MERCER

TALENT • HEALTH • RETIREMENT • INVESTMENTS

ACTUARIAL STUDY OF CYPRUS NATIONAL HEALTH EXPENDITURE AND NATIONAL HEALTH SYSTEM

HEALTH INSURANCE ORGANISATION

OCTOBER 2013

CONTENTS

1

Executive Summary

Mercer has been asked by the Health Insurance Organisation (HIO) of Cyprus to provide an updated actuarial estimation of the Cyprus National Health Expenditure (NHE), the National Health System (NHS) expenditure and the contribution rate required to finance the NHS. This analysis will be used to review the programme to design and install a NHS in Cyprus. The last analysis was completed in September 2008. This report has been prepared in accordance with the requirements of the Memorandum of Understanding on Specific Economic Policy Conditionality between the Republic of Cyprus and the European Commission acting on behalf of the European Stability Mechanism[1].

The current Cyprus healthcare system consists of 2 parallel sub-systems (a public and a private system) which operate separately leading to some inefficiencies and lack of coordination of care. The financing of the current system is characterised by a high proportion of out of pocket expenditure which implies a lack of equity within the system. Although the current health expenditure is relatively low compared to the EU average, there are concerns for upward trends in future which will increase the financial burden and increase the risk of a financially unsustainable system.

The proposed National Health System (NHS) is designed to tackle the challenges of the current system and achieve universality in coverage, good quality of care, equity, solidarity and long term financial sustainability.

To reflect the current economic situation, Mercer has developed a composite model of the Cyprus healthcare system, incorporating an economic analysis within an actuarial approach. This model aims to capture the characteristics of the proposed NHS and thus represent better the reality in the future. During the current period of economic uncertainty and until the introduction of NHS (assumed to be 2016), the expected healthcare expenditure is forecast using the economic analysis. From 2016, our actuarial model is used to forecast healthcare expenditure. To ensure consistency between the approaches, the implied medical inflation from the economic model has been used within our actuarial model.

A detailed expenditure snapshot was developed for 2010. This reflects our best estimate of the NHE in 2010. Our healthcare model was then used to project this forward.

Regarding data, we were provided with considerable information from the Cyprus Statistical Service of the Ministry of Finance and the Ministry of Health. For public sector, financial data was available up to 2012. The private sector data was only available to 2011. There were however areas where the data was limited particularly around recent healthcare activity and private consultations.

The underlying assumptions are based on the agreed economic and demographic framework with the Troika. Historical and current experience data on utilisation has been

[1] Signed May 2013 – European Economy - Occasional Paper Number 149.

used to estimate future experience.

The key results and findings are as follows:

1.1 Under The Current Healthcare System

2010 to 2016 National Healthcare Expenditure In million €

	2010	2011	2012	2013	2014	2015	2016
Public*	572	605	585	594	550	512	510
Private*	708	704	687	607	580	597	624
Total NHE	1,280	1,308	1,272	1,201	1,130	1,109	1,134
Expenditure for services covered under NHS	1,006	1,029	999	949	891	873	891

*These are calculated after Mercer adjustments

Total healthcare expenditure is expected to continue falling until 2015. This downward trend is expected to reverse from 2016 onwards. Private sector expenditure is more elastic and falls more rapidly than the public sector expenditure over the period 2012 to 2014, but this downward trend reverses earlier from 2015 onwards.

2016 to 2025 National Healthcare Expenditure Projections Assuming Current System Million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total NHE	1,134	1,175	1,224	1,276	1,330	1,386	1,446	1,509	1,574	1,643
Expenditure for services covered under NHS	891	921	959	1,000	1,041	1,084	1,130	1,178	1,229	1,282

Note it takes 9 years (2020) to surpass the 2011 NHE of €1,308m.

Under the current healthcare system, expenditure is projected to continue to rise throughout the projection period. In particular, the total expenditure increases from €1,134 m to €1,643 m over the period 2016 to 2025 representing an average growth rate of 4.2% p.a. Private expenditure increases at a higher rate (4.87% p.a. over the period) than the Public expenditure (3.33% p.a.).

1.2 Following NHS Implementation in 2016

2016 to 2025 National Healthcare Expenditure Projections In Million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total NHE*	1,128	1,177	1,221	1,265	1,309	1,351	1,404	1,459	1,517	1,576
Expenditure for services covered under NHS*	886	927	964	995	1,027	1,058	1,098	1,140	1,184	1,230
NHE savings under NHS	7	(2)	3	12	21	35	42	50	58	66

*- This includes allowance for HIO administrative expenses and assumes fully utilised by 2018.

Following the initial slight impact of HIO administration costs, there will be increased control of expenditure which will result in a reduction in the expenditure inflation over the period 2016 to 2025, limiting the growth rate to 3.7% p.a. Over the above period, cumulative savings are € 292 m.

NHS will make use of several best practices such as global budgets, co-payments and reimbursement methods to the healthcare providers (for details see section 3.2), which will improve the cost containment. We have assumed that under NHS, the healthcare trend both in the public and private sector will be similar and controlled with an overall annual trend similar to the projected public spend trend of the current system. If the medical inflation could be reduced by another 0.5%, then this would result in a 4.3% reduction in 2025 NHS costs.

2016 to 2025 NHS Income and Expenditure Projections Assuming NHS Implementation in 2016 in Million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Contributions in line with 2001 NHS Law	758	783	815	849	885	915	952	991	1031	1073
Minus Expenditure for services covered under NHS	886	927	964	995	1027	1058	1098	1140	1184	1230
Plus Co-payments based on HIO proposal (Appendix E)	90	92	94	97	101	104	108	112	116	120
(Deficit) / Surplus	(38)	(52)	(52)	(48)	(42)	(39)	(38)	(38)	(37)	(36)

It follows from the above table that the contributions as per 2001 NHS Law with co-payments in line with HIO proposals will not be sufficient to meet the NHS expenditure. There will therefore need to be additional funding. Expenditures will generally rise at a slightly lower rate than the contributions and the deficit therefore reduces over the period. There are the following policy options for funding this deficit:

1) through additional co-payments - increasing co-payments from €90m to €142m in 2016 (and thereafter increasing in line with medical inflation.

2) through a proportionate increase in contribution rate from all sources by 6.7 per cent. The resulting contribution rates by source are as follows :

Source of Income	Individual	Employer	State	Total
Salaried employees	2.13%	2.72%	4.85%	9.71%
Self-employed	3.79%		4.85%	8.64%
Pensioners - GSIS, GEPS, other	2.13%		4.85%	6.99%
Other Income - Rent, interest, dividends, other	2.13%			2.13%

3) If the State's contribution was increased to the budget level forecast under the current system (i.e. the State would pay no more than they would do under the current system), then the deficit could be financed by additional co-payments of €49m or an increase in contributions rate from non-State contributors of 15.1 per cent resulting in the following contribution rates

Source of Income	Individual	Employer	State
Salaried employees	2.30%	2.93%	In-line with budgets
Self employed	4.09%	n/a	
Pensioners	2.30%	n/a	
Other Income	2.30%	n/a	

Alternatively, this may be financed by excluding certain services or by using a combination of the above.

The projections are particularly sensitive to the medical inflation. One percentage point increase in medical inflation would increase the contribution rate required by approximately 6%. Cost containment measures are therefore key in the future.

We have also considered alternative scenarios. Firstly the potential of a phased implementation of the NHS starting 12 months prior to 2016. It is noted that this could lead to benefits more quickly but also has some additional costs up front. Secondly, an alternative economic scenario (including higher unemployment and lower GDP in 2013 and 2014). Under this scenario, healthcare spending reduces more rapidly and then grows in line with economic growth. Contributions also reduce due to the lower employment rate. Overall, the resultant funding requirements are similar to the above rates.

2

Introduction

As part of an overall programme to design and install a NHS to provide universal coverage through a single payor system for health care in Cyprus. Mercer has been asked to provide an actuarial estimation of the Cyprus National Health Expenditure (NHE), the National Health System (NHS) Expenditure and the contribution rate required to finance the NHS. The present report is carried out in accordance with the requirements of the Memorandum of Understanding on Specific Economic Policy Conditionality (MoU) between the Republic of Cyprus and the European Commission acting on behalf of the European Stability Mechanism[2]. Mercer's first phase cost estimation analysis was completed in September 2008.

Historically, the discussion for health care reforms in Cyprus started 20 years ago with a University of Harvard-University of York study. Since then several attempts have been made to reform the health system and in 2001 the House of Parliament decided to introduce a NHS. The design of NHS was based on the establishment of a universal social insurance system financed by social insurance contributions and public funds, promoting at the same time competition in the public and the private sector. Following the law, the HIO was set up and has been developing the implementation strategy for the system with details around its functionality and operation.

In Spring 2012 the Cyprus Council of Ministers, reaffirmed the formation of a road map for the implementation of health care reforms aiming at universal coverage with long term financial sustainability. Furthermore, the recently signed MoU between the Republic of Cyprus and the European Commission encourages the development of policies for greater efficiency and effectiveness of health care resources with closer public–private partnerships, gate-keeping, Diagnosis Related Groupings (DRG's), user charges and measures aiming at the overall improvements in the performance of the health system.

Mercer has been asked to provide updated estimates of the NHE and NHS income and expenditure under two different bases: firstly assuming no changes to the current healthcare system; and secondly assuming NHS is introduced in 2016.

Our report provides

- A brief summary of the current healthcare system and the proposed NHS development;
- A detailed analysis of current healthcare expenditure;
- A description of our methodology, data and assumptions;
- The projection results with some key sensitivities and scenario analyses; and
- Our key findings.

[2] Signed May 2013 European Economy Occasional Paper Number 149

In completing this analysis, Mercer have complied with International Actuarial Standards including IASP1 and the following technical actuarial standards: TAS D (Data), TAS M (Modelling) and TAS R (Reporting).

Mercer would like to thank the Health Insurance Organisation, the Ministry of Health, the Ministry of Finance and the Statistical Service for their help and support in producing this report.

We would also like to thank Professor John Yfantopoulos of the University of Athens for his considerable support on the Health Economic Analysis.

We have focussed on an actuarial analysis for the current NHS proposals and have not considered other policy options. We have also focussed on the financial position of NHS, i.e. on the income and expenditure components rather than on specific health outcomes.

Unless otherwise stated, we have relied on the information and data supplied to us and from published sources, without independent verification. Mercer will not be responsible for any inaccuracy in the report that is a result of any incorrect information provided to us.

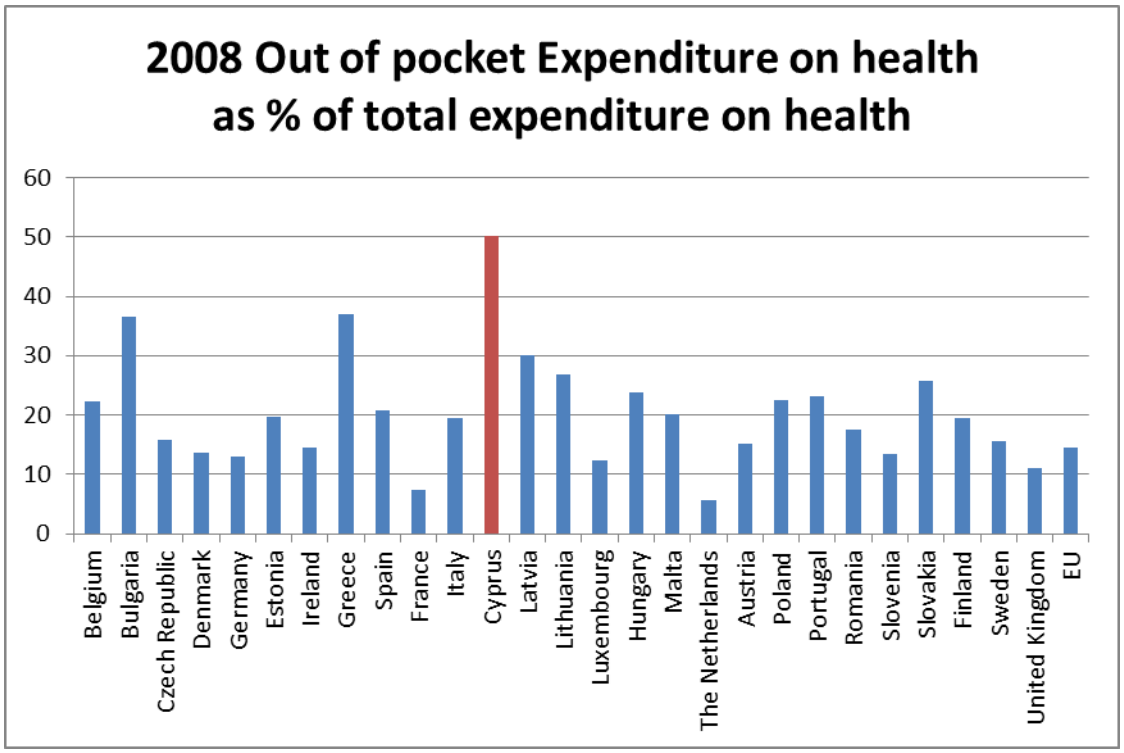
3

Current Healthcare Environment and the Proposed Healthcare Environment

3.1 The Current Healthcare Environment in Cyprus

Healthcare in Cyprus is currently offered by both the public and the private sector. The public health service provision is exclusively financed by the State budget with services provided through a network of hospitals and health centres, whereas the private health service provision is mostly financed by out-of-pocket payments made directly to providers. Out-of-pocket expenditure is estimated at approximately 87%[3] of private healthcare expenditure and 49% of total healthcare expenditure. Such a high proportionate share of out-of-pocket expenditure, which is the highest among EU countries, implies lack of equity in financing and accessing healthcare services.

Chart 1 – Out-of-Pocket Expenditure



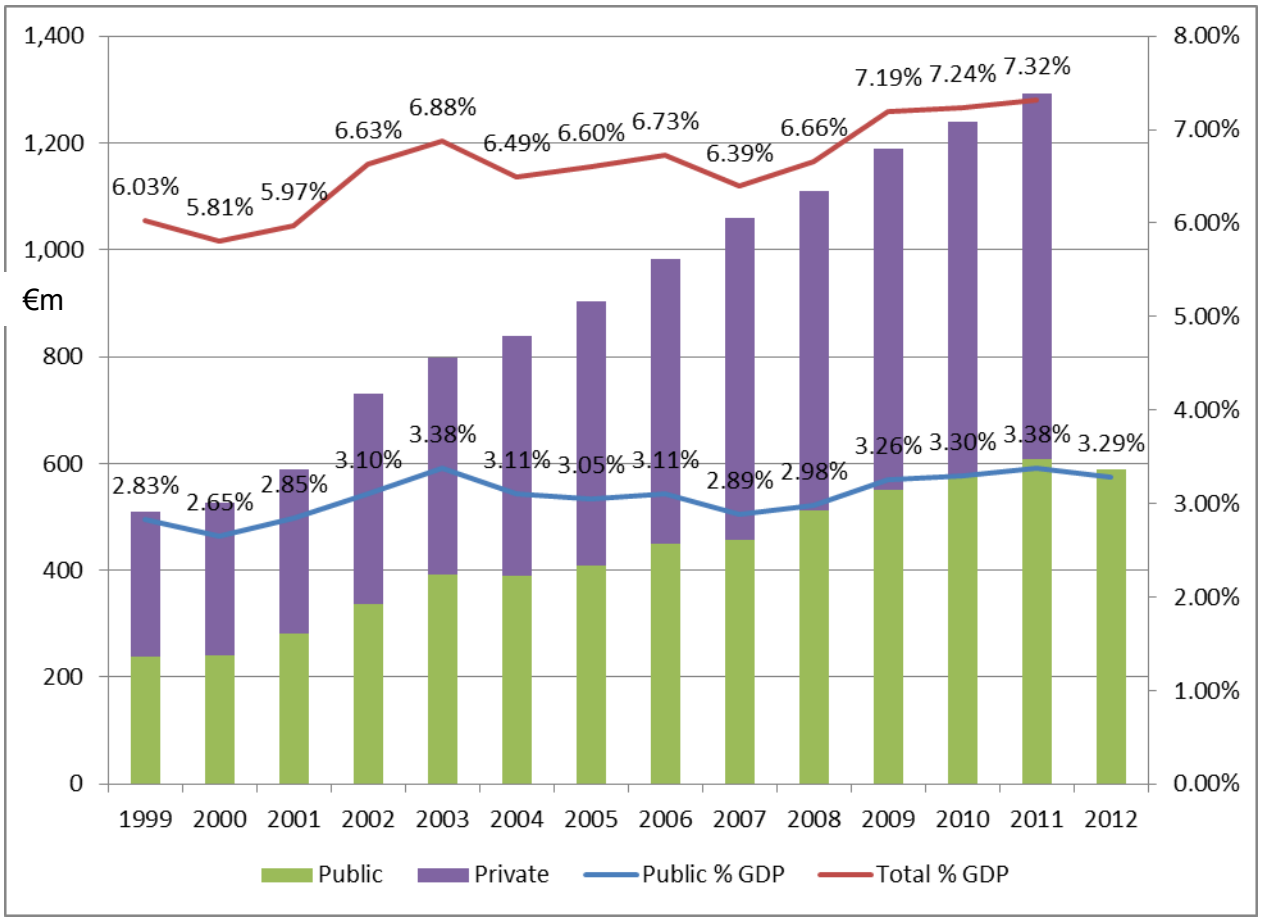
Approximately 80% of the population is entitled to the provision of free healthcare services from the public sector while the rest of the population is uncovered. Despite this, a much smaller percentage of the public healthcare beneficiaries actually use these services. The private and public sectors currently operate separately leading to concerns of overall wastage of resources, overlaps in service coverage and lack of co-ordination and continuity

[3] Source SHA Expenditure Data 2010

of care. The oversupply of certain infrastructure in the private sector such as specialized diagnostic equipment (MRIs, CT scans) highlights some inefficiencies in the system leading to higher private healthcare expenditure.

