third part consists of the analysis of the distributions of LC, and MC for the OP. It provides the different percentiles of the LC and MC distributions, mean and median.
- The fourth part, which is on the right side of this sheet, provides statistical summary of the costs for IP and OP in the different types of hospitals, especially for the OP.

1.4. Problems or questions

- For district and provincial hospitals there are two copies each with different total fund and financing structures for funding sources, and different LC and MC, while for the private hospitals this is not the case. Meaning of columns G and I is unclear.

- Header of row 58?

- The fourth part (purple area) provides a statistical summary of the costs of IP/OP in different types of hospitals. However, there is no clear relationship between the summary and the mean (yellow area) or median (light blue area) in the part of the cost distribution. How was the statistical summary derived?

1.5. Suggestions

- The statistical summary should be taken from the cost distribution statistics on the same sheet.

1.6. References to other sheets or files

- Cost data 2005 for OP and IP are used for sheet **d. unit cost for capitation**:

Table AII.1. Costs of inpatient and outpatient per visit

Hospital	Cost of OP	Cost of IP
District	320	4,478
Provincial	563	10,137
Private	456	7,955
University	1'629	20,850

Only the information in Table 1 is important for the following analysis.

2. Sheet b: CPI 2537–2544(NHA)

2.1. Short description

This sheet analyses the health inflation rate in the past years, based on 1998 = 100, and it forecasts the health inflation rate for future years.

2.2. Hypothesis (assumed by the model)

The model supposes that the health inflation rate, from 2006 to 2010, is constant and equal to the average of the health inflation rate 2000 to 2005.

2.3. Full description

- Health inflation data from 1993 to 2004 is calculated as a proportion of the health inflation data of 1998. The annual rates of change are shown in the following table:

Table AII.2. Past data on health inflation rate

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Percentage of change	7.4	3.7	1.3	3.4	5.6	2.5	1.9	2.2	1.4	1.3	2.3

- To find the change in the inflation rate, the arithmetic and geometric average were computed for the period 2000 to 2004. Since both were almost equal to 1.8 per cent, this rate was considered for 2005.

- The arithmetic average was computed for the period 2000 to 2005. This rate was used for the period 2006 to 2010.

2.4. Problems or questions

- Using the average health inflation rate from 2000 to 2005 to get the data for 2006 is not realistic. Furthermore, the data for 2005 is already an estimation based on the data from 1998 to 2004.

- The assumption that health inflation rates will keep constant in the following years, 2006–2010, is not realistic. In fact, as the data show, the health inflation rate was quite volatile between 1994 and 2004.

- Finally, since the future inflation rate is based on an average of four values (2000–2004), the forecast is not credible.

2.5. Suggestions

- Short-term estimation techniques should be applied for estimating the medical CPI for the current and the following year.

2.6. References to other sheets or files

The health inflation values from 2000 to 2010 are used in sheet c. unit cost inflation.

Table AII.3. Projection of Health inflation from 2000 to 2010

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Health inflation	100	102.2	103.64	104.98	107.38	109.31	111.28	113.29	115.34	117.42	119.54

Only the information in Table 3 is important for the following analysis.

3. Sheet c: Unit cost inflation

3.1. Short description

This sheet calculates the cost inflation rate.

3.2. Hypothesis (assumed by the model)

- The proportions (weights) of the labour cost (LC), material cost (MC), and capital cost (CC) are the same for 2001 and 2002.

- Capital cost (CC) is zero for the period 2003–2010. Only labour cost (LC) and material cost (MC) are considered.

- The proportions of the labour (LC) and material cost (MC) are kept constant for the period 2003–2006 and then from 2007 to 2010.

- Deflators of material cost (MC) come from health inflation for the period 2000–2010 calculated in **Sheet b. CPI 2537–2544(NHA)**

- Labour cost (LC) includes two parts: salary cost, and labour fringe cost.

- The deflator for capital cost (CC) is constant: 100 for the period 2000–2007

- Labour cost growth rate (% growth L11) is assumed to be as follows.

Table AII.4. Labour Cost growth rate

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Percentage of growth LC	5.0	5.0	5.0	12.5	11.2	6.0	6.0	6.0	6.0	6.0

3.3. Full description

- The first part of this sheet computes the deflator of the labour cost (deflator LC) and material cost (deflator MC). The overall deflator is computed by multiplying each deflator by its weight and adding them up:

$$OvDef_t = \frac{LCDef_t \times LCW_t + MCDef_t \times MCW_t + CCDef_t \times CCW_t}{LCW_t + MCW_t + CCW_t}$$

where:

$OvDef_t$ = Overall deflator at year *t*

$LCDef_t$ = Labour cost deflator at year *t*

$MCD\ f_t$ = Material cost deflator at year *t*

$CCDef_t$ = Capital cost deflator at year *t*

LCW_t = Labour cost weight at year *t*

MCW_t = Material cost weight at year *t*

CCW_t = Capital cost weight at year *t*

This formula was used for 2001 to 2010.

- The labour cost is decomposed into two categories: salary cost and labour fringe cost. Different growth rates were applied to each category. The same computation was used as in the first part of the sheet.

- *Table 5* shows that the *growth rates* of salary and labour costs are higher in 2004 and 2005. This may be explained by the implementation of the UC scheme during that period.

Table AII.5. Labour cost growth rate by category

	2001 (%)	2002 (%)	2003 (%)	2004 (%)	2005 (%)	2006 (%)	2007 (%)
Growth rate salary cost	5.0	5.0	5.0	12.5	11.2	6.0	6.0
Growth rate labour fringe cost	5.0	5.0	5.0	12.5	6.0	6.0	6.0

3.4. Problems or questions

- The percentage of growth of labour fringe cost is 6 per cent (See column G, row 31). How is it calculated? Note that when inflation of salary and labour fringe cost is calculated separately, the rates are the same for all the years except 2005.

3.5. Suggestions

- In general, the final report should justify the choice of cost growth rates of each category, related to economic and demographic facts and forecasts.

3.6. References to other sheets or files

The overall growth rates (per cent growth overall) from 2003 to 2010 are used in **sheet d. unit cost for capitation, sheet h. capitation, sheet l. final and sheet i. compare data**. They are shown in the following table:

Table AII.6. Projection of overall growth rates form 2003 to 2010

Year	2003	2004	2005	2006	2007	2008	2009	2010
Percentage of overall growth	3.9	7.0	7.0	4.2	4.8	4.4	4.4	4.4

Only the information in *Table 6* is important for the following analysis.

4. Sheet d: Unit cost for capitation

4.1. Short description

This sheet forecasts the unit cost Baht per OP visit, and Baht per IP case using "quick costing".

4.2. Hypothesis (assumed by the model)

- The "Growth of unit cost" equals the overall economic growth rates estimated on **sheet c: unit cost inflation**.
- For 2000 and 2001 the calculations are based on the median. For 2002, calculations are based on median and adjustment with CPI at 1.029.
- For 2003, the current year price is computed by two methods: one considers the median cost for the district hospital (DH) and the median cost for the provincial hospital (PH) while the other method considers the 70 percentile cost for the DH and the median cost for the PH.
- The result of the last method, multiplied by the "Growth of unit cost", provides the "FY adjusted with growth of unit cost" for the following years 2004-2010.
- For the district hospitals, the unit cost of IP is 14 times the unit cost of OP.
- For the provincial and private hospital, the unit cost of IP is 18 times the unit cost of OP.

4.3. Full description

- In the first part of this sheet, from 2004 until 2010, the unit cost for OP and IP for each kind of hospital is based on the corresponding cost of the last year adjusted with the overall economic growth. This forecast is based on the 70 percentile of 2003.
- In the second part of this sheet, from 2005 to 2010, the mean of the annual unit cost is based on the mean of the unit cost in 2005 found in the **sheet a: unit cost** and shown in *Table 1*.

4.4. Problems or questions

- Justification of mix of cost estimation approach: one part based on the median (for the provincial hospitals) and another part based on the 70 percentile (for the district hospitals).

4.5. Suggestions

- The mean and the 70th percentile calculations provide two different scenarios for computing the OP and IP in current year prices. It is expected that the 70 percentile method would forecast higher prices than those obtained by the mean as we can see on the table below. Note that for the provincial hospitals, the cost is lower when considering the median than the 70 percentile.

4.6. References to other sheets or files

- The unit costs computed by using the median and 70 percentile scenario for the period 2003–2007 are shown in the table below. This table is used on sheet **g. capitation 46–50 high bound and sheet j. summary**.