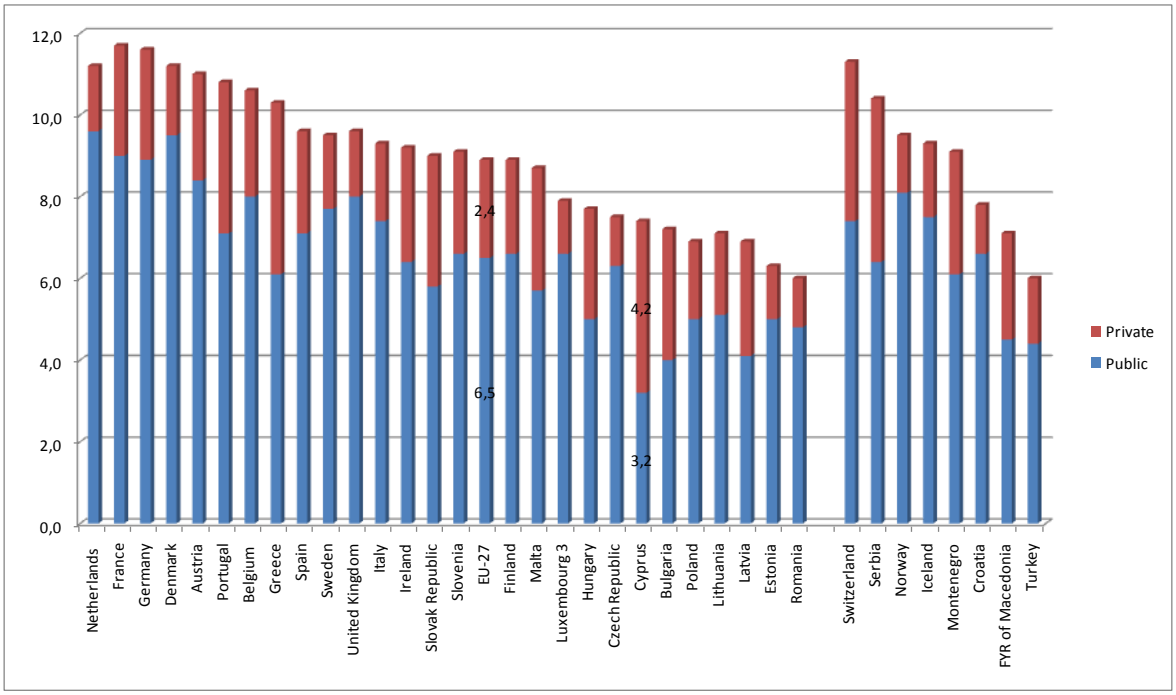
Healthcare expenditure has been gradually increasing since 1999 both in monetary terms and as a proportion of GDP (see Chart 2). Both total healthcare expenditure and public healthcare expenditure are low compared to the EU average. The EU countries devote on average around 8.9% of their GDP on health of which 6.5% is public and 2.4% is private. Cyprus spends 7.4% of GDP on health of which 3.2% is public and 4.2% is private. According to the data depicted in Chart 3 the proportionate share of the private sector is the highest among the EU Member States. The recent growth trend particularly in the private sector raises concerns of the future sustainability of the current system.

Chart 2 – Healthcare Expenditure Growth



Source: Cyprus Statistical Services, Health & Hospital Statistics 1998-2010; Provisional data 2011-12

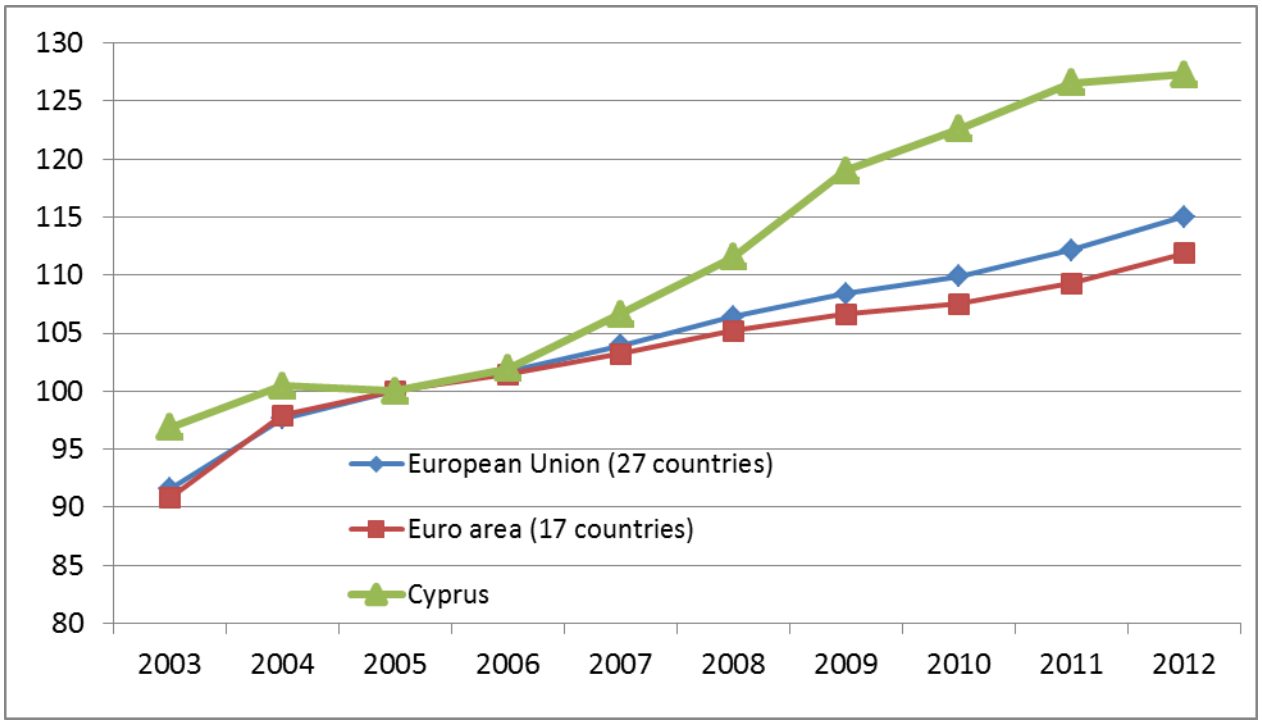
Chart 3 Healthcare Expenditure Spend within Europe (% of GDP)



Source : Health at a Glance Europe 2012 OECD

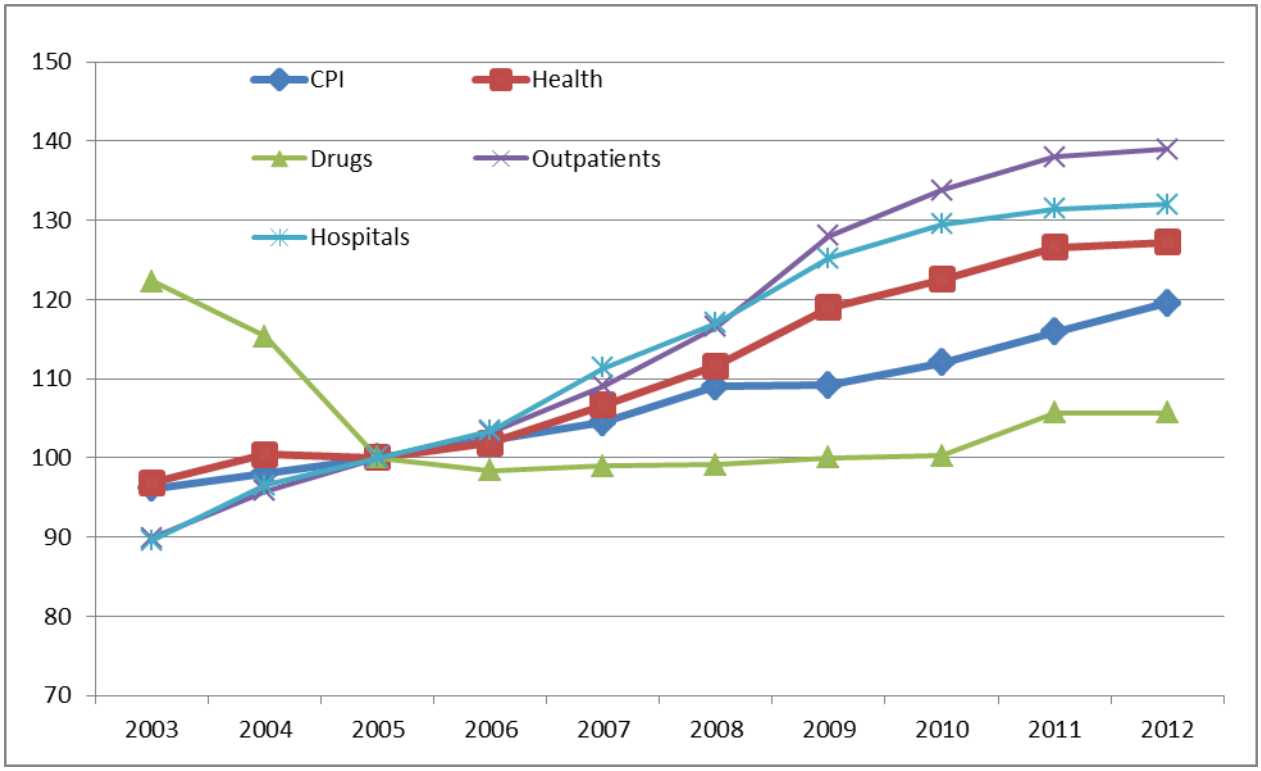
Medical inflation has been one of the key drivers of private healthcare expenditure in Cyprus. It is also higher than the EU average (see chart 4), raising concerns of the future sustainability of the current system. Chart 5 demonstrates that this is being driven by outpatient and inpatient. Drugs have remained level apart from the VAT increase in 2011.

Chart 4 – Healthcare Index for Cyprus vs EU – 2003-2012



Source – Eurostat HCPI Data

Chart 5 – Comparisons between Consumer Price Inflation and Health Items For Cyprus



Source – Eurostat HCPI Data

Health Outcomes

Despite the relatively low level of expenditure, health care in Cyprus is currently of high standards according to health outcome indicators and the World Health Organization assessment classifies Cyprus among the developed countries of the World.

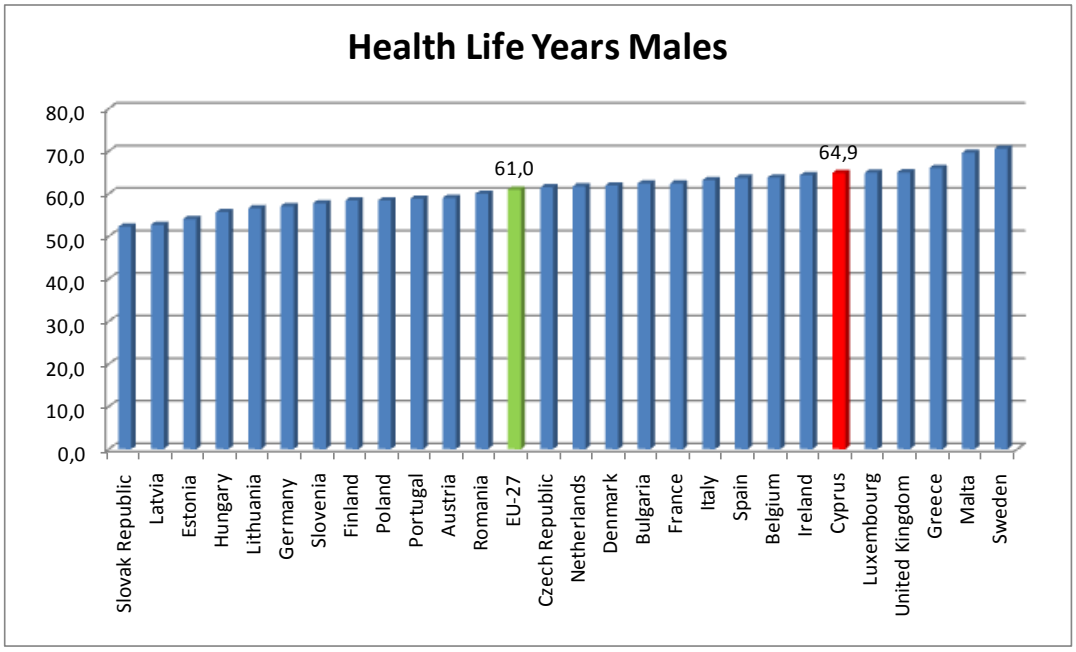
Life Expectancy

Cyprus enjoys a high level of health status in comparison to the rest of the EU-27 European Countries. The life expectancy for men is 78.6 years (a gain of 3.3 year above the EU-27 average) and for women 83.4 (a corresponding gain of 2.7 years above the EU-27 average).

Health Life Years

Health Life Years (HLY) is an important policy indicator endorsed by the European Union indicating the number of years lived in a good health. Alternatively HLY is a measure of life expectancy without disability. Cyprus is the fifth Country among the EU-27 with the highest HLY (see chart 6) indicating a gain of around 5 years above the average for the males and 3.7 years for the females.

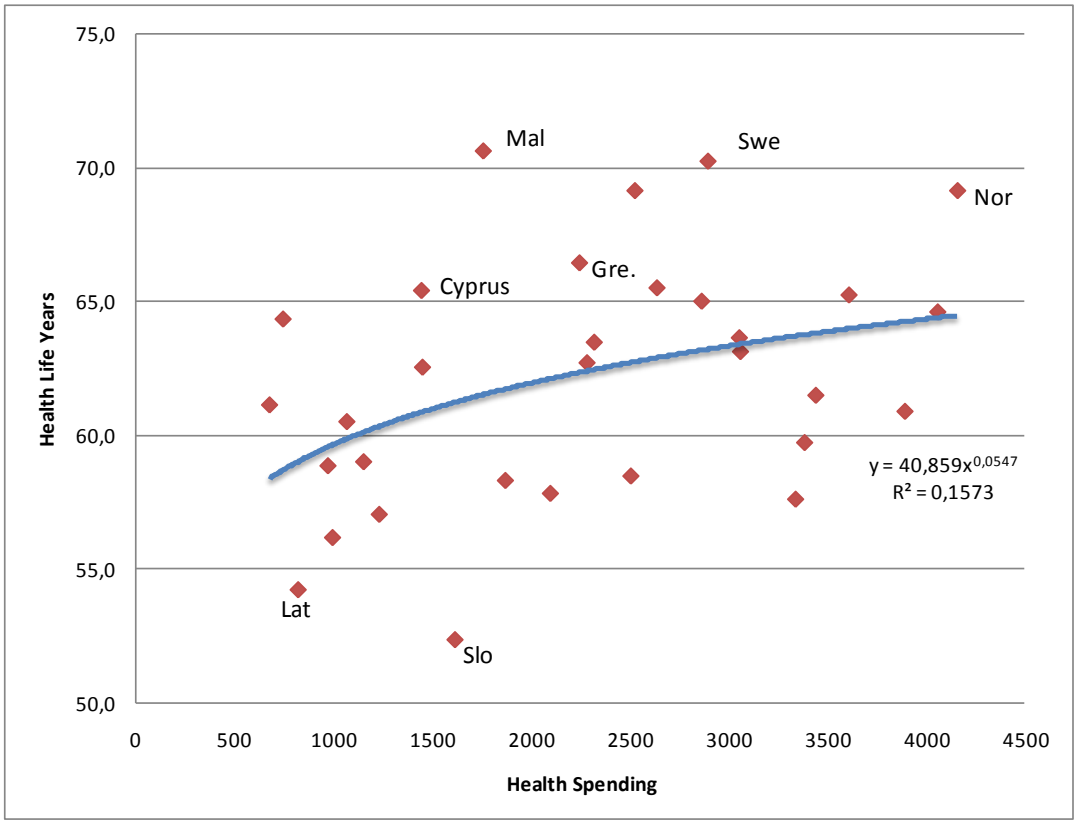
Chart 6 - Health Life Years Males



Source – Health at a Glance Europe 2012 OECD

Life Expectancy and HLY are influenced by a wide range of factors related to economy (often approximated by GDP per capita) and the health sector, often expressed as health expenditure per capita. The relationship between health spending and HLY is depicted in Chart 7.

Chart 7 – Health Life Year v Healthcare Expenditure



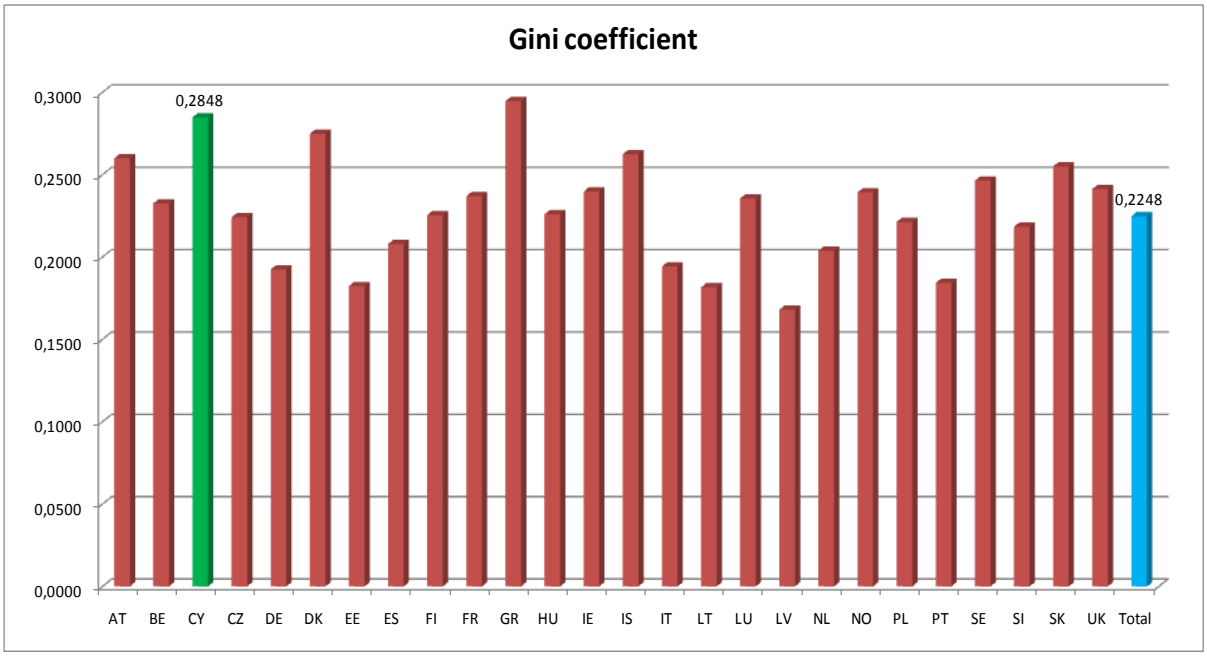
Health Inequalities

The World Health Organization has often argued that the prime objective of the health systems across the world is to improve the health status of the population subject to existing human, social and economic resources. This objective incorporates two important aspects related to: 1) the highest attainable average level of health ("Goodness") and 2) the smallest possible differences in health among individuals and groups ("Fairness"). In the European Council of 2006 the Ministers of Health of the EU countries stressed the importance of certain values for their health systems related to: Universality, Access to good quality care, Equity, Solidarity, and Long term financial sustainability.

The European Commission and the Eurostat have launched recently an investigation on the magnitude of health inequalities across Europe by combining the best practices in health inequalities measurement by taking into account the most reliable and comparable data sources. The results have indicated that health inequalities have been proven to be persistent and increasing over time across the EU Member States. This increase may be attributed to existing socio-economic differences between social groups, regions and countries, differences in health related behavior and the lack of targeted health policies and health care interventions.

Chart 8 presents the magnitude of health inequalities based on subjective health for the EU-27 Member States. Health inequalities are measured by the Gini coefficient (G) ranging (O<G<1) from 0= perfect equality (Pure egalitarian) to maximum inequality =1. Cyprus presents one of the highest Gini coefficients among the EU countries, the 2nd highest after Greece.

Chart 8 – Health Inequalities Index



Source : European Commission, Eurostat

The challenges that the current health system faces such as rising costs, maintaining the quality of services, inequalities in financing and accessing services, coupled with the current economic conditions, highlight the need for changes to the current system.

3.2 Proposed Healthcare Environment - the main characteristics of the NHS

The proposed National Health System (NHS) is an insurance-based system which has been designed to address the current challenges, distortions and deadlocks in the healthcare sector. This will be achieved by adopting good practices of other national health systems[4] and adjusting these to the needs of the local population whilst taking into account social and economic conditions. The main principles and characteristics of the proposed NHS are briefly described below:

- Universal coverage: All Cypriot citizens will become beneficiaries of the NHS.
- Comprehensive benefits package: The NHS benefits package will cover a broad spectrum of healthcare services including primary care, outpatient specialist care, pharmaceuticals, clinical laboratory tests, allied health professionals, accident & emergency care, ambulance care, inpatient care and limited dental care.
- Equal treatment of beneficiaries: All beneficiaries will have the same rights in respect of the provision of healthcare services and therefore reducing the health inequalities within the NHS.

[4] As recommended in a recent Joint Report on Health Systems prepared by the European Commission and the Economic Policy Committee.

- Free choice of healthcare providers: Beneficiaries will have the right to choose their healthcare providers from both the public and the private sector.

- Solidarity: Beneficiaries will contribute to the NHS according to their income level. Hence, beneficiaries with higher income will contribute more to the benefit of beneficiaries with lower income.

Access to healthcare services by beneficiaries will take place after enrolment to the system, followed by registration with a Family Doctor (FD)/Paediatrician Family Doctor (PFD). As a rule, the beneficiaries will visit directly the FD/PFD and if then required will be referred to other healthcare providers within the system depending on his/hers specific medical needs.

In order to contain the growth rate of healthcare expenditure and improve the quality of healthcare services, the NHS incorporates the following mechanisms and good practices:

a) Single payor organization: The NHS will be managed independently by a single organization (the Health Insurance Organization), which is expected to increase economies of scale and reduce the overall costs through bulk buying.

b) Solid basis for financing: The NHS will be self-funded by the contributions that will be made by the employees, self-employed, other income earners (such as income from dividends, interest and rent), employers and the State. This ensures a solid basis of financing from multiple sources.

c) Global Budget: Total expenditure for the provision of services within the NHS will be pre-determined, following collective negotiations with healthcare providers and actual expenditure will not exceed the total pre-determined budget.

d) Healthcare provider reimbursement method: The reimbursement method of healthcare providers such as capitation fees for Family Doctors, Diagnosis Related Group (DRG) based fees for inpatient care and point system mechanism will discourage the excessive use of services and incentivize the prudent behaviour of healthcare providers. The reimbursement mechanism for drugs will incentivize the use of generic drugs where available.

e) Cost sharing: The introduction of co-payments that the users will have to make for certain services will discourage the overuse of services offered and will contribute further to the containment of expenditure.

f) Family doctor: The introduction of the Family Doctor (FD) concept will organize efficiently the provision of primary healthcare. It will ensure immediate access of patients to healthcare services and contribute significantly to the prevention of diseases, the improved management of chronic diseases and the control and containment of expenditure since the FD will assume the role of “gatekeeper” within the system.

g) Introduction of minimum requirements and treatment guidelines for healthcare providers: All providers offering services within the NHS will have to comply with certain minimum requirements regarding their qualifications, available resources and infrastructure and to follow approved treatment guidelines so as to ensure uniform and high-level quality of services.

4

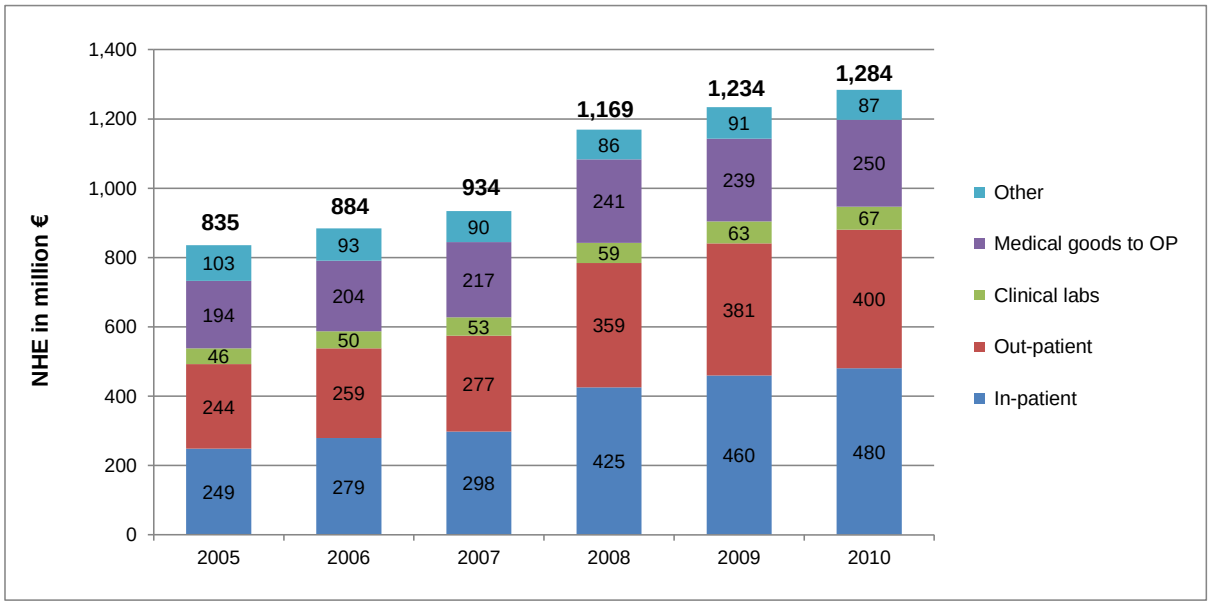
National Health Expenditure Analysis from 2005 to 2010

The main objectives of this section are to review the historical evolution of the NHE in Cyprus over the years from 2005 to 2010 and establish the 2010 'snapshot' figures for healthcare spending in Cyprus under the existing health system.

4.1 NHE evolution

Chart 9 shows the historical trend in NHE, in total and by main type of service (see Table 10) over the period 2005-2010 based on the joint OECD, Eurostat and WHO system of health accounts system (SHA) methodology.

Chart 9 - Cyprus National Health Expenditure 2005-2010 – Amounts in million € by main type of service



Source: Eurostat (SHA) 2005-2010

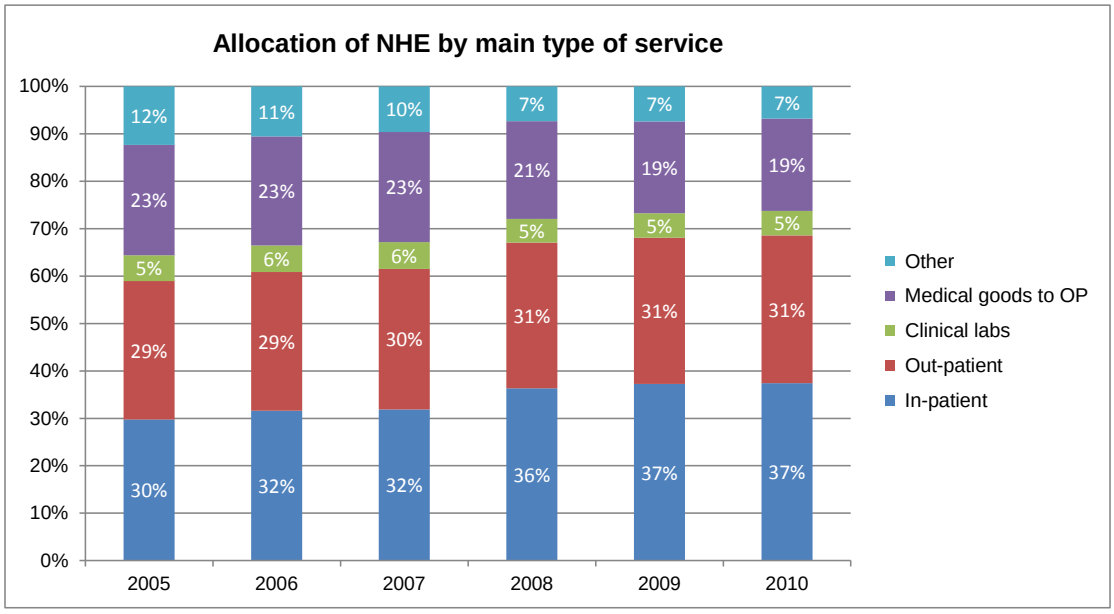
Table 10 - The main categories of healthcare expenses

Category	Description
Inpatient	Inpatient curative and rehabilitative care, day cases, A&E and ambulance.
Outpatient	Outpatient primary care, specialist care including diagnostic imaging, allied health professionals and miscellaneous ancillary services.
Clinical labs	Clinical laboratory
Medical Goods to Outpatients	Pharmaceutical and other medical non-durables, and therapeutic appliances and other medical durables
Other	Administration, prevention health and capital formation

The main points from Chart 9 are as follows :

- The NHE, over the period 2005-10, has increased from €835m to €1284m representing an increase of 54%;
- The largest expenditure increase came from inpatient services which grew from €249m in 2005 to €480m in 2010, representing a 93% increase ; and
- The second largest increase came from outpatient which grew from €244m in 2005 to €400m in 2010, representing a 64% increase.

Chart 11 - Cyprus National Health Expenditure 2005-2010 – Allocation of NHE by main type of service



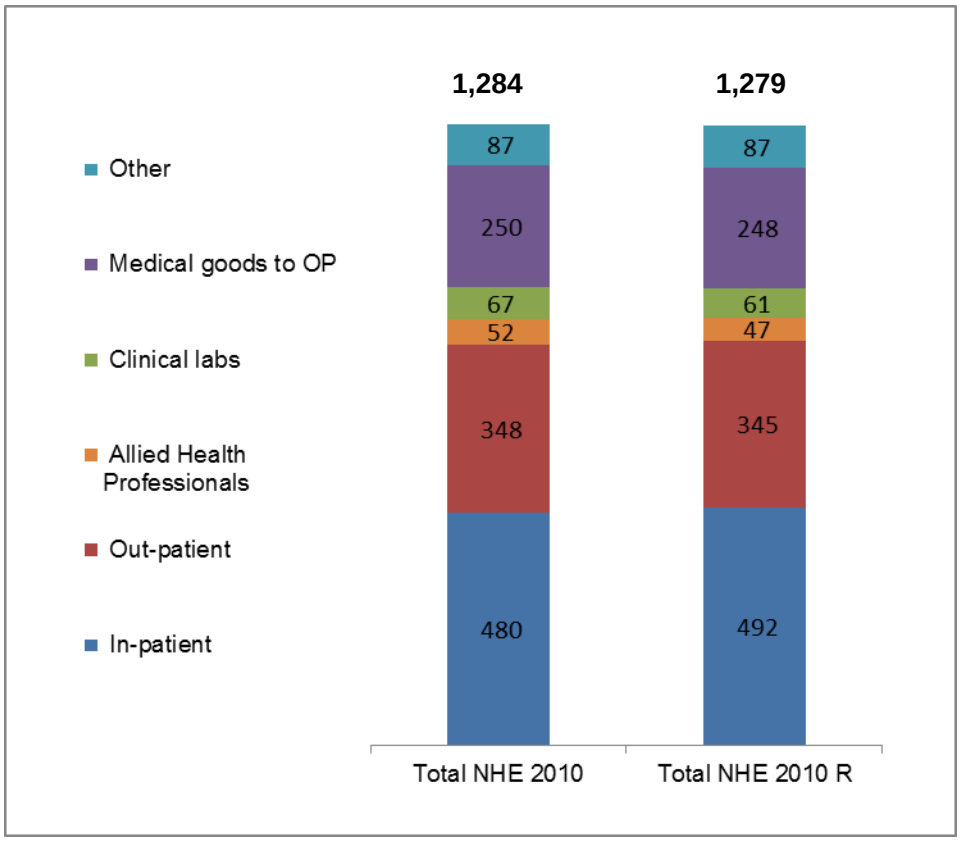
Source: Eurostat (SHA) 2005-2010

It follows from Chart 11 that the Inpatient service has consistently been the largest expenditure amounting to 37% in 2010 while the outpatient service has been the 2nd largest amounting to 31%. The proportionate allocation has been consistently level since 2008.