Table AII.7. Projection of the IP and OP costs based on the 70th percentile of 2003

	2003	2004	2005	2006	2007	
OP	**Median**	**70per'til**	**70per'til**	**70per'til**	**70per'til**	**70per'til**
Health centre	70	70	76	81	84	88
District hospital	250	281	302	324	337	354
Provincial hospital	369	369	397	425	443	465
University Hospital	1,543	1,543	1,662	1,778	1,853	1,943
Private Clinic	114	114	122	131	136	143
Private Hospital	409	409	441	472	491	515
IP						
District Hospital	4,029	4,521	4,869	5,210	5,430	5,692
Province Hospital	7,024	7,024	7,565	8,094	8,436	8,843
University Hospital	13,889	16,938	18,242	19,520	20,344	21,326
Private Hospital	7,788	7,788	8,388	8,975	9,354	9,806

- The unit costs computed by using the mean scenario for the period 2005 - 2010 are shown in the table below. This table is used on sheet **g. capitation 46–50 high bound, on sheet g2. capitation OP&IP report and sheet j. summary**.

Table AII.8. Projection of the IP and OP costs based on the mean of 2005

	2005	2006	2007	2008	2009	2010
OP mean						
Health centre	81	84	88	92	96	101
District hospital	320	333	349	365	381	398
Provincial hospital	563	587	615	642	670	700
University Hospital	1,629	1,698	1780	1,858	1,940	2,026
Private Clinic	153	159	167	174	182	190
Private Hospital	456	475	498	520	543	567
IP mean						
District Hospital	4,478	4,667	4,892	5,105	5,330	5,567
Province Hospital	10,137	10,564	11,075	11,558	12,067	12,603
University Hospital	20,850	21,729	22,779	23,773	24,820	25,922
Private Hospital	7,955	8,290	8,691	9,070	9,469	9,890

Only the information shown in *Table 7* and *Table 8* are important for the following analysis.

5. Sheet e. HWS 2546 only UC

5.1. Short description

This sheet computes the OP and IP utilization rates for 2003. The data used to obtain this rate per episode is based on the HWS 2546 (2003).

5.2. Hypothesis

None. Everything is computed on the basis of the data.

5.3. Full description

Out-patient (OP) utilization rate by episode

- UC data is distributed by different regions of Thailand (BKK, Central, North, N/E and South). The northeast (N/E) has the highest population covered by the UC scheme followed by the central, north and south regions.

- The OP utilization rate per episode was computed by using:

  (i) OP illness per month, that is the number of people seeking care by episode without hospitalization and;

  (ii) the percentage of the population seeking care by episode in a recognized institution such as health centre, primary care unit, district hospital, provincial hospital, university hospital, other public hospital, private clinic and private hospital. Alternative institutions like herbal medicine, folk medicine and drug store are not considered. For example, in the table below, 25.7 per cent of people with disease, covered by the UC scheme and looking for an OP cure, were treated in a health centre in 2003.

Table AII.9. Percentage of population seeking OP cure in a recognized institution 2003

Health care sought (OP)	Total UC members (%)
Health Centre	25.7
Primary Care Unit	0.9
District Hospital	22.2
Provincial Hospital	5.8
University Hospital	0.5
Other Public Hospital	2.6
Private Clinic	12.4
Private Hospital	2.6

Table AII.10. Percentage of population seeking IP cure in a recognized institution 2003

Health care sought (IP)	(%)
District hospital	
Provincial hospital	27.0
University Hospital	1.3
Non-MOPH Hospital	7.6
Private Polyclinic	0.9
Private Hospital	8.8

The OP utilization rate by episodes per year is computed as follows:

$$OPRate = \frac{OPill \times 12 \times PercentInst}{Pop}$$

where

OPRate	=	Outpatient utilization rate in 2003
OPill	=	Outpatient illness per month in 2003
PercentInst	=	% of population seeking OP cure in a recognized institution in 2003 (sum of percentages in Table 9)
Pop	=	Population covered by UC in 2003

This rate does not include persons cured by alternative institutions through herbal medicine, folk medicine or drug stores.

- This sheet provides the acute OP rate per visit per capita per year, which is the value of utilization rate per visit. In 2003 it was 3.62. The North region had the highest yearly rate. In column G row 8 another rate is given: 3.93.

- The differences between the OP rate per episode/visit is that the former indicates how many times people go to institutions for different illnesses, while the latter indicates how many times people go to institutions.

- The acute ambulatory illness per capita per year is defined as the product of outpatient illness per month and 12, divided by the total number of people registered under the UC scheme. It is the same as the OP utilization rate by episodes, but it includes the number of people treated by other institutions (herbal medicine, folk medicine, drug stores).

$$OPRate = \frac{OPIll \times 12}{Pop}$$

Inpatient utilization rate by episode

- In order to calculate the annual admission rate per capita from the HWS 2546 (2003), the number of admissions per year is divided by the total population covered by UC. This is computed by region and for the whole Thai population. The highest admission rate is in the north of Thailand. For the whole Thai population the rate is 0.086. It seems that this rate already includes the compliance rate (the contrary to the OP utilization rate).

General remark

- For 2005, the utilization rate calculated in sheet **f. forecast use rate 48** for the *whole* Thai population is used here as the basis to estimate the utilization rate for IP and OP for each region of the country.

5.4. Problems or questions

- Meaning of "Acute OP visit in institutional care" is unclear. This report assumes that all kinds of illnesses are included.

- Questions:

  (i) How is the "Acute OP visit rate = 3.93" calculated? (Column H, Row 8)

  (ii) Does the IP utilization rate include the compliance rate? If so: does the number of admissions per year (used in this sheet) include only patients using their registered provider? (Which is assumed in this report?)

  (iii) Why is the primary care unit being neglected? (See *Table 11* below).

5.5. Suggestions

- If monthly data is available, the outpatient illness per year should be computed directly from monthly data by adding them up rather than estimating them by multiplication by 12.

5.6. References to other sheets or files

- Two values are important on this sheet: the *acute OP visit rate*, which is 3.62, and the *admission rate per capita per year* (IP utilization rate), which is 0.086. Both are used in sheet **f. forecast use rate 48** and sheet **g. capitation 45–50 high bound**.

- *Table 9* and *Table 10* presented above are used in the sheet **g. capitation 45–50 high bound** as well as *Table 11* and *Table 12* presented below. These percentages are taken as given, since they are not computed explicitly. The percentages in *Table 11* and *Table 12* are per visit (e.g. 49.4% of OP visits made by people covered by the UC scheme are in health centres), while in *Table 9* and *Table 10* those percentages are per episode (e.g. 25.7 per cent of OP diseases are cured in health centres).

Table AII.11. Percentage of population seeking OP cure in a recognized institution 2005

Health care sought (OP)	%
Health Centre	49.37
Primary Care Unit	
District Hospital	35.67
Provincial Hospital	11.59
University Hospital	0.47
Other Public Hospital	1.25
Private Clinic	0.24
Private Hospital	1.41

Table AII.12. Percentage of population seeking IP care in a recognized institution 2005

Health care sought (IP)	%
District hospital	56.07
Provincial hospital	36.86%
University Hospital	2.20%
Non-MOPH Hospital	3.17%
Private Polyclinic	1.71%
Private Hospital	

6. Sheet f. Forecast use rate 48

6.1. Short description

This sheet analyses different regression models in order to forecast the utilization rate per episode, per visit and by "Input & Output", based on the total population covered by the UC scheme. The main problem in this sheet is that regressions are based on only three observation points.

6.2. Hypothesis

- Different regression models are applied. OP and IP utilization rates are estimated using annual data for 2003, 2004 and 2005.
- The regression with the highest R-squared value is chosen in order to forecast the capitation rate until year 2010.

6.3. Full description

Forecast for utilization rate by episode (Rows 6–7, 11-12; Columns J-M)

- The compliance rate is the extent to which patients use their registered health provider rather than another (in which case they must pay individually out-of-pocket).

  Firstly, the OP and IP utilization rate per episode from HWS 2539, 2544 and 2546 are computed by using the same methods as in sheet e. HWS 2546 only UC. OP and IP utilization rates are analyzed separately:

  (i) **OP utilization rate:** Four regression models were compared: a linear, an exponential, a power and logarithmic. The linear model was chosen to estimate the utilization rate up to 2007 because its R-squared was the highest.