4.2 Snapshot of NHE expenditure in 2010

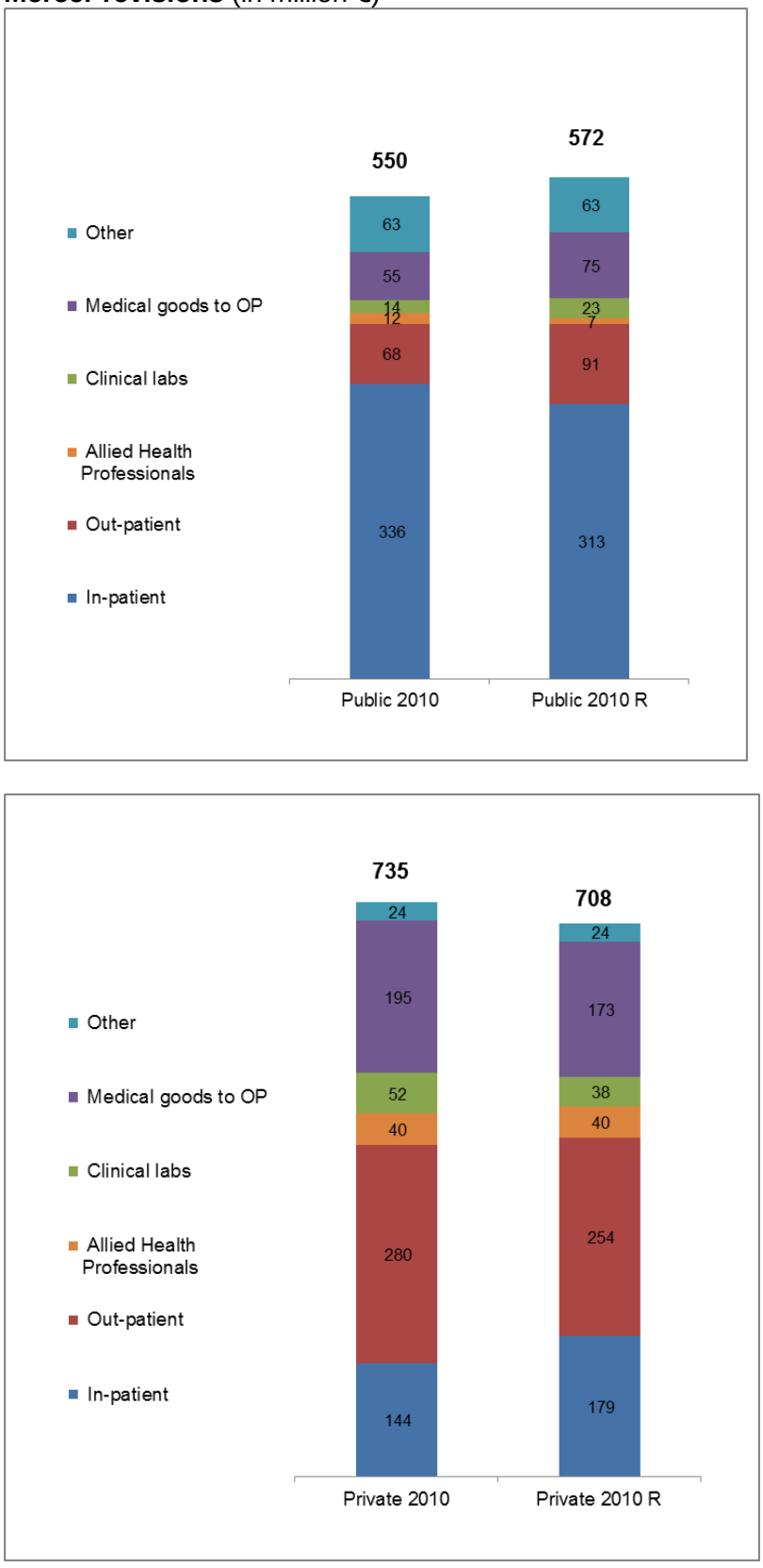
Following a detailed review performed on the 2010 health expenditure data in Cyprus, as per SHA methodology, and an assessment of the reliability of that data through internal and external benchmarks, Mercer has concluded that there has been a small overestimate of total spend in 2010 of approximately €5m, consisting of an underestimate of public spending of €22m and an overestimate of private spending of €27m. In addition, evidence suggested the need for a reallocation of some funds in both the public and private sectors between a number of categories of spend. Charts 12 and 13 present graphically the decrease and reallocation of health expenditure in 2010.

Chart 12 - Snapshot 2010 – Comparison of total spending with and without Mercer assumptions (in million €)



Source – Eurostat (SHA) 2010, Mercer estimates

Chart 13 - Snapshot 2010 – Comparison of Public and Private Spend with and without Mercer revisions (in million €)



Source – Eurostat (SHA) 2010, Mercer estimates

We have highlighted below the main points in relation to the Mercer assumptions, which were used to derive the public and private expenditure figures for 2010 as shown in Chart 13 above:

1. **Total public spend** – The spending on the public health system in 2010 has been revised upwards from €550m to €572m in line with State budget figures.

2. **Allocation of public spending** - The public spending of €572m was allocated into the various categories of spend (service departments) based on a cost accounting allocation exercise undertaken by the HIO and reviewed by Mercer. Under that exercise, direct costs, such as staff costs, were allocated directly to service departments, while indirect costs, such as repairs and maintenance, utilities and office administration, were allocated to service departments primarily by the proportion of direct costs.

3. **Total private spending** – The private health care spending in 2010 has been revised downwards from €735m to €708m because:
    i. A total amount of approximately €5m representing State subsidies towards some specialised institutions, such as Genetics Institute and Karaiskakio, was subtracted from the private sector since it was included in the public spending figures; and
    ii. An amount of €22m representing an overestimate in spending on medical goods to outpatient. This was based on a detailed research performed by HIO and reviewed by Mercer. Through that research, actual volume data of medical goods in private sector, broken into inpatient/ outpatient and prescription/ over-the-counter, was collated and analysed.

4. **Private – movement from outpatient to inpatient spending** - In the private sector, an amount of €25m has been shifted from outpatient to inpatient based on the reliability checks performed on the inpatient and outpatient data. In particular, through a detailed analysis of utilisation data for inpatient and outpatient through internal and external benchmarks, it was established that private outpatient spending was overestimated by approximately €25m. Details on the above analysis are presented in Appendix C. The above shift can be explained by the fact that private doctors, when they perform inpatient work, are in a lot of cases paid under a separate billing arrangement than the hospitals. This means that in those cases their inpatient activity gets captured in the outpatient part of the SHA health expenditure data.

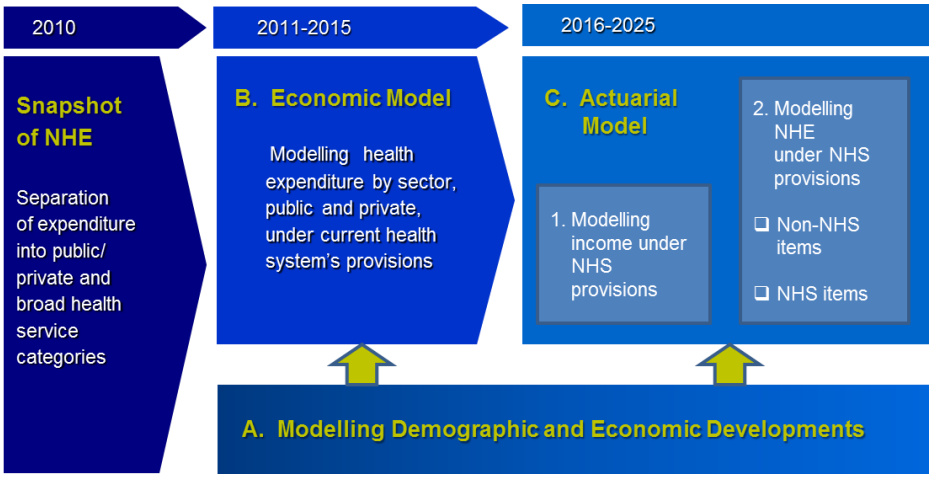
5. **Private labs** - In the private sector, an amount of €10m has been shifted from clinical labs to inpatient based on the reliability checks performed on the clinical labs figures. In particular, based on the results of a previous study on outpatient private labs tests volume and an analysis of the weighted average price per lab test in the private sector, which was estimated using the detailed public labs tests volume (which represents 75%-80% of the total volume) and applying to them available private prices per lab test, Mercer believes that €10m should be moved to the inpatient spending.

5

Methodology

The actuarial review of health system makes use of a comprehensive methodology developed for the purposes of meeting the two key policy aims of the study – assessing the financial impact of the introduction of the proposed national health reforms in 2016 (through the actuarial model) and reviewing the significant impact of the current economic situation in Cyprus on healthcare expenditure (through the economic model). The overall model is consistent as the medical inflation assumption for 2016 onwards is derived from the economic model. The deployment of such a composite modeling approach allow us to capture the key features of the proposed NHS and model its financial consequences, as well as better measure the sensitivity of key variables onto projection results. Chart 14 shows graphically the methodology used in this actuarial study.

Chart 14 – Projection Methodology



As shown in Chart 14 above, the projections in this study are based on the legal provisions of the current situation and proposed future National Health System, data regarding the starting point of projections including the snapshot health expenditure data, and assumptions regarding future demographic and economic experience.

The actuarial exercise starts with a projection of the future demographic and economic environment of Cyprus, based on a framework of assumptions agreed with Troika and which relate to the general population, the economic growth, the labour market and the evolution and distribution of wages. Next, other economic projection factors specifically related to the current health system, which is assumed to be in force from now until the end of 2015, and to the proposed NHS, which is assumed to be in force from 2016 onwards, are determined and are used in combination with the demographic/ economic framework.

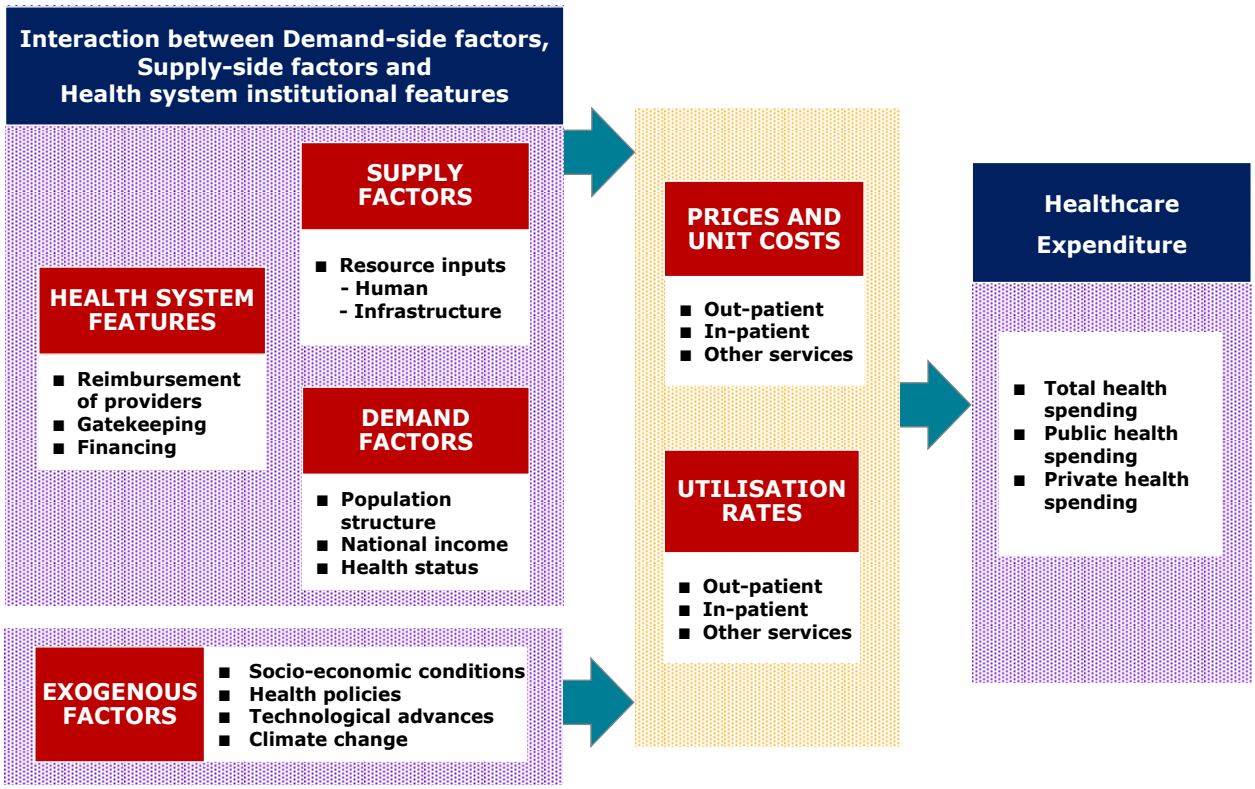
5.1 Expenditure projection modelling

In the previous actuarial study in 2008, the expenditure model used was an actuarial component-based model which enabled us to consider the impact of the proposed health reforms through their impact on utilisation and unit costs. We have updated this model to reflect the latest available data. To reflect the economic situation in the short and medium term, we have also integrated a macro level econometric model which enables us to consider the economic impact until 2016. From 2016, we have also incorporated certain health economic factors, such as medical inflation, consistent with the underlying economic framework.

Our overall health care expenditure model is therefore a combined model enabling us to more accurately reflect future healthcare expenditure.

The diagram below provides a summary of our overall approach. We will then provide further details regarding the economic and actuarial elements of our model.

Chart 15 – Determining the drivers of healthcare expenditure – our approach



5.1.1 The Economic Model (focussed on 2011 – 2015)

We are focusing here on the medium term impact of the economic situation and basing our projections on the agreed economic framework. A key driver of healthcare spending is GDP and therefore this is a major variable in our models. We considered several econometric models to produce estimates of the healthcare expenditure costs and its components from 2011 to 2016 based on the historical data of the period 1998-2010. Following these analysis, various statistical tests were undertaken to determine the suitability of the models. The most suitable models were then incorporated within our analysis to determine the Healthcare Expenditure until 2016.

For Public Expenditure, the model incorporates the impact of its own lagged value and GDP. This is expected to provide the best indicators of medium-term forecasts of Health Expenditure. This takes the form:

$$HE_t = \alpha + \beta_1 HE_{t-1} + \beta_2 GDP_t + \beta_3 GDP_{t-1} + \varepsilon_t$$

where HE_t = Health expenditure for time t, GDP_t = Gross Domestic Product for time t, β is unknown fixed regression coefficient, a = constant term, e_t = random error term

For Private Expenditure, the model was based on current GDP reflecting the more short term considerations around private spend, primarily due to the importance of out-of-pocket expenditure. Health Expenditure is regressed as a linear function of GDP (assuming all other factors unchanged), and it takes the form:

$$HE_t = \alpha + \beta_1 GDP_t + \varepsilon_t$$

where HE_t = Health expenditure for time t, GDP_t = Gross Domestic Product for time t, β is unknown fixed regression coefficient, a = constant term, e_t = random error term

A key assumption is that the historic experience is relevant in the future. In particular, we assume that the historical elasticities developed are symmetric i.e. they are appropriate during economic growth or decline.

More details on the economic modelling are provided in Appendix B.

5.1.2 The Actuarial Model (2016-2025)

This actuarial model is an activity based model. The healthcare expenditure is based on the projected healthcare activity level multiplied by forecasted unit costs for each activity within each main category of spending such as inpatient, outpatient etc.

From the snapshot expenditure results as presented in Section 4 of this report, we have data regarding the utilisation and unit costs for each major activity in 2010. There is a considerable variation in healthcare utilisation with age and we have therefore reflected this by considering the utilisation for each age band. This is particularly important to ensure that we allow for the impact of the ageing population.

We use this historic experience as a guide for our future projections. We have made adjustments to this to reflect any changes in the system over time. In particular, we have reflected the impact of the current economic situation and also the structural changes proposed through the introduction of NHS.

2011 to 2016

Based on historic utilisation experience, the forecast demographic profile and the adjustments highlighted below, we have forecasted the expected activity. Until 2016, the system will be consistent with the current system but will clearly be affected by the economic situation. The unit costs are calculated to be consistent with the projection results as per economic model.

2016 to 2025

From 2016, the NHS changes are introduced. The expected impact is reflected by adjustments to the projected utilisation and unit costs from 2016. In addition, demographic changes, the economic situation and current trends all continue to impact. Mercer believe that the combination of NHS measures and the focus on cost containment will improve the ability to control costs and manage medical inflation in the future.

The following adjustments were allowed for:

- **Trend** : This represents the underlying changes in service utilization and cost over time. This will reflect the effects of changes in morbidity, technology, general appetite/demand for services, and price inflation. Annual trend factors reflect the combined effects of utilization change, price inflation, demographic changes and the mix of services used. To ensure economic consistency, we have used trend figures from the economic model.

- **Provider reimbursement**: This reflects the expected change in unit cost levels associated with NHS changes in provider contracting (beyond that associated with annual price inflation). In particular, the impact of the global budget and the single payor organisation. These should lead to more effective cost management.

- **Insurance effect**: A sustained increase in service utilization that reflects the phenomenon that individuals use more health care services when they are insured than when they are responsible for full payment out of pocket. Note out of pocket expenses are relatively high for Cyprus.

- **Care management:** This reflects changes in expected utilization of services associated with system design elements such as a physician gatekeeper/medical home environment, electronic record keeping and real-time editing of prescription drugs, and incentives to reduce unnecessary A&E visits. This will also lead to switches from inpatient to outpatient activity.

- **Physician incentives**: Additional care management effects associated with the implementation of performance incentives for family doctors, paediatric family doctors, and outpatient specialist physicians. The baseline scenario assumes that the first 3 years of the NHS implementation include incentive payments for data submission. Beginning in year 2019, incentives will be based on referral and prescription patterns and thus may influence service utilization levels.

This approach is used for each of the key areas. We have highlighted below any particular issues for each of these areas.

Inpatient

Care management will lead to a slight reduction in inpatient activity. This will be through the physician gatekeeper (ensuring that only appropriate activity is undertaken and outpatient is considered where more appropriate). We have, however, allowed for an initial slight increase in services due to increased coverage. However, this is expected to be smaller and for a shorter term as compared to other types of service as a result of the less discretionary nature of inpatient services.

In addition, the reimbursement method through the Diagnosis Related Group (DRG) system will lead to a more uniform and predictable model of expenditure. We expect that this shift will also lead to a more efficient use of resources.

We have assumed that the cost per hospital day is the same for each specialty. The average length of stay figures are relatively low compared to other countries and we have assumed that these remain level over the projection period.

Outpatient Specialists

There is limited information available around private sector use of outpatient facilities. We have however followed a consistent approach to that described in the Snapshot analysis.