Table AII.13. OP utilization rate computed with a linear function model

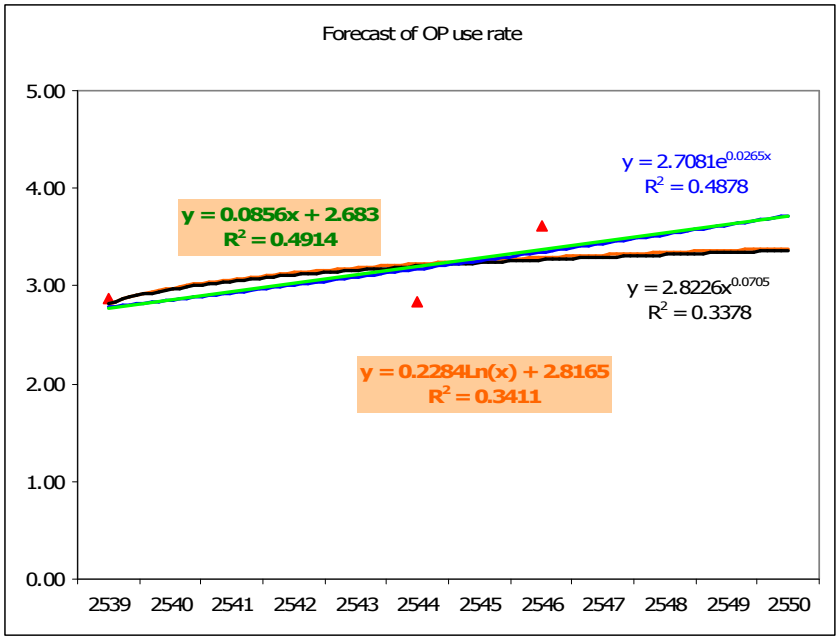
	2003	2004	2005	2006	2007
OP rate	3.6197	3.4534	3.539	3.6246	3.7102

IP utilization rate: The same regression equations were tested. The exponential model was chosen to estimate the utilization rate up to 2007 because its R-squared was the highest.

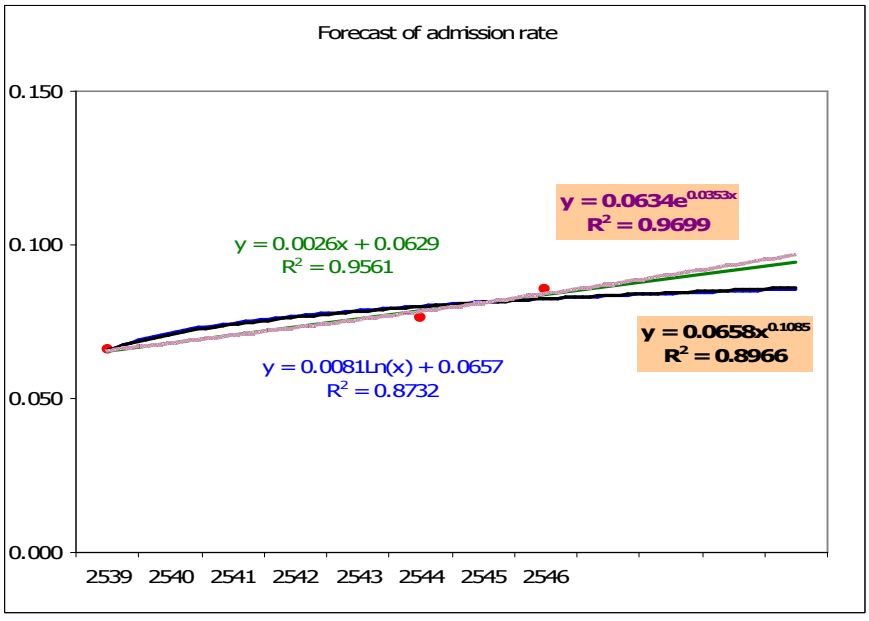
Table AII.14. IP utilization rate computed with an exponential model

	2003	2004	2005	2006	2007
IP rate	0.086	0.087	0.090	0.093	0.097

Graph AII.1. Forecast of OP utilization rate by episodes



Graph AII.2. Forecast of IP utilization rate by episodes



- It seems that the OP utilization rate does not include the compliance rate, while the IP utilization rate does.

- Regressions are based on the utilization rate given in sheet **e. HWS 2546 only UC**. In that sheet, the OP utilization rate is not multiplied by the compliance rate, while the IP utilization rate is multiplied by it.

Forecast for utilization rate per visit (Rows 13–17; Columns Q-W)

- The forecast of OP and IP utilization rates are estimated using annually data for 2003, 2004 and 2005:

  (i) **OP utilization rate**: one method to estimate this rate for the years 2006 and 2007 is to compute the mean of the OP utilization rate of the years 2003 to 2005. For 2008, the average of the utilization rate of 2003 to 2007 is taken. For 2009, the average of the utilization rate from 2003 to 2008 is taken, and so on. (Rows 13–20; Column S; and *Table 15*). This calculation is used in further sheets to project the capitation rate.

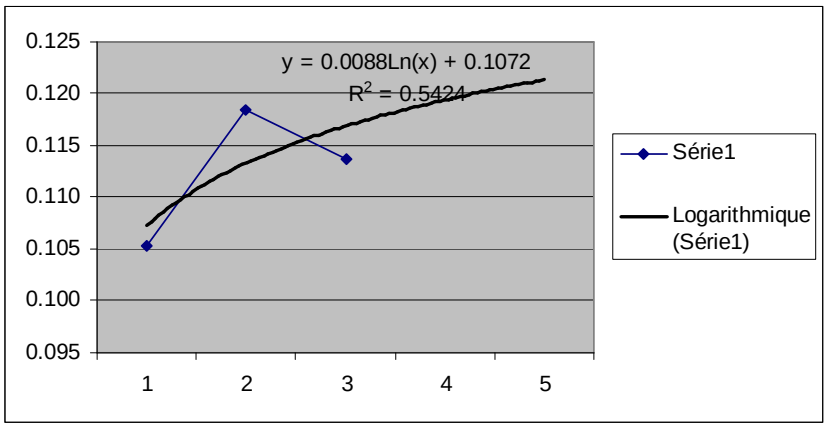
Table AII.15. Forecast of OP utilization rate by visits

Year	OP
2003	3.934
2004	4.124
2005	3.871
2006	3.976
2007	3.976
2008	3.976
2009	3.976
2010	3.983

Another method is to use a linear regression based on data from 2003 to 2005 (Rows 13–17; Column V). This method is not used in other sheets.

IP utilization rate: In order to estimate the IP utilization rate for years 2006–2010, a logarithmic regression based on annual data (2003 to 2005) is being used (Column W). The estimated rates are used later in order to compute the capitation rate (See *Graphic 3*). Note that only 3 observation points have been used.

Graph AII.3. Forecast of IP utilization rate by visits



Another method was performed: it seems that the rate found in column W was multiplied by the compliance rate in order to find an utilization rate including the compliance rate (column T). A logarithmic regression and a linear regression were used from these data to forecast the utilization rate in 2006 and 2007. This information is not used in further computations.

Table AII.16. Forecast of IP utilization rate by visits with a logarithmic regression

Year	Utilization rate from report		Compliance rate
	IP *Compliance rate	IP	
2003	0.086	0.105	0.813
2004	0.095	0.118	0.802
2005	0.093	0.114	0.816
2006	0.097	0.119	0.822
2007	0.098	0.121	0.838
2008		0.123	
2009		0.124	
2010		0.125	

Forecast for utilization rate by Output & Input (OP&IP)

- The utilization rate for 2006 to 2010 was estimated by using report data for the years 2003 to 2005. These rates differ from the other two because of multiplication by the compliance rate.

- The results obtained by a lognormal regression model are resumed below.

Table AII.17. Forecast of OP and IP utilization rate based on the Output & Input (OP&IP) report

Year	Utilization rate from report	
	OP	IP
2003	2.523	0.088
2004	2.563	0.093
2005	2.563	0.100
2006	2.580	0.102
2007	2.589	0.104
2008	2.596	0.106
2009	2.602	0.108
2010	2.607	0.109

6.4. Problems and questions

- The definition of the utilization rate by OP & IP is unclear. It seems that the survey HWS 2539 (1996) is used, but at that time the UC scheme did not exist.

- The meaning of the data in columns Q-W is unclear (no header).

- The forecast values were estimated by using different regressions. A serious problem is that there is not enough data available to validate such regressions. The data set comprises only three points (annual data 2003-2005).

- On *Table 15*, the utilization rate is kept constant.

6.5. Suggestions

- Population behaviour may change over time: free health service might increase the utilization rate.
- A regression based on three points is close to redundant. Are there other estimation possibilities? If not: scenario technique.

6.6. References to other sheets or files

- *Tables 13–16* are used in sheet **g. capitation** 45–50 high bound and **j.summary**.
- *Table 17* is used in sheet **g2. capitation** OP & IP report, l.final and **j.summary**.

7. Sheet g. Capitation 45–50 high bound

7.1. Short description

In this sheet, the HWS 2003 data are used to forecast OP and IP capitation. Capitation rates are per episode and per visit. Capitation rate is defined as the estimated cost for each insured person to be covered under the UC scheme. This rate is multiplied by the total population covered by the UC scheme in order to calculate the total estimated cost for one year.

7.2. Hypothesis

- It seems that the OP utilization rate in institutional care (episodes per capita per year) and the admission rate (IP utilization rate) per capita per year are the same in 2005 and 2006.

7.3. Full description

- Two different OP and IP capitation rates were computed, one per episode (first half of the sheet) and the other per visit (second half of the sheet).
- **OP and IP capitation rate by episodes:** results obtained in previous sheets are used to estimate the capitation rate per episode:

  (i) The OP and IP utilization rates per episode are calculated in sheet **f. forecast use rate 48** (*Table 13 and Table 14*). Remember that these rates were estimated by a linear regression (for the OP) and an exponential regression (for the IP) and that for 2006, the rates estimated by the regression were not used. As mentioned in the hypothesis section, the same rate was applied for 2006 and 2005.

  (ii) The OP and IP median and 70 percentile unit costs for 2003 are given in sheet **d. unit cost for capitation** (*Table 7*).

  (iii) The percentage of population seeking care in recognized institutions in 2003 is given in sheet e. HWS 2546 only UC (Tables 9 and 10), which are percentages per episode. However, they are supposed to be constant from 2003 to 2007.

  (iv) The OP and IP capitation rates were computed from 2003 until 2007 as follows:

$$OPCap_t = \frac{OPRate_t \times \sum_i \left[PercentInst_i \times CostInst_{it} \right]}{\sum PercentInst_i}$$

where

$OPCap_t$	=	OP capitation rate in year *t*;
OPRatet	=	OP utilization rate in year *t;*
PercentInsti	=	Percentage of population seeking care in institution *i* (provincial hospital, district hospital, private hospital, etc);
CostInstit	=	Unit cost in institution i for year *t.*

The same computation was made for the IP capitation rate. However, the meaning of the two rates seems slightly different: the OP capitation rate does not include the compliance rate whereas the IP capitation rate does (this is due to the utilization rates used for the computation).

Table AII.18. Capitation rate per episode

	Capitation 2546/2003, median	Capitation 2546/2003, 70%til	Capitation 47/2004, 70 %til	Capitation 2548/2005, 70 %til	Capitation 2549/2006, 70%til	Capitation 2550/2007, 70%til
OP	674	708	727	798	831	914
IP	470	496	544	603	628	706
Total	1,145	1,204	1,271	1,400	1,459	1,620

- **OP and IP capitation rate per visit:** same computation as before, except for a few changes.

  (i) The utilization rate per visit calculated in sheet **f. forecast use rate 48** (*Table 15* and *Table 16*).

  (ii) The OP and IP average unit costs, found in sheet **d. unit cost for capitation** (*Table 8*).

  (iii) The percentage of population seeking care in institutions in 2005 found in sheet **e. HWS 2546 only UC** (*Tables 11* and *12*), per cent per visit, are constant from 2005 to 2009.

  (iv) The capitation rate per visit is shown in the following table:

Table AII.19. Capitation rate per visit

	Capitation 2550/2007	Capitation 2551/2008	Capitation 2552/2009
OP	1,046	1,092	1,140
IP	950	1,004	1,060
Total	1,996	2,096	2,200

7.4. Problems or questions

- Two different methods have been used to estimate the capitation rate: the *average cost*, used to compute the capitation rate per visit, and the *70 percentile cost*, used to compute the capitation rate per episode. Each method may be interpreted as the consideration of different scenarios: the *70 percentile* would provide a higher cost estimator than those obtained by the *average* (mean). However, in this sheet, both

methods are mixed. The procedure should be to calculate both methods per visit and both methods per episode.

7.5. Suggestions

7.6. References to other sheets or files

- *Table 20* is used in **sheet j. summary**.

Table AII.20. Percentages of persons seeking care in institutions

	Percentages of person seeking care in institutions	
	By episode	By visit
Health Centre	0.35	0.49
Primary care unit	0.01	
District hospital	0.31	0.36
Province hospital	0.12	0.13
University hospital (referred case)	0.00	0.00
Private clinic	0.17	0.00
Private hospital	0.04	0.01
Total	1	1

8. Sheet h. Capitation

8.1. Short description

This sheet computes the curative care costs for all patients covered by the UC scheme and the total capitation rate based on the **sheet g. capitation 45-50 high bound**. Other costs are added to those computed in **sheet g. capitation 45-50 high bound**.

8.2. Hypothesis

- The compliance rates are given. It is not clear where they come from and if such values are reasonable (*Table 21*). The first three compliance rates are used to calculate the capitation rate per episode while the last three are used to calculate the capitation rate per visit.

Table AII.21. Compliance rates

	2005	2006	2007	2007	2008	2009
Compliance rate OP	0.80	0.80	0.80	0.80	0.80	0.80
Compliance rate IP	1.00	1.00	1.00	0.85	0.85	0.85

- The *cost of capital replacement* is obtained by multiplying the sum of the OP and IP capitation rates given in **sheet g. capitation 45-50 high bound**, (*Tables 18* and *19*) by 10 per cent for the years 2003 to 2010, except for 2005, where the sum was multiplied by 7 per cent.

- The evolution of the population is given.

- *Dental costs* equal 2.31 Baht per person.

- *EMS costs* equal 10 Baht per person.

- *No fault liability costs* equal to 0.2 Bath per person per episode and 0.5 Baht per person per visit.

- *Prevention and promotion cost* is given for 2001-2004: 206 Baht per person. For the following years, it is estimated according to the inflation rate provided in **sheet c. unit cost inflation** (*Table 6*), and is proportional to the population size.

- *Disability costs* (rehabilitation) are zero from 2000 to 2006. From 2007 to 2009, they equal 4 Baht per person.

8.3. Full description

- Two different projections were made: one per episode (2005 to 2007) and another per visit (2007 to 2009).

Table AII.22. Capitation rate and total resource requirement up to 2009

Health welfare survey unit cost item	By episodes			By visit		
	2005	2006	2007	2007	2008	2009
	2550, high bound 2'548 without chronic dz	2550, high bound 2'549 without chronic dz	2550, high bound 2'550 without chronic dz	2550, high bound 2'550 without chronic dz	2550, high bound 2'551 without chronic dz	2550, high bound 2'552 without chronic dz
OPD	638	665	731	837	873	912
IPD	603	628	706	807	854	901
High cost						
Dental care	2	2	2	2	2	2
A&E (accident emergency)						
P&P (prevention and promotion	216	225	236	236	246	257
EMS	10	10	10	10	10	10
Disable			4	4	4	4
Capital replacement	87	129	144	164	173	181
No fault liability	0	0	0	1	1	1
Capitation rate	**1,556**	**1,660**	**1,833**	**2,061**	**2,162**	**2,268**
Curative care cost	1,241	1,293	1,437	1,644	1,727	1,813
Capitation	-3.77%	6.68%	10.46%	12.41%	4.92%	4.8%
Estimated population (mio)	46	46	48	48	49	49
Total budget P&P (mio baht)	9,930	10,349	11,260	11,372	11,986	12,635
Total resource requirement	**71,569**	**76,349**	**87,534**	**99,379**	**105,308**	**111,502**

- The *OPD and IPD* line in *Table 21* is the multiplication of the OP and IP capitation rate (**sheet g. capitation 45–50 high bound**, *Tables 18* and *19*) by the compliance rate (*Table 21*). The sum of the OPD and IPD gives the *curative care cost* line.

- The *capitation rate* line is the sum of all the elements described above.

- The *Total resource requirement* line is the capitation rate multiplied by the population.

- The *accident and emergency cost* (A&E) as well as the *high cost* are calculated in **sheet i. compare data**.

- The IP compliance rate in *Table 21* equals 1. Thus, the IP capitation rate includes it. In fact, in **sheet g. capitation 45–50 high bound**, the IP capitation rate per episode is the only rate that is multiplied by the compliance rate.

8.4. Problems or questions found

- The evolution of the population in the analysis does not match the population used in other sheets. In 2003, the population was estimated at 45 million in this sheet while an estimation of about 48 million is given in sheet e. HWS 2546 only UC.

Table AII.23. Comparison of population projections in two different excel files

	2003	2004	2005	2006	2007	2008	2009
Population under UC scheme (Mio)							
Used here	45.00	45.00	46.00	46.00	47.74	48.70	49.17
In the pop projection excel file	50.24	49.91	49.77	50.25	50.64	51.02	51.39

Table AII.24. Comparison of population projections in three different sheets of the same excel file

	2005	2006	2007	2007	2008	2009
Population (in millions)						
Sheet h	46.00	46.00	47.74	48.22	48.70	49.17
Sheet h2	47.16	47.75	48.34	48.70	49.17	49.64
Sheet I	47.16	47.75	48.34	48.70	49.17	49.65

- Data show population increase from 45 million (2004) to 46 million (2005). However, total resource requirement decreases from 72,754 million Bahts (2004) to 71,569 million Bahts (2005).

- There is a mistake in column J-L: the years corresponding to these columns (for the costs) are respectively 2007, 2008, 2009 and not 2008, 2009, 2010. However, the population used is for year 2008, 2009 and 2010.

8.5. Suggestions

8.6. References to other sheets or files

- *Table 21* and *Table 22* are used in **sheet j. summary**.

9. Sheet g2. Capitation OP&IP report

9.1. Short description

This sheet is similar to the **sheet g. capitation 45-50 high bound**. The OP and IP capitation for patient services is calculated from 2003 to 2010 and is based on the data of the OP&IP report.