Following NHS implementation, we would expect the global budget approach and point system mechanism to have a considerable impact on the outpatient specialists' behaviour.

We expect care management through FDs to influence outpatient activity in two ways: on the one hand we expect the FD to better filter visits to outpatient specialists but on the other hand we would expect the physician gatekeeper to refer some potential inpatient activity to more cost effective outpatient activity, in line with protocols to be introduced.

Medical goods to outpatients

The design of NHS introduces measures that will control the utilisation of medical goods such as co-payments, generic drug reimbursement and the use of a uniform information

technology platform that will enable monitoring of prescribing patterns and stockpiling by patients. In addition, the increased expenditure for new medicines will be counterbalanced by the increased use of generics.

The fact that the price negotiations for medical goods will be undertaken by a single payor organisation achieves high negotiation power and stable levels of budgets over time.

Family doctor costs

The reimbursement methods used for Family Doctors (FD) through capitation fee adjusted for age, ensure that the FD expenditure over time will be highly controlled.

It should be added that even though it is expected that there will be an insurance effect for the FD services this will not affect the expenditure as the reimbursement methods used is not related with the volume of services provided by the FDs. FD expenditure is expected to increase only due to medical inflation.

Accident & Emergency (A&E) and Ambulance

The expenses for A&E and Ambulances are expected to increase in line with outpatient activity and underlying medical inflation costs.

For A&E, NHS will introduce a stricter implementation of a triage process that aims in routing the non-urgent cases from A&Es to primary healthcare. Under NHIS, the new reimbursement system based on care levels is expected to further control costs by reimbursing a casemix of services.

In the case of Ambulances, the global budget principle will ensure that yearly expenses are contained to the budgeted ones.

Allied Health professionals

The global budget principle is an important measure since it will ensure that expenditure for AHP will not exceed the agreed budget.

Furthermore, control of access to AHP services through FD / Outpatient specialist and the introduction of co-payments will further control the AHP expenditure despite an expected increase in the activity due to the insurance effect.

Labs

The referral system through Family Doctor / Outpatient specialist in combination with the co-payment and the clinical protocols is expected to control the expenditure in respect of the laboratories and will counterbalance any insurance effect.

Other

These are expected to increase in line with medical inflation.

5.2 Co-payments

HIO has provided Mercer with a detailed analysis of co-payments for each type of service, which are considered by HIO to be the base case scenario (see Appendix E for details). Mercer has included the figures in the actuarial model and estimated that the co-payments of the base case scenario will finance NHS with €90m in 2016. These co-payments are assumed to increase in line with medical inflation.

The total expenditure less the co-payments represents the funding required for NHS.

5.3 Income projection modelling

HIO has provided us with a base case scenario for the financing method of NHS. Based on this scenario, the HIO will be financed primarily through contributions and at a lesser extent via co-payments.

5.3.1 Contributions

The main components of contribution income under the NHS is contributions paid by active insured population and pensioners, primarily of the General Social Insurance Scheme (GSIS). Other smaller sources of NHS income include contributions from rent, interest on deposits, etc.

In order to model NHS contribution income, a macro-economic actuarial pension model was deployed, consistent with the pension model used for the actuarial valuation of the GSIS. The model uses a cohort approach using the “flow method” for generating future generations of active insured persons and pensioners on a single age basis.

Contribution income is the result of the contribution rate applied to the covered earnings. Under existing NHS legislation the contribution rates for each contributor segment are shown below (Chart 16).

Chart 16 – Contribution rates under current statute

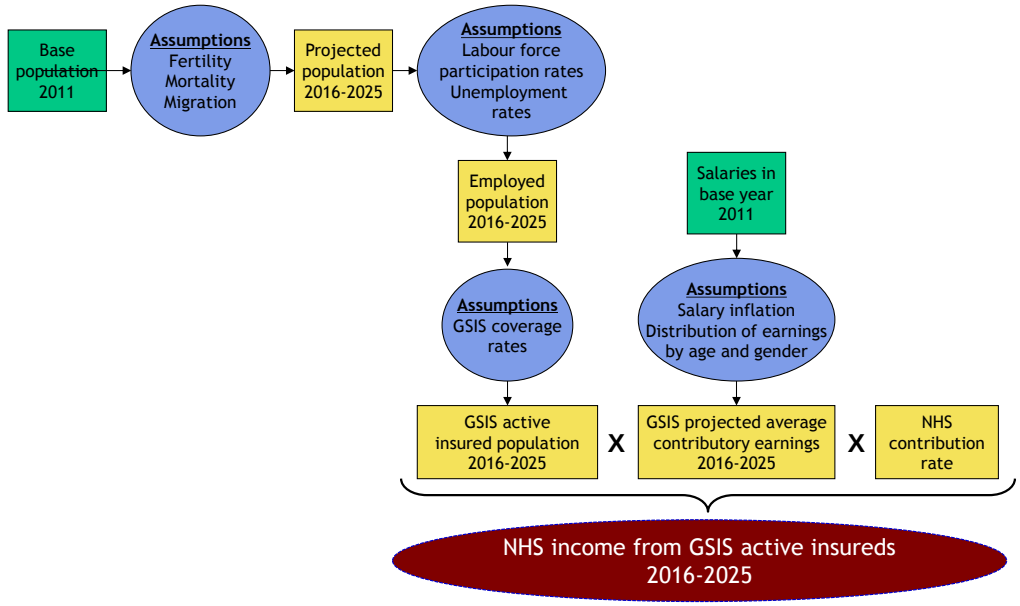
Source of Income	Contributor			Total
	Individual	Employer	State	
Employed				
Salaried employees	2.00%	2.55%	4.55%	**9.10%**
Self-employed	3.55%		4.55%	**8.10%**
Pensioners				
GSIS, GEPS, other	2.00%		4.55%	**6.55%**
Other income				
Rent, interest, dividends, other	2.00%			**2.00%**

Covered earnings result from:

1. the number of active insured persons and the average earnings on which contributions are paid; and
2. the number of pensioners and the average pension on which contributions are paid.

Chart 17 illustrates how the NHS income from GSIS active insured persons over the period 2016-25 is developed.

Chart 17 – Income development process for active insured population

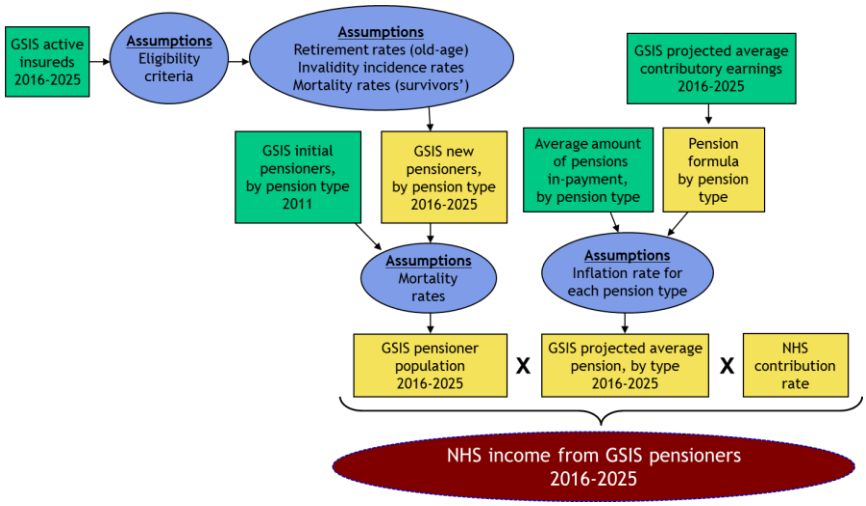


As it is shown in Chart 17, the demographic projections of the active insured population are derived from the following:

- The total population is projected starting with the actual population by age and sex, and projecting that population over several decades using appropriate assumptions concerning fertility, mortality and migration;
- Labour force participation rates are applied to the total population to obtain the labour force, distributed by age and sex;
- The labour force is then separated into employed and unemployed persons;
- Finally, NHS contributors represent a subset of the employed population. They are projected by using appropriate assumptions about the rate of coverage of the employed population under the NHS.

Chart 18 illustrates how the NHS income from GSIS pensioners over the period 2016-25 is developed.

Chart 18 – Income development process for GSIS pensioner population.



As it is illustrated in Chart 18, in order to determine the projected number of GSIS pensioners, by type of pension, the following income development process is applied:

- Starting with the number of active insured persons and using past service records it is determined whether these persons are eligible to the various types of pensions.
- Once this potential population of beneficiaries is established, a probability of occurrence of the risk involved (type of benefit) is applied to the eligible population to determine the number of new pensioners that will emerge each year.

The probability of occurrence of the benefit varies according to the benefit involved. It may be:

- retirement rates for determining old-age pensions;
- invalidity incidence rate for determining invalidity pensions; and
- mortality rates for determining survivors' pensions.

These new GSIS pensioners are then projected in the future using survival rates.

6

Data

Mercer had several meetings with the HIO, who provided considerable detail around the current healthcare system and the proposed changes. Some of the major data sources used in this study are the following:

- Cyprus Statistical Services - Health & Hospital Statistics 2003 – 2010 (providing detailed information around public healthcare usage); Household budget survey 2009; Consumer price indexation data, provisional financial and utilization data for 2011 and 2012, Economic Statistics on Health 2009 and 2010.
- Eurostat healthcare expenditure as per SHA methodology.
- Additional incident level data for public and private sector was provided by the Ministry of Health.
- Eurostat's and OECD's healthcare databases were also used to provide external benchmarking data.
- Ministry of Finance – budget data for health services 2010 to 2015.
- Social insurance services – data on the insured population for actives and pensioners of the General Social Insurance Scheme.

Data Limitations

There were several areas where data was limited. Our approach regarding these areas is described below.

a) Details of public health activity were only available to 2011. Private inpatient data was available to 2012. There is therefore limited data to assess the impact of the economic situation. Note our economic analysis has been used to assess the impact of the economic situation.

b) No recent private outpatient activity data is available. We have therefore been required to estimate this based upon the consistency in the ratio of total outpatient to inpatient activity levels. That assumption was validated through external benchmarking (see Appendix C for details on this).

c) For inpatient data, we do not have detailed data around disease.

d) There will be significant reductions in healthcare spending over the next few years. It is not possible at this time to specify what these changes will be. We have therefore not allowed for all the potential additional benefits arising from NHS implementation as it may not be possible to deliver these economies following the reductions until 2016. We would however expect NHS to ensure that healthcare effectiveness, outcomes and health inequalities are improved.

7

Key Assumptions

Economic framework

We have used the economic framework as agreed with the Troika. This ensures that any assumptions are economically consistent. The key assumptions are as follows :

	2012	2013	2014	2015	2016	2017	2018
GDP growth (real)	-2.4%	-8.7%	-3.9%	1.1%	1.9%	2.3%	2.2%
CPI Inflation	3.1%	1.0%	1.2%	1.6%	1.7%	1.7%	1.8%
GDP deflator	2.0%	0.6%	1.1%	1.5%	1.8%	1.9%	1.9%
Unemployment	11.9%	15.3%	16.7%	14.4%	13.5%	12.7%	11.8%
Real wage inflation	-4.0%	-4.9%	-5.0%	-3.4%	-0.5%	-0.1%	0.0%

	2019	2020	2021	2022	2023	2024	2025
GDP growth (real)	1.9%	1.8%	2.1%	2.0%	2.1%	2.0%	2.1%
CPI Inflation	1.9%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
GDP deflator	1.9%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Unemployment	10.9%	10.0%	9.7%	9.5%	9.2%	9.0%	8.8%
Real wage inflation	0.0%	0.0%	0.5%	0.6%	0.7%	0.9%	1.1%

In section 11, we consider an alternative economic scenario.

Demographic – The demographic framework has also been agreed with Troika. It is in line with the demographic projections of the 2012 ageing report of the Ageing Working Group of the Economic Policy Committee (EPC) of the EU. The average age is expected to increase from 37.6 (in 2010) to 40.4 (in 2025). It is noted that 3rd country nationals are included within our projections.

Medical Inflation - We have undertaken an economic analysis to determine the expected healthcare inflation assumptions. This implies that private healthcare costs will rise more rapidly than public healthcare costs.

NHS Administration Costs – These are as agreed in the statute. We have assumed that the NHS system will be fully utilized by 2018.

NHS Development Costs – Note we have assumed that the NHS development costs will be funded from future administrative costs.

Health Assumptions - We have used historic experience to provide estimates of expected future utilisation. As can be seen from charts below, these are very dependent on age. Within our projections, we have therefore allowed for age profile of the membership and calculated the impact of this.

Chart 19 – Public Inpatient Discharges Per 1,000 Lives By Age band and Year

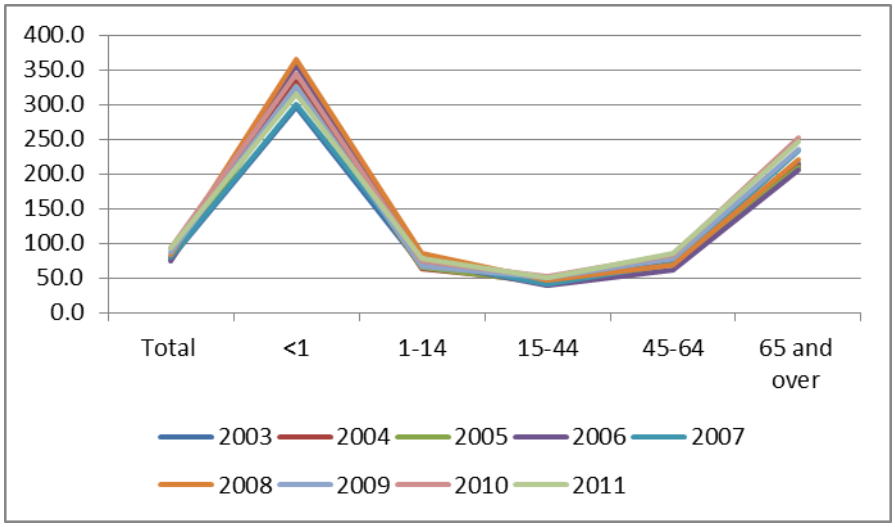
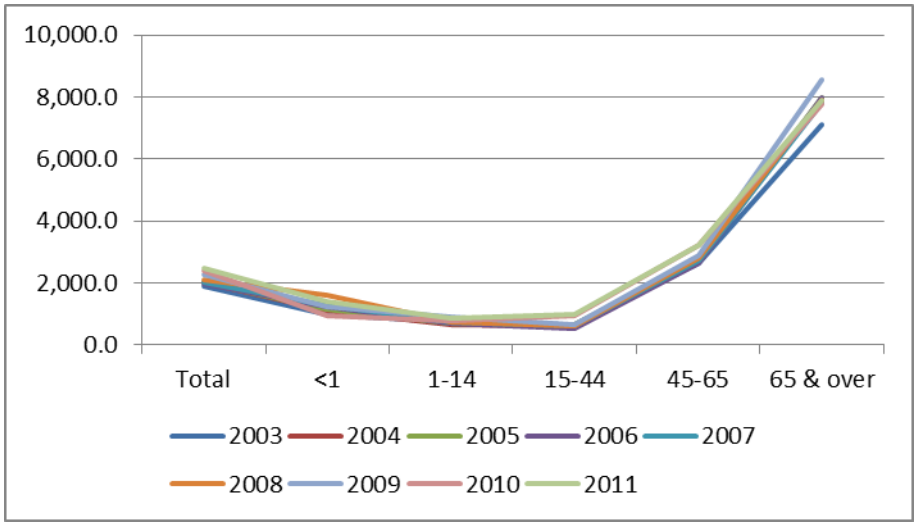


Chart 20 – Public Outpatient Visits Per 1,000 Lives By Age band and Year



For inpatient and outpatient, unit costs have been calculated as at 2016. Total expenditure is calculated as the unit cost multiplied by the underlying activity with an adjustment for expected medical inflation.

8

Healthcare Projection Results

This section provides the detailed results with a brief summary of the key points.

8.1 National Healthcare Expenditure 2010 to 2016 in million €

	2010	2011	2012	2013	2014	2015	2016
Public	572	605	585	594	550	512	510
Private	708	704	687	607	580	597	624
Total NHE	1,280	1,308	1,272	1,201	1,130	1,109	1,134
Services not covered under NHS	274	279	273	252	239	236	243
Expenditure for services covered under the NHS	1,006	1,029	999	949	891	873	891

Under the current healthcare system, private healthcare expenditure over the period 2011 to 2016 is expected to be relatively more sensitive to current economic conditions and therefore has already started to reduce from 2011 with a particularly marked impact in 2013. It is however expected to return to real growth in 2015. It is noted that inpatient spend is likely to be less elastic and is therefore expected to decrease at a lower rate over the projection period.

Public healthcare expenditure is expected to have more of a time lag and therefore the major reduction is expected in 2014. It still however continues to decrease throughout the period.

8.2 National Healthcare Expenditure 2016 to 2025 Assuming No NHS Implementation in million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total NHE Expenditure	1,134	1,175	1,224	1,276	1,330	1,386	1,446	1,509	1,574	1,643
Services not covered under NHS	243	254	264	276	289	302	316	331	345	361
Expenditure for services covered under the NHS	891	921	959	1,000	1,041	1,084	1,130	1,178	1,229	1,282

If there are no changes to the current healthcare system, then total healthcare expenditure is projected to increase over the period 2016-2025 at an average of 4.2% p.a. It takes nine years (i.e. up to 2020) until NHE surpasses the 2011 level of €1,308m. Private sector growth over the period is 4.9% p.a. whereas public sector growth is limited to 3.3%.