9.2. Hypothesis

- The percentage of the population seeking care in institutions is shown below. Note that it is constant for the period 2003 to 2010, data source is unclear.

Table AII.25. Percentages of population seeking care in institutions for OP care (OP&IP report) 2003–2010

Institutions OP	Proportions
Health centre	0.44
Primary care unit	
District hospital	0.38
Province hospital	0.14
University hospital (referred case)	0.01
Private clinic	0.01
Private hospital	0.02

Table AII.26. Percentages of people seeking care in institutions for IP care (OP&IP report) 2003–2010

Institutions IP	Proportions
District hospital	0.55
Province hospital	0.39
University hospital (referred case)	0.03
Private hospital	0.03

9.3. Full description

- OP and IP capitation rates by OP & IP: it is the same computation that was made in **sheet g. capitation 45-50 high bound**. The only differences are:

  (i) The utilization rate by OP & IP is calculated in sheet f. forecast use rate 48 (Table 17).

  (ii) The OP and IP average unit costs are found in sheet d. unit cost for capitation (Table 8) for the period 2005 to 2010. For the period 2003–2004, the costs used are given in Table 7 (the median and 70 percentile).

Table AII.27. Capitation rate (OP&IP report) 2003–2010

Capitation									
	2003 median	2003 70% til	2004 70% til	2005 70% til	2006 70% til	2007 70% til	2008 70% til	2009 70% til	2010 70% til
OP	491	521	569	653	685	721	754	789	826
IP	490	521	595	725	771	827	879	932	986
Total	981	1,042	1,164	1,378	1,456	1,547	1,633	1,721	1,812

9.4. Problems or questions

- Source *OP & IP report* to be clarified.

9.5. Suggestions

9.6. References to other sheets or files

- *Table 27* is used in sheet h2. Capitation report, in sheet i. compare data, and in sheet l. Final.

- *Table 25* and *Table 26* are used in sheet **j. summary**.

10. Sheet h2. Capitation report

10.1. Short description:

This sheet is similar to **sheet h. capitation**. It computes the curative care cost for all patients covered by the UC scheme and the total capitation rate based on the s**heet g2. capitation OP&IP report**. A few other costs are added to those computed in **sheet g2. capitation OP&IP report.**

10.2. Hypothesis:

- High costs, dental costs, accident and emergency costs, prevention and promotion costs, EMS costs, disable costs, capital replacement costs and no fault liability cost, follow the same assumptions as in **sheet h. capitation**.

- The evolution of the population is given.

10.3. Full description:

- There is no need to multiply the OP and IP capitation rate by a compliance rate here, since the utilization rate used in **sheet g2. capitation OP&IP report** was already multiplied by the compliance rate and so, the OP and IP capitation rate are also already multiplied by this compliance rate.

Table AII.28. Capitation rate and total resource requirement up to 2010

Health welfare survey unit cost item	2005	2006	2007	2007	2008	2009
	2548, high bound 2'548 without chronic dz	2549, high bound 2'549 without chronic dz	2550, high bound 2'550 without chronic dz	2550, high bound 2'551 without chronic dz	2550, high bound 2'552 without chronic dz	2550, high bound 2'553 without chronic dz
OPD	653	685	721	754	789	826
IPD	725	771	827	879	932	986
High cost						
Dental care	2.31	2.31	2.31	2.31	2.31	2.31
A&E (accident emergency)						
P&P (prevention and promotion	211	217	253	264	275	287
EMS	10	10	10	10	10	10
Disable			4	4	4	4
Capital replacement	96	146	155	163	172	181
No fault liability	0.20	0.20	0.53	0.53	0.53	0.53
Capitation rate	**1,697**	**1,831**	**1,972**	**2,077**	**2,185**	**2,297**
Curative care cost	1,378	1,456	1,547	1,633	1,721	1,812
Capitation	13.21%	7.87%	7.69%	5.33%	5.21%	5.13%
Estimated population (min)	47	48	48	49	49	50
Total budget P&P (min baht)	9,930	10,349	10,982	12,837	13,531	14'268
Total resource requirement	**80,041**	**87,420**	**95,308**	**101,138**	**107,437**	**114,033**

- The *OPD and IPD* line in *Table 28* is the OP and IP capitation rate given in **sheet g2. capitation OP&IP report**, *Table 27*.

- The *capitation rate* line is the sum of all the elements described above.

- The *Total resource requirement* line is the capitation rate multiplied by the population size.

- The *accident and emergency cost (A&E)* as well as the *high cost* are calculated in **Sheet i. compare data**.

10.4. Problems or questions

- The population size used in this sheet does not match the population size used in other sheets, as already mentioned above.

- From the sheet (see row 7; columns D, E) we observe a drop in the OP cost decreasing from 635 Bahts in 2002 to 521 Baht in 2003 per person. How is it possible? Note that OP costs are given as data from 2000 to 2002, but they are calculated since 2003, which is the year we observe a strange drop.

10.5. Suggestions

10.6. References to other sheets or files

- *Table 28* is used in **sheet j. summary**.

11. Sheet i. Compare data

11.1. Short description

- This sheet is used to compare the number of OP & IP per visits and per episodes coming from different kind of data for 2005: Health Welfare survey (see: sheet g**. capitation** 45-50 high bound and sheet **h. capitation**) and the Input & Output report (see: sheet **g2. capitation** OP&IP report and sheet **h2. capitation** report).

- DRG version 3.5 is introduced. Using this data, the accident and emergency costs (A&E) as well as the high costs are projected until 2010.

11.2. Hypothesis

- The compliance rate for the OP is 0.767 and for the IP 0.8244. It seems they are based on the HWS 2548.

11.3. Full description

- The sheet is divided into four parts: the HWS survey data, the Input & Output report, the DRG version 3.5 data, and the projection. The three first parts are based on 2005.

- Part 1: HWS

  - The outpatient and inpatient utilization rate per visit are the same as those computed in **sheet f. forecast use rate 48** (*Tables 15* and *16*).

  - The OP and IP utilization rates per episode are slightly higher than those in **sheet f. forecast use rate 48** (*Table 13* and *Table 14*).

  - The population is the same as in **sheet h2. capitation report** and in **sheet l.Final**.

- From this data, it is possible to compute the number of OP and IP visits and episodes. Results are shown in *Table 29*.

Table AII.29. Number of OP and IP visits and episodes based on HWS in 2005

	HWS	
	Episodes	**Visits**
Population UC 2005	47,163,799	47,163,799
Out-patient utilization rate	3.545	3.871
In-patient utilization rate	0.093	0.114
OP		
Number of OP	167,214,012	182,565,343
Used UC scheme 0.767	128,253,148	140,027,618
IP		
Number of IP	4,372,406	5,360,330
Used UC scheme 0.8244	3,604,611	4,419,056

The number of OP visits at registered providers is:

$$NumbOP_t = OPRate_t \times Pop_t \times CompRate$$

where

$NumbOP_t$	=	Number of OP visits in registered provider in year *t*;
$OPRate_t$	=	OP utilization rate in year *t*;
$CompRate$	=	Compliance rate (0.767 for OP; 0.8244 for IP);
Pop_t	=	Population covered in UC scheme in year *t*.

The same calculation is done by IP episodes and by IP visits at registered providers. This computation is done only for year 2005.

- Part 2: Input & Output report.
- The population size is the same as in part 1.
- The number of OP and IP visits to registered providers is taken as given and not analyzed since this information comes from another Excel file (not available).
- By dividing the second information by the first, the utilization rate is obtained (2.563). The same rate is reported in **sheet f. forecast use rate 48** (See: *Table 17*).

$$OPRate_t = \frac{NumbOP_t}{Pop_t}$$

Table AII.30. Number of OP and IP visits based on Input & Output report in 2005

Input-output report (no 5)	
Population UC 2005	47,163,799
Out-patient utilization rate	2.563
In-patient utilization rate	0.096
OP	
Used UC scheme 0.767	120,881,683
IP	
Used UC scheme 0.8244	4,530,530

- Part 3: Inpatient database in DRG version 3.5.

- Concerning OP: The High cost (*HC*) and Accident and Emergency cost (*A&E*) are introduced. This data comes from an external Excel file. Data is classified in three categories: number of visits, cost of those visits and the part of the cost that has already been paid.

Table AII.31. High costs (HC) and Accident and Emergency (A&E) costs for OP in 2005

	In-patients database in DRG version 3.5		
	Visits	Charges	Pay
OP AE	66,804	40,151,650	25,306,225
OP PUC	34,524	12,132,529	7,739,652
OP HC add on	102,585	311,376,717	197,968,087
Instruments	31,936	87,968,960	30,616,283
Total OP AE/HC	101,328	52,284,179	33,045,877

- Concerning IP: The High Cost (*HC*) and Accident and Emergency cost (*A&E)* are introduced. Another cost, called *Normal IP*, is introduced; it seems to be the sum of all other costs used in previous sheets. This data comes from an external Excel file. Data is classified in four categories: the number of cases, the DRG weight associated to each disease, the total cost and the part of the cost that has been already paid. (See: *Table 32*).