8.3 Projections Assuming NHS Implementation in 2016

8.3.1 National Healthcare Expenditure 2016 to 2025 Assuming NHS Implementation in 2016 in million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total NHE Expenditure*	1,128	1,177	1,221	1,265	1,309	1,351	1,404	1,459	1,517	1,576
Services not covered under NHS	242	250	257	270	282	293	306	319	333	346
Expenditure for services covered under the NHS *	886	927	964	995	1,027	1,058	1,098	1,140	1,184	1,230

*- This includes allowance for HIO administrative expenses and assumes fully utilised by 2018.

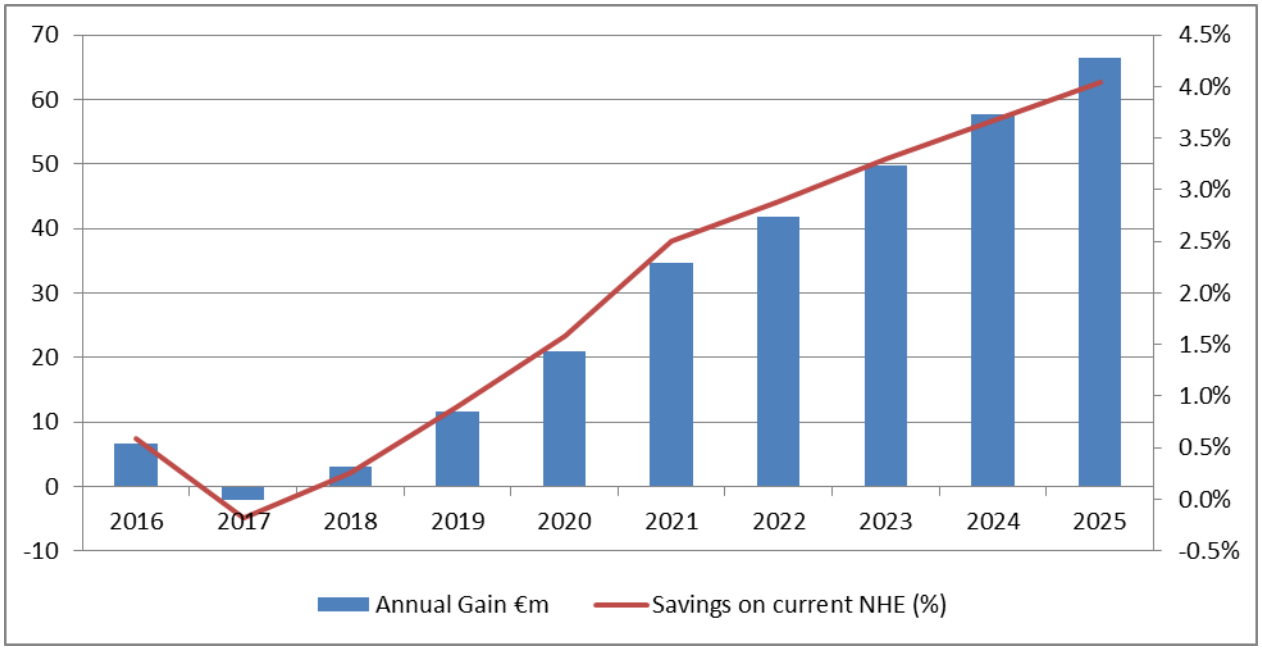
If the NHS is implemented in 2016, then NHE will rise at a relatively lower rate (3.7% p.a. over the projection period) reflecting the additional expenditure controls in place. Over the projection period, cumulative NHE savings are € 292m.

Projected savings in NHE arising under NHS in million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Implied NHE savings arising under NHS	7	(2)	3	12	21	35	42	50	58	66

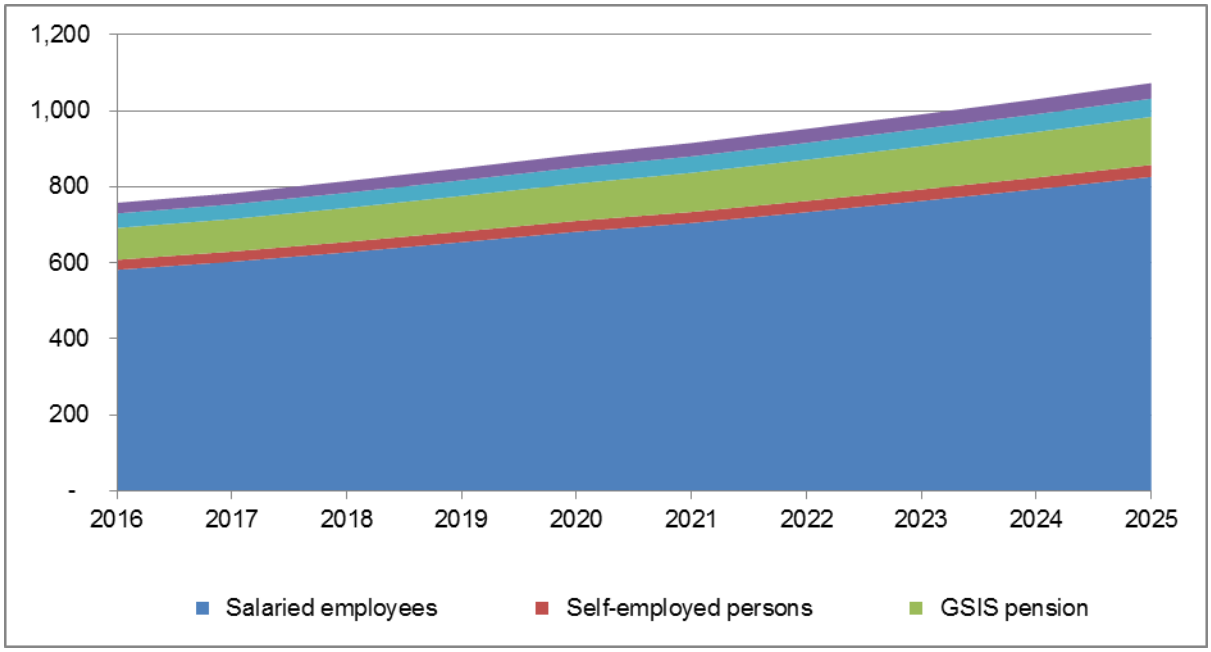
Chart 21 shows graphically the potential gain in NHE assuming implementation of NHS in 2016 over NHE assuming no implementation of NHS takes place.

Chart 21 – Potential gain of NHE with NHS over NHE without NHS (in million €)



8.3.2 Contribution Income 2016 to 2025 under NHS

Chart 22 – Breakdown of NHS contribution income 2016-2025 by income source (in million €)



It follows from Chart 22 that contributions from actively working population represent the greatest component of income to finance the NHS amounting to approximately 80% of the total. The pensioner population provides broadly 16% of the total, of which 10% is in respect to the GSIS. The 'Other income' accounts for approximately 4% of the total. The contributions by source are included in Appendix D.

Based on the existing NHS legislated State's contribution rate of 4.55% as a general subsidy and 2.55% as an employer, we have projected the State's contribution amount towards financing NHS.

Table 23 – NHS contribution income financing by State (in million €)

State contribution	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Gen. Subsidy - Salaried employees	291	301	314	327	341	352	367	381	397	413
Gen. Subsidy - Self-employed persons	15	15	15	16	16	16	17	17	17	18
Gen. Subsidy - GSIS pensioners	58	59	62	65	68	71	75	79	83	88
Gen. Subsidy - Other pension	27	27	28	29	29	30	31	32	33	33
State contribution as employer	43	43	42	42	43	43	44	45	46	47
TOTAL	**433**	**445**	**461**	**479**	**497**	**514**	**534**	**554**	**576**	**599**

8.3.3 NHS Income and Expenditure 2016 to 2025 Assuming NHS Implementation in 2016

Under the baseline scenario of health care expenditure, assuming that co-payments totaling €90m are introduced in 2016 (and thereafter increase in line with underlying medical inflation) and the contribution rates for each contributor segment are as in current statute (see Table 16 in Section 5.2.1). The income generated for the NHS would produce an annual deficit with a maximum of €52m in 2017/ 2018 reducing to €36m over the period 2016-2025 against the projected NHS expenditure and co-payments.

	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Contributions in line with 2001 NHS law	758	783	815	849	885	915	952	991	1,031	1,073
Minus* Expenditure for services covered under NHS	886	927	964	995	1,027	1,058	1,098	1,140	1,184	1,230
***Plus* co-payments**	90	92	94	97	101	104	108	112	116	120
(Deficit)/ Surplus	(38)	(52)	(52)	(48)	(42)	(39)	(38)	(38)	(37)	(36)

*- including HIO administrative expenses.

8.3.4 Financing Options under NHS

We have set out below alternative approaches for financing the above deficit.

1. The deficit is fully financed through additional co-payments

Additional co-payments could be introduced to finance this deficit. Additional co-payments of €52m in 2016 would result in the following:

	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Contributions	758	783	815	849	885	915	952	991	1,031	1,073
***Minus* Expenditure for services covered under NHS**	886	927	964	995	1,027	1,058	1,098	1,140	1,184	1,230
***Plus* co-payments**	90	92	94	97	101	104	108	112	116	120
(Deficit)/ Surplus	(38)	(52)	(52)	(48)	(42)	(39)	(38)	(38)	(37)	(36)
Additional co-payments	52	53	54	56	58	60	62	64	67	69

Co-payments require the users of the NHS to make contributions to the cost of their treatment. They will also lead to lower utilization of the system as users will consider more carefully whether they visit health care providers due to the additional out-of-pocket costs required.

2. The Deficit is fully funded through Increased Contributions

All contributions could be increased to finance this deficit. We would suggest an increase of 6.7 per cent on all current contribution rates which would result in the following:

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Contributions	809	836	870	906	944	977	1,016	1,057	1,100	1,145
***Minus* Expenditure for services covered under the NHS**	886	927	964	995	1,027	1,058	1,098	1,140	1,184	1,230
***Plus* co-payments**	90	92	94	97	101	104	108	112	116	120
(Deficit)/ Surplus	13	0	2	8	17	22	25	28	31	35

This would imply the following contribution rates by contributor segment.

Source of Income	Contributor			Total
	Individual	Employer	State	
Salaried employees	2.13%	2.72%	4.85%	9.71%
Self-employed	3.79%		4.85%	8.64%
Pensioners - GSIS, GEPS, other	2.13%		4.85%	6.99%
Other Income - Rent, interest and other	2.13%			2.13%

3. The State contribution within budget under current system, deficit financed by co-payments or increased contributions from non-State sources (in million €)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
State maximum contributions	442	449	464	481	498	515	533	553	573	594
Plus contributions - non State	325	338	355	372	390	404	421	440	459	479
Minus Expenditure for services covered under the NHS*	886	927	964	995	1,027	1,058	1,098	1,140	1,184	1,230
Plus co-payments	90	92	94	97	101	104	108	112	116	120
(Deficit)/ Surplus	-29	-49	-51	-46	-41	-38	-39	-40	-41	-42

Under this scenario, we assume that the public expenditure remains within the budget forecast under the current system. This means that the total State's contribution towards financing the NHS and services not covered by NHS will not be higher than that under the current system.

The above deficit could be financed by additional co-payments of €49m in year 2016 or an increase in the contribution rate of non-state sources by 15.1 per cent.

Source of Income	Individual	Employer	State
Salaried employees	2.30%	2.93%	In-line with budgets
Self employed	4.09%	n/a	
Pensioners	2.30%	n/a	
Other Income	2.30%	n/a	

Alternatively, this may be financed by excluding certain services or by using a combination of the above.

9

Sensitivity Analysis to Key Assumptions

Since all projections have a degree of uncertainty, sensitivity tests were carried out on the results in order to test the model's sensitivity to certain key assumptions which are subject to a relatively high degree of uncertainty. It is important to highlight that all the assumptions should be consistent and so typically a change in one assumption would also lead to change in other assumptions within the model. This analysis does though provide an indication of the sensitivity of the model to these specific assumptions. These sensitivities are compared with the base case where NHS is introduced in 2016 with co-payments of €90m.

Base Case

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Contributions in line with 2001 NHS law	758	783	815	849	885	915	952	991	1,031	1,073
Minus* Expenditure for services under the NHS	886	927	964	995	1,027	1,058	1,098	1,140	1,184	1,230
***Plus* co-payments**	90	92	94	97	101	104	108	112	116	120
(Deficit)/ Surplus	(38)	(52)	(52)	(48)	(42)	(39)	(38)	(38)	(37)	(36)

9.1 Medical Inflation

This is clearly the key driver of healthcare costs.

Medical Inflation: + 1 percentage point

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Expenditure for services under NHS	886	936	980	1,024	1,067	1,109	1,163	1,219	1,278	1,340
Impact on expenditures	0	9	19	29	40	52	65	79	94	110
Deficit	(38)	(62)	(71)	(77)	(82)	(91)	(103)	(117)	(131)	(146)
Deficit increase	0	(9)	(19)	(29)	(40)	(52)	(65)	(79)	(94)	(110)

The estimated increase in the 2001 NHS Law contribution rates would need to increase by an additional 6% over the period. In addition, the expenditure is increasing at a higher rate than contributions and therefore this will need to increase further over time.

Medical Inflation: – 1 percentage point

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Expenditure for services under NHS	886	918	945	966	987	1,006	1,034	1,063	1,093	1,124
Impact on expenditures	0	(9)	(19)	(29)	(40)	(52)	(64)	(77)	(91)	(106)
Deficit	(38)	(43)	(33)	(19)	(2)	13	26	39	54	70
Deficit decrease	0	9	19	29	40	52	64	77	91	106

The estimated increase in the 2001 NHS Law contribution rates could decrease by 1% over the period.

We can see that an increase in medical inflation of 1 percentage point would increase the deficit by €110m at the end of the projection period. A reduction would effectively remove the deficit by 2021. It is therefore key that there is a focus on controlling expenses.

9.2 NHS Cost Control

Improved cost control by 0.5%.

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Impact on NHS expenditure	0	(4)	(9)	(14)	(20)	(25)	(31)	(38)	(45)	(52)
Improvement in Deficit	0	4	9	14	20	25	31	38	45	52

If NHS can improve cost control by 0.5% p.a., then the estimated increase in contributions required from the 2001 NHS Law contributions would reduce from to 6.7% to 6.1%.

10

Alternative Implementation Scenarios

We consider below potential alternative scenarios for phased implementation of NHS. We have highlighted below the impact of these compared with the current proposed approach of NHS implemented in full in 2016.

Phased Implementation - Inpatients launched in April 2015, Rest in 2016

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Impact on expenditure for services under NHS	(3)	(3)	(3)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Deficit reduction	3	3	3	4	4	4	4	4	4	4

In addition, we would need to include additional HIO administrative expenses in 2015.

Phased Implementation – Outpatients launched in July 2015, rest in 2016

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Impact on expenditure for services under NHS	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Deficit reduction	2	2	2	2	2	2	2	2	2	2

In addition, there would be additional HIO administrative expenses in 2015.

Phased Implementation results in a quicker reduction in costs, which then continues throughout the projection period. It is noted though that some inefficiencies may be built into system.

11

Alternative Economic Scenario

We have also considered an alternative economic scenario, which was agreed by the Troika. This reflects higher unemployment and a more significant fall in economic growth in 2013 and 2014, but with higher growth thereafter.

According to the baseline scenario, the overall unemployment rate for both males and females is assumed to progressively increase from its current level of 11.9% in 2012 to its highest level of 16.7% in 2014 and thereafter gradually decrease to reach the level of 8.8% in 2025 (see section 7).

In this alternative economic scenario of higher unemployment, the unemployment rate is assumed to be, on average, higher than in the baseline scenario by approximately two percentage points over the projection period 2012-2025, while on a yearly basis the above difference between baseline and higher unemployment scenario ranges between one and three percentage points.

Assumptions

We have highlighted below the alternative economic assumptions:

Table 24 – Higher unemployment scenario

	2012	2013	2014	2015	2016	2017	2018
GDP growth (real)	-2.4%	-9.8%	-6.3%	1.4%	2.1%	2.6%	2.4%
Unemployment	11.9%	16.3%	19.7%	17.2%	16.1%	15.1%	14.0%
Real wage inflation	-4.0%	-4.9%	-5.0%	-3.4%	-0.5%	-0.1%	0.0%

	2019	2020	2021	2022	2023	2024	2025
GDP growth (real)	2.1%	2.1%	2.3%	2.3%	2.3%	2.3%	2.1%
Unemployment	12.9%	11.8%	11.3%	10.9%	10.4%	10.0%	9.8%
Real wage inflation	0.0%	0.0%	0.8%	0.8%	0.9%	1.1%	1.1%

The Healthcare Results

This section provides the detailed results (in a similar format to section 8) with a brief summary of the key points.

11.1 National Healthcare Expenditure 2010 to 2016 in million €

	2010	2011	2012	2013	2014	2015	2016
Public	572	605	585	594	567	508	502
Private	708	704	687	604	567	587	615
Total NHE	1,280	1,308	1,272	1,198	1,134	1,094	1,117
Services not covered under NHS	274	279	272	251	237	232	240
Expenditure for services covered under the NHS	1,006	1,029	999	947	897	862	877

The Healthcare expenditure is lower than the base model from 2013. Total NHE in 2016 is 1.6% lower than the base projection.