Table AII.32. High costs (HC) and Accident and Emergency (A&E) costs for IP in 2005, first part

IP	Cases	Sum adj DRG
IP AE	170,624	148,165
IP PUC	89,875	62,950
IP NB illness	116,339	92,386
IP NB other fund	82,751	23,404
IP HC chemo	56,812	85,278
IP HC cranio	5,363	27,346
IP HC open heart	6,134	59,014
IP DRG>=4	55,727	341,333
Total AE/HC	583,625	839,877
Normal IP	4,115,465	2,209,480
Normal IP + AE/HC	4,699,090	3,049,356

Table AII.33. High costs (HC) and Accident and Emergency (A&E) costs for IP in 2005, second part

IP	Sum Charges	Sum Pay
IP AE	1,435,915,012	1,435,915,012
IP PUC	581,330,062	581,330,062
IP NB illness	1,010,163,379	1,010,163,379
IP NB other fund	92,524,994	92,524,994
IP HC chemo	973,330,744	973,330,744
IP HC cranio	453,195,295	453,195,295
IP HC open heart	879,649,177	879,649,177
IP DRG>=4	4,730,020,598	4,730,020,598
IP act7	67,177,828	13,402,731
IP add on		30,495,703
Instruments	1,470,455,890	400,538,098
Total AE/HC	11,693,762,982	10,600,565,795
Normal IP	26,302,250,648	26,302,250,648
Normal IP + AE/HC	37,996,013,630	36,902,816,444

Note that in *Tables 32* and *33*, the Total AE/HC is different: in *Table 33*, the concepts *IP act7*, *IP add* on and *Instruments* are included while *Table 32* does not include them.

- Part 4: Projections up to 2010

- The inflation rate comes from *Table 6*.

- For OP: first, the charges per visit were computed by dividing the total amount of charges by the number of visits in 2005. Second, the cost per visit is multiplied by the inflation rate provided in *Table 6*. Then the cost per visit is projected until 2010 (see *Table 34*).

Table AII.34. Cost per OP visit

In-patient database in DRG version 3.5						
	Charges per visit					
	2005	2006	2007	2008	2009	2010
OP AE	601	626	657	685	715	747
OP PUC	351	366	384	401	418	437
OP HC add on	3,035	3,163	3,316	3,461	3,613	3,772
Instruments	2,755	2,871	3,009	3,141	3,279	3,423
Total OP AE/HC	516	538	564	588	614	641

- For IP: same computation as OP. The charges per DRG are calculated by dividing the sum of charges by the sum of DRG. However, there is an exception: when the DRG data is missing, the sum of costs is divided by the number of cases. It is the case for: *IP act7*, *IP add on* and *Instruments*. Finally, *IP act7* and *IP add on* are not computed from the sum of charges, but from the sum of charges already paid.

Table AII.35. Costs by DRG for different categories

In-patient database in DRG version 3.5						
	Charges per DRG					
	2005	2006	2007	2008	2009	2010
IP AE	9,691	10,100	10,588	11,050	11,537	12,045
IP PUC	9,235	9,624	10,089	10,530	10,993	11,477
IP NB illness	10,934	11,395	11,946	12,467	13,016	13,589
IP NB other fund	3,953	4,120	4,319	4,508	4,706	4,913
IP act/	6,970	7,264	7,615	7,947	8,297	8,662
IP HC chemo	11,414	11,895	12,470	13,587	13,587	14,185
IP HC cranio	16,573	17,272	18,106	18,896	19,728	20,597
IP HC open heart	14,906	15,535	16,285	16,996	17,744	18,525
IP DRG>=4	13,857	14,442	15,140	15,800	16,496	17,222
IP add on	9,177	9,502	9,960	10,395	10,853	11,331
Instruments	15,869	16,538	17,337	18,093	18,890	19,722
Total AE/HC	13,923	14,511	15,212	15,875	16,574	17,304

In order to compare the *Normal IP* and the cost found in **sheet g2. capitation OP&IP report** the same unit should be used. The *Normal IP* is computed as explained above (See: *Table 35*). However, there are some modifications for the cost found in **sheet g2. capitation OP&IP report.**

The IP capitation rate of 2005 (*Table 27*) is divided by the utilization rate. Then, the average cost per case is obtained (and no longer the average cost per person). This amount is divided by 0.649 to obtain the average cost by DRG. Therefore, data from *Table 35* and *Table 36* is comparable.

The number 0.649 is obtained by dividing the total number of DRG (3,049,356) by the total number of cases (4,699,090). See *Table 32*.

Costs by DRG are multiplied by the inflation rate in *Table 6*, from 2005 to 2010.

Table AII.36. Comparison between two different methods

Inpatient database in DRG version 3.5	Charges per DRG					
	2005	2006	2007	2008	2009	2010
Normal IP	11,904	12,407	13,006	13,573	14,171	14,795
From sheet g2	11,200	11,673	12,165	12,678	13,213	13,771

- Remark: from 2003, the exclusive capitation rate applies. That means that the contracted unit primary care is paid as follows: for the ambulatory care, the capitation is used; for the inpatient care, the "Diagnostic related group weighted global budget" is used.

11.4. Problems or questions found

- Why are the outpatient and inpatient utilization rates per episode (used in Part 1: HWS) slightly higher than those computed in **sheet f. forecast use rate 48** (*Tables 13* and *14*)?

11.5. Suggestions

11.6. References to other sheets or files

- *Table 31, Table 32* and *Table 34* to *36* are used in **sheet l.Final**.

- *Table 37* is used in **sheet l.Final**. For 2005, the cost per DRG is taken as given. It may be a kind of mean of all the categories given in *Table 35*. The cost by DRG is multiplied by the inflation rate in *Table 6*, from 2005 to 2010.

Table AII.37. Global costs by DRG

	Inpatient database in DRG version 3.5					
	2005	2006	2007	2008	2009	2010
Charges per DRG	10,300	10,735	11,253	11,744	12,261	12,801

12. Sheet j. Summary

12.1. Short description

This sheet summarizes all previous sheets. It compares the capitation rates computed by three different methods: by episodes, by visits (calculated in **sheet g. capitation 45-50 high bound** and in **sheet h. capitation**) and by the Input & Output report (**sheet g2. capitation OP&IP** report and **sheet h2. capitation report**).

12.2. Hypothesis

- Same assumptions than sheet **h. capitation**, sheet g. capitation 45-50 high bound, sheet **g2. capitation** OP&IP report and sheet **h2. capitation** report.

12.3. Full description

Method 1*:* capitation rate per episode

- The first part of the sheet summarizes the information by episode given in **sheet g. capitation 45-50 high bound** and **sheet h. capitation**.

- The percentage of population seeking care in institutions and the OP and IP utilization rates come from the **sheet g. capitation 45-50 high bound**.

- The compliance rate, the IP and OP capitation rate, the dental costs and the EMS costs are the same as in **sheet h. capitation** (*Table 21* and *Table 22*).

- The *prevention and promotion (P&P) costs* are identical each year except in 2007. See *Table 22* and *Table 38*. The *P&P* cost is about 17 Baht higher in 2007.

Table AII.38. Capitation rate by episode from 2003 to 2007

Capitation per capita	Calculated by episode				
	HWS46	Forecast47	Forecast48	Forecast49	Forecast50
	2003	2004	2005	2006	2007
OPD	566	582	638	665	731
IPD	496	544	603	628	706
High cost					
Dental care	2.31	2.31	2.31	2.31	2.31
A&E					
P&P	206	206	216	225	253
EMS	10	10	10	10	10
Disabled					4
Capital replacement	106	113	124	129	144
No fault liability	0.20	0.20	0.20	0.20	0.50
Capitation rate	1,0387	1,457	1,593	1,660	1,850

- Two other important differences appear between *Tables 22* and *38:*

- In 2005, the *capital replacement cost* is equal to 10 per cent of the sum of the OP and IP capitation rate, and not anymore 7 per cent as in **sheet h. capitation**.

- In 2003 and 2004, the OP and IP capitation rates are not multiplied by the compliance rate in *Table 22* as was done in *Table 38*.

- ***Method 2***: capitation rate by visits

- The second part of the sheet summarizes the visits information of sheet **g. capitation** 45-50 high bound and sheet **h. capitation**.

- The percentages of population seeking care in institutions come from the sheet **g. capitation** 45-50 high bound (for OP and IP).

- The utilization rate is the same as in sheet **g. capitation** 45-50 high bound and sheet **f. forecast use rate** 48 (See: *Table 15* and *Table 16*).

- The *dental costs*, the *EMS* costs and the *no fault liability costs* are the same as in sheet **h. capitation** (*Table 22*).

Table AII.39. Capitation rate by visit for 2003 to 2009

Capitation per capita	Calculated by visit						
	HWS46	HWS47	HWS48	Forecast49	Forecast50	Forecast51	Forecast52
	2003	2004	2005	2006	2007	2008	2009
OPD	600	651	715	798	837	873	912
IPD	496	636	671	758	807	854	901
High cost							
Dental care	2.31	2.31	2.31	2.31	2.31	2.31	2.31
A&E							
P&P	206	206	210	225	253	246	257
EMS	10	10	10	10	10	10	10
Disabled					4	4	4
Capital replacement	110	129	139	156	164	173	181
No fault liability	0.20	0.20	0.20	0.20	0.53	0.53	0.53
Capitation rate	1,425	1,634	1,747	1,949	2,078	2,162	2,268

- The *prevention and promotion* (*P&P*) cost are identical in *Tables 22* and *39* except for 2007 where the cost is about 17 Baht higher.

- The *capital replacement* cost 2005 is equal to 10 per cent of the sum of the OP and IP capitation rates, and no more 7 per cent as in **sheet h. capitation**.

- The compliance rate comes from the HWS 2003 to 2005. Then, for the period 2006 to 2009, the rates are the same than those provided in *Table 21* (**sheet h. capitation**).

Table AII.40. Compliance rates

	Compliance rate						
	HWS46	HWS47	HWS48	Forecast49	Forecast50	Forecast51	Forecast52
	2003	2004	2005	2006	2007	2008	2009
OP	0.78	0.74	0.767	0.8	0.8	0.8	0.8
IP	0.8	0.81	0.824	0.85	0.85	0.85	0.85

- For 2008 and 2009, the same total capitation rate is obtained as in **sheet h. capitation** (compare *Tables 22* and *39*). For 2007, the difference comes from the *prevention and promotion (P&P)* costs which are about 17 Baht higher in *Table 39* than in *Table 22*.

- For 2003 to 2006, the computations per visit were not made before. It is done, here, in the same way as in **sheet g. capitation 45-50 high bound and in sheet h. capitation**. In 2003 and 2004, the 70 percentile cost was used (*Table 7*), and in 2005/2006 mean costs were used (*Table 8*).

Method 3: Capitation by OP & IP

- The third part of the sheet summarizes information from **sheet g2. capitation OP & IP report** and **sheet h2. capitation report**.

Table AII.41. Capitation rate from 2003 to 2009, Input & Output report

Capitation per capita	Calculated by Input-Output (no 5)							
	Report 46	Report 47	Report 48	Report49	Report50	Report51	Report52	Report53
	2003	2004	2005	2006	2007	2008	2009	2010
OPD	521	569	653	685	721	754	789	826
IPD	521	595	725	771	827	879	932	986
High cost								
Dental care	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31
A&E								
P&P	206	206	210	225	253	264	275	287
EMS	10	10	10	10	10	10	10	10
Disabled	4	4	4	4	4	4	4	4
Capital replacement	104	116	138	146	155	163	172	181
No fault liability	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Capitation rate	1,369	1,504	1,742	1,843	1,972	2,077	2,185	2,297

- *Table 41* is almost the same as *Table 28*. The differences are:
    - In *Table 41* the *no fault liability* cost is assumed to be 0.53 Baht per capita instead of zero for 2003, and 0.2 from 2004 to 2006.
    - The *disabled cost* (or rehabilitation cost) is supposed to be equal to 4 Baht per capita in *Table 41*. In *Table 28*, from 2003 to 2006, this amount is zero.
    - In 2005, the capital replacement cost is equal to 10 per cent of the sum of the OP and IP capitation rate, and no more than 7 per cent as in **sheet h2. capitation report**.
    - In 2006, the *promotion of health care and prevention (P&P)* cost is assumed to be equal to 225 Baht per capita in *Table 41*. By doing so, the cost is not increased by the inflation rate, as in **sheet h2. capitation report**.
- Finally, there is a table in the sheet that reports the **Actual global budget**; source is unclear. (See: *Table 42*).

Table AII.42. Global budget

Fiscal year	Actual global budget			
	2546	2547	2548	2549
Year	20003	2004	2005	2006
1. OP	574.0	488.2	533.01	585.11
2. IP	303.0	418.3	435.01	460.35
3. PP	175.0	206.0	210.00	224.89
4. AE	25.0	19.7	24.73	52.07
5. High Cost Care	32.0	66.3	99.48	190.00
6. EMS	10.0	10.0	10.00	10.00
7.	83.4	85.0	76.80	129.25
8.		10.0	7.07	7.00
9. No fault liability		5.0	0.20	0.53
Sum capitation	1,202.4	1,308.5	1,396.30	1,659.20

12.4. Problems or questions found

- Why do the results presented on the summary sheet sometimes differ from the results obtained on the previous sheets?
- What is *Table 42*?

12.5. Suggestions

12.6. References to other sheets or files

- *Table 41* is used in **sheet l. Final**.

13. Sheet k. Disease Management

13.1. Short description

This sheet provides information about different disease groups and their costs for 2007. This information is not used anywhere else.

14. Sheet l. Final

14.1. Short description

This sheet calculates the capitation rate per capita from 2003 to 2010, including *high costs* (*HC*) and *accident and emergency* (*A&E*) costs. The last part of the sheet has the same structure as in **sheet h. capitation** and **h2. Capitation report**.

14.2. Hypothesis (assumed by the model)

- The number of DRG weight by case, called CMI, is the same for every year from 2005 to 2010.
- The number of OP visits due to *Disease Management* is equal to the number of IP cases due to *Disease Management*.
- The increase rate of the number of OP visits is equal to the increase rate of the number of IP cases.

14.3. Full description

- The sheet is divided into three different parts: the first part computes the cost per capita from 2005 to 2010 for several *High costs* (*HC*) categories, several *Accident and Emergency (A&E)* categories and other costs. In the second part, the costs obtained before are grouped as: *high costs*, *A&E* costs and *normal costs*. Then, the last part structures the cost as in **sheet h. capitation** and **h2. Capitation report**. The capitation rate includes all costs and is projected until 2010.
- Computations are made separately for IP costs and OP costs.

Part 1

- It provides the population size until 2010 (*Table 24*).
- The computation of the OP and IP costs is made differently. In order to calculate the IP costs, the DRG is used, which is not the case for the OP calculation.

IP computation

- For each year from 2007 to 2010, a table is produced with the same structure: sum of cases, sum of DRG, sum of costs and cost per capita.
- Cost are divided in two main categories:

  (i) The normal costs;

  (ii) The High cost and Accident and Emergency costs.

- The *normal costs* contain the *IP act7*, the *IP add on*, the *Instruments*, the *Disease management* costs and some other costs not defined before.
- The High cost and Accident and Emergency costs contain the IP AE, IP PUC, IP NB Illness, IP NB Other fund, IP HC CHEMO, IP HC CRANIO, IP HC OPEN HEART and the IP DRG >4.
- In 2005: the number of IP cases as well as the sum of DRG weight by type of cost come from **sheet i. compare data** (*Table 32*). Then,

  CMIi = (Sum of DRG) i / (number of case) i

where

i = type of cost (High costs, normal costs, A&E costs, etc).

The CMI is assumed to be constant until 2010.

- The IP utilization rates come from *Table 17*.
- The total number of cases (for all categories) is computed as follows: TotNumCaset = (Popt - DMt) * IPRatet

where

$TotNumCase_t$ = Number of cases in year *t;*

Pop_t = Population in year *t;*
$IPRate_t$ = IP utilization rate in year *t;*
DM_t = Number of Disease Management cases in year *t*.

For *t* = 2006 to 2010.

- In 2006:

  (i) The numbers of cases by category (*IP AE, IP PUC, IP NB Illness, etc.*) are given. They come from an external Excel file.

  (ii) The DRG weights are computed as follows:

  $$DRG_i = NumCase_i * CMI_i$$

  where

  $NumCase_i$ = Number of cases for type of cost *i* (or category *i*);

CMI_i = Number of DRG weight per case for type of cost *i*;

DRG_i = Number of DRG weight for type of cost *i*.

However, the number of DRG weights for *Disease Management* comes from an external Excel file.

(iii) The cost by category is obtained by multiplying the number of DRG weights obtained above by the DRG costs obtained on **sheet i. compare**. (See *Table 35*) This is done except for the *IP act7*, *IP add on, Instruments and the Disease management*. *Table 35* reports the *IP act7* costs by case (as DRG weights are not given for this one), so the total cost was obtained by multiplying the cost of *Table 35* by the numbers of cases. The other costs, *IP add on, Instruments and the Disease management* are given.

- For 2007 to 2010:

(i) An increase rate of cases is computed as follows:

$$IncrRateCase_t = \frac{Pop_t}{Pop_{t-1}} \times \frac{IPRate_t}{IPRate_{t-1}}$$

where

$IncrRateCase_t$ = Increase rate of cases in year *t;*

Pop_t = Population in year *t;*

$IPRate_t$ = IP utilization rate in year *t;*

Note that the increase rate of OP visits is equal to the IP increase rate of cases. This formula is applied for the OP using the IP utilization rate.