11.2 National Healthcare Expenditure 2016 to 2025 Assuming No NHS Implementation in million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total NHE Expenditure	1,117	1,159	1,211	1,266	1,323	1,383	1,447	1,514	1,585	1,656
Services not covered under NHS	240	251	263	275	289	302	317	333	350	366
Expenditure for services covered under the NHS	877	908	948	991	1,034	1,081	1,130	1,181	1,235	1,290

If there are no changes to the current healthcare system, then total healthcare expenditure is projected to increase over the period 2016-2025 at an average of 4.5% p.a. (vs 4.2% for base run). Total NHE in 2025 is 0.8% higher than the base projection.

11.3 Projections Assuming NHS Implementation in 2016

11.3.1 National Healthcare Expenditure 2016 to 2025 Assuming NHS Implementation in 2016 in million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total NHE Expenditure*	1,110	1,159	1,205	1,251	1,296	1,341	1,397	1,455	1,516	1,580
Services not covered under NHS	238	247	258	270	281	293	307	322	337	351
Expenditure for services covered under NHS*	872	912	947	981	1,015	1,048	1,090	1,133	1,179	1,229

*- This includes allowance for HIO administrative expenses and assumes fully utilised by 2018.

If the NHS is implemented in 2016, then NHE will rise at a relatively lower rate (4.0% p.a. over the projection period) reflecting the additional expenditure controls in place. Over the projection period, cumulative NHE savings are €352m (€292m for base run).

Projected savings in NHE arising under NHS in million €

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Implied NHE Savings arising under NHS	6	0	6	16	27	42	50	59	69	76

11.3.2 Contribution Income 2016 to 2025 under NHS

Based on the existing NHS legislated State's contribution rate of 4.55% as a general subsidy and 2.55% as an employer, we have projected the State's contribution amount towards financing NHS.

Table 25 – NHS contribution income financing by State (in million €)

State contribution	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Gen. Subsidy - Salaried employees	283	294	307	321	335	347	362	377	393	410
Gen. Subsidy - Self-employed persons	14	15	15	15	16	16	16	17	17	18
Gen. Subsidy – GSIS pensioners	58	60	62	65	68	71	75	79	83	88
Gen. Subsidy – Other pension	27	27	28	29	29	30	31	32	33	33
State contribution as employer	43	43	42	42	43	43	44	45	46	47
TOTAL	**425**	**438**	**454**	**472**	**491**	**508**	**529**	**550**	**572**	**595**

11.3.3 NHS Income and Expenditure 2016 to 2025 Assuming NHS Implementation in 2016

Assuming that co-payments totaling €90m are introduced in 2016 (and thereafter increase in line with underlying medical inflation) and the contribution rates for each contributor segment are as in current statute (see Chart 16 in Section 5.3.1). The income generated for the NHS would produce an annual deficit with a maximum of €53m in 2017 over the period 2016-2025 against the projected NHS expenditure and co-payments.

	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Contributions in line with 2001 NHS law	741	767	801	836	872	904	943	982	1,024	1,066
Minus Expenditure for services covered under the NHS*	872	912	947	981	1,015	1,048	1,090	1,133	1,179	1,229
Plus co-payments	90	92	94	98	101	104	108	113	117	122
(Deficit)/ Surplus	(41)	(53)	(52)	(47)	(41)	(40)	(39)	(38)	(38)	(41)

*- including HIO administrative expenses.

11.3.4 Financing Options under NHS

We have set out below alternative approaches for financing the above deficit.

1. The deficit is fully financed through additional co-payments

Additional co-payments could be introduced to finance this deficit. Additional co-payments of €52m in 2016 would result in the following:

	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Contributions	741	767	801	836	872	904	943	982	1,024	1,066
Minus Expenditure for services covered under the NHS	872	912	947	981	1,015	1,048	1,090	1,133	1,179	1,229
Plus co-payments	90	92	94	98	101	104	108	113	117	122
(Deficit) / Surplus	(41)	(53)	(52)	(47)	(41)	(40)	(39)	(38)	(38)	(41)
Additional co-payments	52	53	55	56	58	60	63	65	68	71

2. The Deficit is fully funded through Increased Contributions

All contributions could be increased to finance this deficit. This would require an increase of 6.8 per cent on all current contribution rates. This would imply the following contribution rates by contributor segment.

Source of Income	Contributor			Total
	Individual	Employer	State	
Salaried employees	2.14%	2.72%	4.86%	9.72%
Self-employed	3.79%		4.86%	8.65%
Pensioners - GSIS, GEPS, other	2.14%		4.86%	7.00%
Other Income - Rent, interest and other	2.14%			2.14%

3. The State contribution within budget under current system, deficit financed by co-payments or increased contributions from non-State sources (in million €)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
State maximum contributions	435	441	456	474	492	509	529	549	570	593
Plus contributions - non state	316	330	346	364	381	396	414	432	451	471
Minus NHIS expenditure *	872	912	947	981	1,015	1,048	1,090	1,133	1,179	1,229
Plus co-payments	90	92	94	98	101	104	108	113	117	122
(Deficit)/ Surplus	(31)	(49)	(50)	(46)	(40)	(39)	(39)	(39)	(41)	(43)

Under this scenario, we assume that the public expenditure remains within the budget forecast under the current system. This means that the total State's contribution towards financing the NHS and services not covered by NHS will not be higher than that under current system.

The above deficit could be financed by additional co-payments of € 48m in year 2016 or an increase in the contribution rate of non-state sources by 15.2 per cent.

Source of Income	Individual	Employer	State
Salaried employees	2.30%	2.94%	In-line with budgets
Self employed	4.09%	n/a	
Pensioners	2.30%	n/a	
Other Income	2.30%	n/a	

Alternatively, this may be financed by excluding certain services or by using a combination of the above.

12

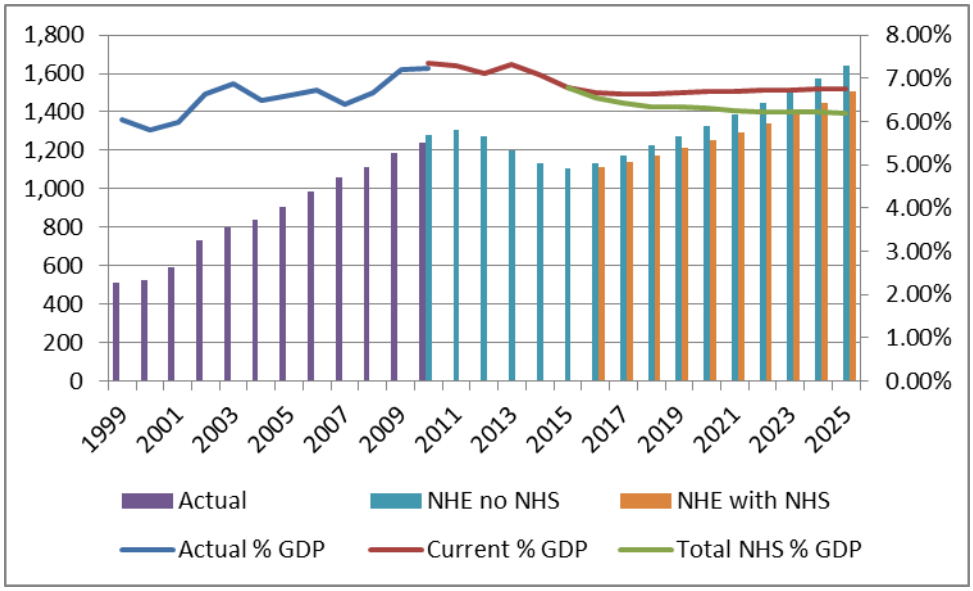
Risk & Benefits

NHS Benefits

Expenditure Savings

The NHE Expenditure for Cyprus has gradually increased as a proportion of GDP from 1999 to 2010. Under the current system, we expect that the healthcare expenditure will fall in the short term as a proportion of GDP but gradually increase again (see the red line below). The introduction of NHS is forecast to control and manage this increase in healthcare expenditure. The drivers of this expense control are through the introduction of the expense control best practice measures. The cumulative savings on NHE which are expected to arise due to NHS implementation amount to €292m for the period 2016-2025.

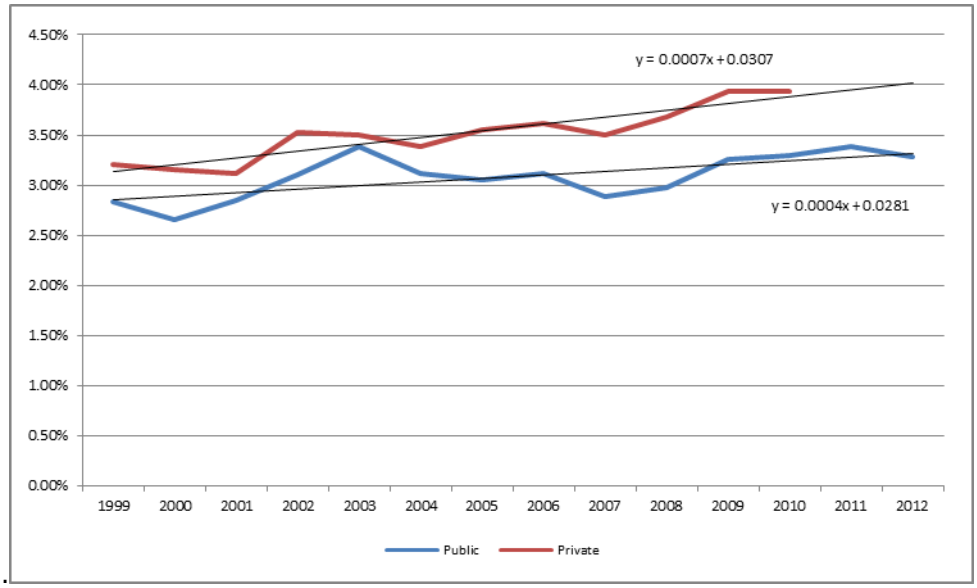
Chart 26 – Historic and Forecast Expenditure 1999 to 2025



Improved Cost Containment and Control of Medical Inflation

Our analysis indicates that private sector expenditure is expected to grow more rapidly than public sector expenditure. This is consistent with the historical data (see Chart 26) and indicates that on-going private sector expense inflation is a major concern. The market is currently uncontrolled and therefore the proposed NHS cost containment measures should have particular impact.

Chart 27 – Historic Public and Private Expenditure (% GDP)



Transparency in the Management of Total Health Expenditure

The NHS will also lead to more information and analysis becoming available to enable more informed decisions to be taken.

Risks

General Risks

NHE grows more rapidly than expected

Under the current system, the private sector is not controlled and hence there is a risk that healthcare expenditure will grow more rapidly than expected. Under NHS, this risk will be mitigated by the cost control measures and best practices (as per section 3.2) that are being introduced.

Health outcomes

Given the current economic conditions, potential reductions in future health expenditure may lead to a worsening of health outcomes. Under NHS, this can be mitigated to some degree due to the introduction of universal coverage and improved access to healthcare services. In addition, improved information /analysis can ensure that these factors are considered.

Note our figures are based on the assumptions as detailed in the report. Experience may vary from these assumptions. The model can however be used to estimate the potential impact of these alternative scenarios.

NHS Specific Risks

NHS may not lead to the savings forecast.

Our figures have used a conservative trend for NHS expenditure in line with the projected public sector growth i.e. we are assuming that under NHS the private sector cost control will be similar to the public sector's. This is conservative due to the various best practice cost containment measures that are being introduced. In addition, we would expect that cost effective management of future budgets will be achieved under the introduction of NHS through the global budget mechanism, the single payor organisation (HIO) and also through the integration of the private and public sector.

Under NHS, contributions may not be sufficient to meet the NHS costs.

However, the use of global budgets and other cost control measures should ensure that expenditure is set at an affordable level and that it does not exceed the pre-determined budget. In addition, various options may be implemented to meet actual costs, including a combination of increased cost sharing measures and / or excluding certain NHS services.

APPENDIX A

Services excluded from NHS Coverage

Acupuncture
Audiology
Chiropodists
Chiropractors
Chronic Institutionalized Psychiatric Care and Institutionalized Psychiatric Care
Community Health Care
Consumables (bandages, syringes, etc.)
Dental services (except for medically necessary inpatient/outpatient care and preventive care for children up to age 16)
Dieticians (non-clinical)
Durable Medical Equipment (glasses, orthopedics, prosthetics, wheelchairs, etc)
Food scientist
Health visitors
Home Nursing
Homeopathy
Long Term Care
Nutritionists
Optometry
Osteopathy
Orthoptry
Psychologists (non-clinical)
School Medicine and Health Visitors

APPENDIX B

Health Economic Analysis

The objective of this section is to discuss the forecast of Health Expenditure in Cyprus, for Total, Public and Private Health Expenditure, and subsequently for several subcategories of Health Expenditure, over the period 2011-2016.

Health Expenditure forecasting aims to inform the policy makers of Cyprus on future trends in order to plan and implement effective and efficient reforms towards a Health Insurance System. Forecasting models can also clarify the drivers of Health Expenditure, and thus providing a more enriched picture of the policy options available.

Following the literature of health economics we may distinguished among three broad categories of forecasting methods. (Astolfi et al., 2012):

1. **Micro-level analysis,** which makes use of microsimulation techniques and focus on individual as the unit of analysis. A large sample of individuals is required in order to capture the characteristics and behaviour of the whole population of interest, so as future health spending can be forecasted, after the simulation of life course events and the costs associated with related health-care interventions.

2. **Component-based models,** which stratify sections of health expenditures or individuals to groups by financing agents, providers, goods and services consumed, by groups of individuals (cohorts) or by some combination of these groups. These models demand less data than microsimulation models, and health expenditures are forecasted by multiplying the average costs associated with each cell in the model by the projected number of individuals included in each cell.

3. **Macro-level models,** which target on aggregate Health Expenditure within the context of the whole economy. These models are more appropriate for short to medium-term projections and are the least data demanding (Bartosz, 2010). Forecasting is based on extrapolation of statistical models, after the use of econometric regression analysis of time series data, or they can be based on the projected values of the exogenous variables.

Different time horizons can be used for the projections. As the time window expands, the degree of uncertainty increases, since the drivers of health expenditures can change in all sort of different ways. Furthermore, while for short-term projections Health Expenditure at current prices is often considered more suitable, for medium-term is more appropriately expressed at constant prices, and in the long run the health spending to GDP ratio is regarded as the most appropriate forecasting measure (Astolfi et al., 2012).

Many factors have been identified as determinants of health expenditures growth, which concern **demand-side, supply-side and regulatory drivers**, and whose impact depends on the time window of the projection.

Income or GDP is regarded as the most important driver of health expenditures. Higher levels of GDP enables increased health spending (Newhouse, 1992) and people are inclined to spend a larger share of their income on improving their health (Fogel, 2008). The income elasticity **(e_y)** varies across empirical studies reporting inelastic ($e_y<1$), elastic ($e_y>1$), or unitary ($e_y=1$) elasticities. In a review of nearly 40 empirical studies, Getzen (2006) reported values ranging from **0 to 2.2,** and concluded that elasticity increases with the unit of analysis, while more recent studies have highlighted the importance of the estimation techniques, with more advanced ones to lead to values below 1 (Di Matteo, 2010). The overall conclusion is that the value of income elasticity constitutes more an empirical exercise than a theoretical foundation.

Demographic effects measure the impact of population structure on the upward trend of health spending. Although it is a widely accepted view that that an ageing population increases health care costs, as the ageing of the population is presumably associated with a deterioration of the health status, empirical findings suggest only a minor to modest impact of the againg on the rising of health expenditures (Fogel, 2008, Smith et al., 2009, Morgan and Cunningham, 2011, Kea et al., 2011). This gave rise to the "red-herring argument" (Zweifel et al., 1999), according to which longevity gains would not raise health expenditures, but instead it would postpone it, since health expenditures tend to concentrate in the time-to-death period (Yang et al., 2003, Seshamani and Gray, 2004). Three hypothesis have been suggested to represent the relationship between life expectancy and mortality (Astolfi et al., 2012). The "healthy ageing" hypothesis assumes that life expectancy gains correspond to an equal increase in healthy life years. The "expansion of morbidity" hypothesis suggests instead a longer-time spent with ill-health, based on the extension of the life of people with diseases and disabilities, attributed to technological advancements. Finally, according to the "compression of morbidity" hypothesis, life expectancy improvements are associated with an increase in healthy life years.

New health technologies improve the intenseness of patients' treatments, which may lead to cost savings (Astolfi et al., 2012). Nevertheless, high cost of research may also be cost-increasing, since unit costs would likely rise more than any cost-savings in the health system (Banks, 1995). Furthermore, even inexpensive treatments tend to increase health expenditures, as health improvements to a large share of population incur further costs related to improved life expectancy and new health-care needs (Goldman et al., 2005).

Inflation in health-care related prices and the lower productivity of the health sector are also reported as a possible driver of health expenditures. According to Baumol's model of unbalanced growth (Baumol, 1967), health sector's productivity is lower than other sectors due to the fact that health services are labour intensive. Thus, prices for health services tend to inflate in relation to other prices so that wages between sectors are balanced (Baltagi and Moscone, 2010). The **"Baumol effect"** is still an unsettled issue with contradictory empirical findings, and it seems to affect mainly developed economies (Kea et al., 2011).