(ii) The number of cases by category is obtained by multiplying the number of cases of last year by the increase rate obtained above (under 1.).

$$NumCase_{it} = IncrRateCase_{it} \times NumCase_{it-1}$$

where *i* indicates the category and *t* the year.

This expression is not used for the *IP PUC*, the *IP NB illness* and the *IP NB other fund* for years 2008 to 2010. Instead of multiplying the number of cases of the previous year by the increase rate obtained in 1, it is only multiplied by the population's growth rate.

Moreover, for 2009 and 2010, the number of cases for the *Instruments* category is computed from the same formula, but instead of using the increase rate of the respective year, the rate of 2008 is used.

(iii) The DRG weights are computed as in 2006.

(iv) Computation of the sum of costs: the cost by category is obtained by multiplying the Number of DRG weight (above) by the costs of DRG obtained in **sheet i. compare**. However, the costs of *Table 35* are not used. For 2007, the cost provided in *Table 37* is used for each category. The sum of costs obtained is based on the 2005 average cost of 10,300 Baht per DRG weight. For 2008 to

2010, the cost provided on *Table 36* (row "from sheet g2") is used. The sum of costs is based on the 2005 average cost of 11,200 Baht per DRG weight.

For the *IP add on, Instruments and Disease Management*, the computation is different:

$$Cost_{it} = \frac{Cost_{it-1}}{NumCase_{it-1}} \times NumCase_{it} \times InflRate_t$$

where

$Cost_{it}$ = Sum of the costs of category *i* for year *t*;
$NumCase_{it}$ = Number of cases of category *i* for year *t*;
$InflRate_t$ = Inflation rate of year *t* (*Table 6*).

(v) Finally, the cost per capita is computed by dividing the sum of costs in each category by the population of the year. Results are summarized in Table 43.

Table AII.43. Cost per capita in different categories for IP

Categories	Cost per capita			
	2007	2008	2009	2010
IP AE	41.00	47.06	49.80	52.58
IP PUC	15.78	17.77	18.52	19.31
IP NB illness	18.03	20.31	21.17	22.06
IP NB other fund	7.14	8.05	8.39	8.74
IP HC Chemo	23.26	26.69	28.25	29.83
IP HC Cranio	7.75	8.90	9.42	9.94
IP HC open heart	14.70	16.88	17.86	18.86
IP DRG > = 4	89.05	102.19	108.15	114.19
IP act7	0.31	0.31	0.35	0.37
IP add on	1.39	1.39	1.57	1.66
Instruments	41.85	41.85	46.89	48.51
Disease management	16.20	16.20	18.25	19.31
Normal IP	632.97	632.97	666.64	704.52

Note: The Normal IP cost is the sum of the IP act7, the IP add on, the Instruments, the Disease management costs and some other costs not defined.

OP computation

- For each year from 2007 to 2010, a table is produced with the same structure: number of visits, sum of costs and cost per capita.
- The IP utilization rates come from *Table 17*.
- The total number of visits (whatever the category is) is computed as follows:

$$TotNumCase_t = (Pop_t - DM_t) * OPRate_t$$

where

$TotNumCase_t$ = Number of cases in year *t;*
Pop_t = Population in year *t;*
$OPRate_t$ = IP utilization rate in year *t;*

DM_t = Number of Disease Management cases in year *t*.

For *t* = 2006 to 2010.

- In 2005: The number of OP visits and the sum of costs by category come from **sheet i. compare data** (*Table 31*).

- In 2006:

  (i) The numbers of visits by category are taken as given. They come from an external file.

  (ii) The sum of costs for *OP AE* and *OP PUC* is obtained by multiplying the number of visits by the cost by visit given in *Table 34*, **sheet i. compare**. The other three costs were taken as given.

- For 2007 to 2010:

  (i) The number of visits is computed in the same way as the number of cases for the IP. However, the number of visits due to the *Disease Management* is equal to the number of cases due to the *Disease Management* for the IP.

  The *Normal OP* number of visits is the total number of visits minus the visits due to *OP A&E* and *OP PUC*.

  (ii) The sum of costs for *OP AE* and *OP PUC* is obtained by multiplying the number of visits by the cost per visit given in Table 34, **sheet i. compare**. For the *OP HC add on*, *Instruments* and *Disease Management*, the computation is different:

$$Cost_{it} = \frac{Cost_{it-1}}{NumVisit_{it-1}} \times NumVisit_{it} \times InflRate_t$$

  where

  $Cost_{it}$ = Sum of the costs of category *i* for year *t*;
  $NumVisit_{it}$ = Number of visits of category *i* for year *t*;
  $InflRate_t$ = Inflation rate of year *t* (*Table 6*).

  The sum of cost for the *Normal OP* is obtained by multiplying the number of visits by the capitation rate provided in *Table 27*, divided by the utilization rate.

  (iii) Finally, the cost per capita is computed by dividing the sum of costs in each category by the population size of the year. Results are summarized in *Table 44.*

Table AII.44. OP costs per capita by different categories

Categories	Cost per capita			
	2007	2008	2009	2010
OP Accidents Emergency	1.25	1.33	1.41	1.49
OP PUC	0.17	0.18	0.19	0.20
OP HC add on	12.11	12.88	13.65	14.44
Instruments	2.31	2.39	2.47	2.55
Disease management	9.19	9.77	10.36	10.96
Normal OP	719.87	753.30	788.26	824.89

Note: The *Normal OP* cost is contains the *OP HC add on*, the *Instruments*, the *Disease management* costs and some other costs not defined.

Part 2

- The costs obtained previously are grouped as follows:

Table AII.45. Summary cost per capita

Categories	Cost per capita			
	2007	2008	2009	2010
OP	**744.91**	**779.85**	**816.34**	**854.54**
AE	1.42	1.51	1.60	1.60
HC	23.61	25.04	26.48	27.96
Normal OP	719.87	753.30	788.26	824.89
IP	**909.44**	**941.50**	**995.26**	**1,049.89**
AE	82.26	93.52	98.23	103.06
HC	194.21	218.68	230.38	242.31
Normal IP	632.97	629.29	666.64	704.52
IP + OP	**1,654.35**	**1,721.35**	**1,811.60**	**1,904.43**

- It seems that some costs (the *OP HC add on*, the Instruments and the *Disease management*) are counted double in the total cost: once in the *HC* cost and again in the *Normal OP cost*.

- The same duplication of costs (*IP act7*, the *IP add on*, the Instruments, the *Disease management*) is found in the calculation of the IP cost.

Part 3

- The final results are presented in *Table 46* and can be compared with *Table 41* of **sheet j. summary**.

Table AII.46. Capitation per capita, including HC and A&E costs

Type of services	Cost per capita							
	2003	2004	2005	2006	2007	2008	2009	2010
Out-patient (OP)	574.00	488.20	533.01	582.80	719.87	753.30	788.26	824.89
In-patient (IP)	303.00	418.30	435.01	460.35	632.97	629.29	666.64	704.52
Promotion and Prevention	175.00	206.00	210.00	224.89	252.57	263.59	275.20	287.42
Accident Emergency	25.00	19.70	24.73	52.07	83.69	95.03	99.83	104.76
High Cost	32.00	66.30	99.48	190.00	217.82	243.72	256.86	270.27
Dental care				2.31	2.31	2.31	2.31	2.31
EMS	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Disable					4.00	4.00	4.00	4.00
Capital replacement	83.40	85.00	76.80	129.25	165.44	172.14	181.16	190.44
??		10.00	7.07	7.00				
No fault liability		5.00	0.20	0.53	0.53	0.53	0.53	0.53
Capitation per capita	1,202.40	1,308.50	1,396.30	1,659.20	2,089.20	2,173.92	2,284.79	2,399.14

- Most of the amounts are identical.
- Remarks:
    - The Capital replacement cost is 10 per cent of the sum of the *OP*, *IP*, *HC* and *AE* costs given in *Table 46*.
    - The *AE cost* in *Table 46* is the sum of the *IP AE* and *OP AE* given in *Table 45*. Same for the *HC* cost.
    - The *OP* and *IP cost* of *Table 46* are the *Normal OP* and *IP* of *Table 45*.
    - The *No fault liability* and *Dental* costs are not the same in *Table 46* than in *Table 41* for the years 2003 to 2006.
    - The *Disabled* costs are not the same in *Table 46* than in *Table 41* for the years 2003 to 2006.
    - The *promotion* and *prevention* costs are not the same in *Table 46* than in *Table 41* on 2003.

Otherwise, amounts are identical.

14.4. Problems or questions

- The increase rate of OP visits may be computed with the OP utilization rate and not the IP utilization rate.

14.5. Suggestions

14.6. References to other sheets or files