The organization of the health care system, concerning primarily the insurance coverage, the financing and the delivery of the system, is also a determinant of health expenditures growth (Baltagi and Moscone, 2010). Insurance coverage drives health spending via: a) the proportion of population with insurance, b) the depth of coverage, and c) the level and structure of reimbursement (Astolfi et al., 2012). Public-integrated and public-contract models may exert leverage on providers constraining health spending (Docteur and Oxley, 2003).

Health promotion and disease prevention programs, and health-seeking behaviour may also influence the health status and the demand for health care services (Wanless, 2002), but these factors are difficult to measure and thus to be included in projection models. Section two of this paper describes the methodology of the forecasting procedure for this study, where we specify the econometric models, the strategy of analysis and the data we used. Section three presents the results of the best models, while the corresponding outcomes of the other models are included in the Appendix.

Methodology

Specification of the econometric models

Following the literature we projected Health Expenditure developments for Cyprus by applying econometric models to forecast the values of its components and the ratio to the projected GDP for each year from 2011 to 2016, based on the historical data of the period of 1998-2010. According to this modeling, Health Expenditure varies in line with GDP, and the estimations will be accomplished through the implementation of four different econometric models. In the subsequent analysis we specify four econometric models based on the available information on: 1) data characteristics, 2) and pattern evolution (Theil, 1966),

1) The first model Health Expenditure is regressed as a linear function of GDP (assuming all other factors unchanged), and it takes the form:

Health Expenditure = function of (GDP_t)

or $\mathbf{HE_t = \alpha + \beta_1 GDP_t + \varepsilon_t}$

at the time points t = 1998 – 2016, where
β is unknown fixed regression coefficient, and
a = constant term
HE_t = Health expenditure for time t
GDP_t = Gross Domestic Product for time t
e_t = random error term

2) The second model explores the lag impact of GDP on Health Expenditure. (assuming all other factors unchanged). This lag effect is expected since health care budgets are generally set in the previous year. The model takes the form:

Health Expenditure = function of (GDP_t , GDP_{t-1}, GDP_{t-2})

or $\mathbf{HE_t = \alpha + \beta_1 GDP_t + \beta_2 GDP_{t-1} + \beta_3 GDP_{t-2} + \varepsilon_t}$

at the time points t = 1998 – 2016, where
β's are unknown fixed regression coefficients, and
a = constant term
HE_t = Health expenditure for time t
GDP_t = Gross Domestic Product for time t
GDP_{t-1} = Gross Domestic Product for time t-1 (first lag of GDP)
GDP_{t-2} = Gross Domestic Product for time t-2 (second lag of GDP)
e_t = random error term

3) **The third model** forecasts Health Expenditure growth rate as a function of GDP growth rate (assuming all other factors unchanged), and it takes the form:

Health Expenditure growth$_t$ = function of (GDP growth$_t$ + GDP growth$_{t-1}$ + GDP growth$_{t-2}$)

or $\mathbf{HEgr_t = \beta_1 GDPgr_t + \beta_2 GDPgr_{t-1} + \beta_3 GDPgr_{t-2} + \varepsilon_t}$

at the time points t = 1998 – 2016, where
β's are unknown fixed regression coefficients, and
$HEgr_t$ = Growth rate of Health Expenditure between time t and t-1
$GDPgr_t$ = Growth rate of GDP between time t and t-1
$GDPgr_{t-1}$ = Growth rate of GDP between time t-1 and t-2 (first lag)
$GDPgr_{t-2}$ = Growth rate of GDP between time t-2 and t-3 (second lag)
e_t = random error term

4) The 4th Model which provides **best indicators of medium-term forecasts** of Health Expenditure are suggested to be its own lagged value and GDP. This function applies the fourth model, which takes the form:

Health Expenditure=function of (Health Expenditure$_{t-1}$, GDP$_t$, GDP$_{t-1}$)

or $\mathbf{HE_t = \alpha + \beta_1 HE_{t-1} + \beta_2 GDP_t + \beta_3 GDP_{t-1} + \varepsilon_t}$

at the time points t = 1998 – 2016, where
β's are unknown fixed regression coefficients, and
a = constant term
HE_t = Health expenditure for time t
HE_{t-1} = Health expenditure for time t-1 (first lag of HE)
GDP_t = Gross Domestic Product for time t
GDP_{t-1} = Gross Domestic Product for time t-1 (first lag of GDP)
e_t = random error term

We also explored a scenario based on an equivalent assumption derived from a recent OECD paper (Scherer and Devaux, 2010). According to this scenario, Health Expenditure ceases to grow and remains stable at the level of the last observed figures of 2010. This simplistic assumption, though "unrealistic", aims to isolate and highlight the impact of the estimated recession of the next few years in Cyprus on the ratio of health expenditure to GDP.

Strategy of analysis

At first, we calculated GDP and Health Expenditure at **constant prices**. Subsequently, we forecasted Health Expenditure values by the implementation of the four specified econometric models with the use of Eviews 7.1 statistical software package.
There were 6 stages of the analysis for each model:

Stage 1: Running the model and estimating parameters of the model based on the historical data of 1998-2010.

Stage 2: Applying augmented Dickey-Fuller unit root test on the residuals for the detection of cointegration between the regressed variables. A series is said to be stationary if the mean and autocovariances of the series do not depend on time (has changing means and variances over time). Many studies have concluded that the apparent strong relationship between Health Expenditure and GDP is the result of non-stationarity, rather than evidence of a real economic relationship (Hansen and King, 1996, Blomqvist and Carter, 1997, Gerdtham and Lothgren, 2000, Dybczak and Przywar, 2010). Nevertheless, if the non-stationary variables are cointegrated in a linear combination, the problems of non-stationarity ceases to exist, and the regression estimates are robust (Dybczak and Przywar, 2010). A number of studies confirm the presence of a cointegration relationship between Health Expenditure and GDP (Blomqvist and Carter, 1997, Gerdtham and Lothgren, 2000, Okunad and Murthy, 2002).

Stage 3: Using the estimated parameters to forecast fitted values of the dependent variables, alongside with 95% forecasting intervals, and the evaluation of the forecast. The evaluation of each forecast included the following statistics:

- The Root Mean Squared Error.
- The Mean Absolute Error.
- The Mean Absolute Percentage Error.
- Theil Inequality Coefficient.
- The bias proportion, which depicts the distance between the mean of the forecast and the mean of the actual series.
- The variance proportion, which represents the distance between the variation of the forecast and the variation of the actual series.
- The covariance proportion, which measures the remaining unsystematic forecasting errors.

The first two measures depend on the scale of the dependent variable, while the third and fourth are scale invariant. These statistics can be used as comparative measures between models; the smaller the error, the better the forecasting ability of the particular model according to each criterion. The Theil inequality coefficient always lies between zero and one, where zero indicates a perfect fit. The bias, variance, and covariance proportions decompose mean squared forecast error, so they add up to one; for a forecast to be reliable, the bias and variance proportions should be small.

Stage 4: Combination of out-of-sample forecasts of the models for which cointegration between the variables was confirmed by taking the average. Literature depicts that by averaging either simply or weighted, forecasts gain accuracy and precision and reduce uncertainty (Makridakis and Winkler, 1983, Makridakis et al., 1998) compared to an individual model.

Estimation of Elasticities: Furthermore, we calculated GDP elasticities for the main components of Health Expenditure, i.e. Total Health Expenditure, Public Health Expenditure and Private Health Expenditure. At first, we estimated the elasticity of GDP by applying Model 1, where GDP and Health Expenditure were transformed to their logarithmic form. For a log-log model, the slope coefficient β of an explanatory variable estimates directly the elasticity coefficient of the dependent variable with regard to the given explanatory variable. Thus, the elasticity estimation model was:

Natural logarithm of Health Expenditure = function of (natural logarithm of GDP_t)

or $\mathbf{LOGHE_t = \alpha + \beta_1 LOGGDP_t + \varepsilon_t}$

at the time points t = 1998 – 2010, where

β is unknown fixed regression coefficient which also represents the elasticity,

a = constant term

$LOGHE_t$ = Natural logarithm of Health expenditure for time t

$LOGGDP_t$ = Natural logarithm of Gross Domestic Product for time t

e_t = random error term

Subsequently, we calculated the short run and long run GDP elasticities by applying Model 4, where explanatory and dependent variables were log transformed. Therefore, the elasticity estimation model had the form:

Natural logarithm of Health Expenditure=function of (natural logarithm of Health Expenditure$_{t-1}$, GDP$_t$, GDP$_{t-1}$)

or $\mathbf{LOGHE_t = \alpha + \beta_1 LOGHE_{t-1} + \beta_2 LOGGDP_t + \beta_3 LOGGDP_{t-1} + \varepsilon_t}$

at the time points t = 1998 – 2010, where

β's are unknown fixed regression coefficients, and

b_1= short run GDP elasticity and $\frac{\beta_2+\beta_3}{1-\beta_1}$= long run GDP elasticity

a = constant term

$LOGHE_t$ = Natural logarithm of Health expenditure for time t

$LOGHE_{t-1}$ = Natural logarithm of Health expenditure for time t-1

$LOGGDP_t$ = Natural logarithm of Gross Domestic Product for time t

$LOGGDP_{t-1}$ = Natural logarithm of Gross Domestic Product for time t-1

e_t = random error term

Elasticity results are presented in a separate report.

Demographic Effects: Finally, we explored the demographic effect on Health Expenditure main components, i.e. Total Health Expenditure, Public Health Expenditure and Private Health Expenditure. We used Model 4, which among all models depicted the best fit, to explore the effect of the proportion of the elderly to the total population. Consequently, we applied the following model:

Health Expenditure=function of (Health Expenditure$_{t-1}$, GDP$_t$, GDP$_{t-1}$)

or $\mathbf{HE_t = \alpha + \beta_1 HE_{t-1} + \beta_2 GDP_t + \beta_3 GDP_{t-1} + \beta_4 AGESHARE_t + \varepsilon_t}$

at the time points t = 1998 – 2010, where

β's are unknown fixed regression coefficients, and

a = constant term

HE_t = Health expenditure for time t

HE_{t-1} = Health expenditure for time t-1 (first lag of HE)

GDP_t = Gross Domestic Product for time t

GDP_{t-1} = Gross Domestic Product for time t-1 (first lag of GDP)

$AGESHARE_t$= proportion of people aged 65+ to the total population for time t

e_t = random error term

Demographic effect results are presented in a separate report.

Data

For the forecasting we used GDP and Health Expenditure at **constant prices**. Nominal GDP and nominal Health Expenditure components were provided for the period of 1998-2010 by the Cyprus Statistical Services . **Table 1** presents Total Health Expenditure and its components.

Table 1 Total Health Expenditure and its components

Total Health Expenditure = Public Health Expenditure + Private Health Expenditure
Public Health Expenditure = Gross Capital Formation + Compensation of Employees + Social Benefits + Intermediate Consumption + Other Current Transfers
Private Health Expenditure = Current Expenditure + Capital investments

Current Expenditure = Medical and Pharmaceutical Products + Therapeutic Appliances and Equipment + Physicians, Dentists and Other Medical Services + Hospital Care + Health Insurance

We extracted GDP and Health Expenditure components in constant prices by deflating nominal GDP and nominal Health Expenditure components. GDP deflators were derived from the IMF official databases. Projections of real GDP growth till 2016 were provided by the Ministry of National Economy, from which we then calculated absolute values of real GDP.
Finally, we attempted to estimate the demographic effect, and we used Eurostat data calculating the ratio of Cyprus people aged 65+ to the total population, for the period of 1998-2010.

Results

In this section we present the results of the Models which best forecasted Health Expenditure components in line with the criteria we discussed in the previous section. According to the forecast evaluation, **Model 1 and Model 4** depicted the best fit, and the results are presented in this section. The corresponding results of the other models are included in the Appendix.

For each health expenditure component the following results are included:

1. The specified equation that was estimated.
2. The estimation output of the Model.
3. The results of the cointegration test, i.e. the result of the augmented Dickey Fuller test on the residuals of the equation.
4. The forecast graph, which also depicts the 95% forecasting intervals, and the forecast evaluation of the particular Model.
5. The evolution of the Health Expenditure component in absolute values, as it was forecasted.
6. The evolution of the Health Expenditure component as % of GDP, as it was forecasted.

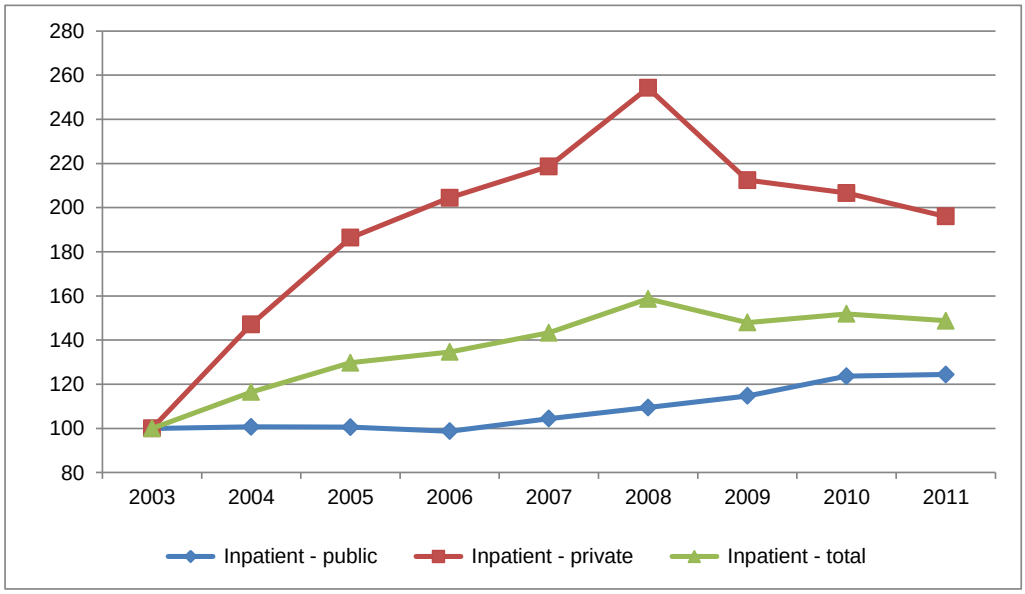
At the end of each Model's analytical presentation, we summarize in a table the forecasts of all health expenditure components in absolute values, with the 95% forecasting intervals, and as % of GDP, while the historical data are also included for comparisons and inference.

APPENDIX C

Analysis of utilisation of inpatient and outpatient activity

Data on public inpatient activity is available from the annual Health & Hospital Statistics report whereas data on private inpatient activity is available from the Commissioner of Private Hospitals. Both sets of data are believed to be relatively reliable and can be used to derive the annual growth rates of public, private and total volumes of inpatient activity (See chart below).

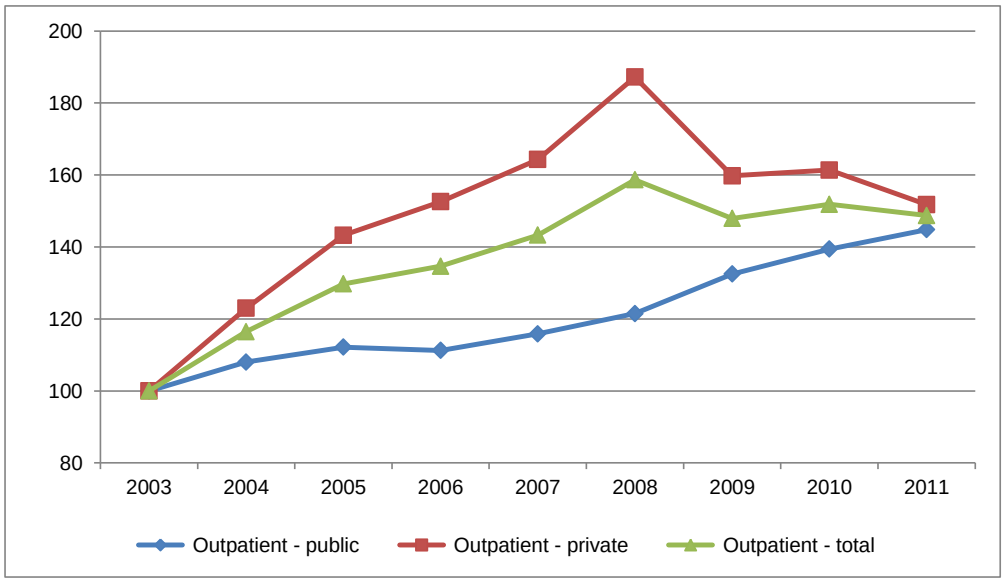
Chart C1 – Index of inpatient activity 2003-11



Source: Health & Hospital Statistics, Commissioner of Private Hospitals

Data on public outpatient visits is available from the annual Health & Hospital Statistics report. Given these, it is possible to derive a reliable estimate of the volume and growth of private outpatient visits, by matching the growth rate of total inpatient visits in total outpatient visits and deducting the public outpatient visits (Chart C2). Making the assumption of a constant ratio is reasonable by historical external benchmarks as illustrated by Table C3.

Chart C2 – Index of outpatient activity 2003-11



Source: Health & Hospital Statistics, Mercer Analysis

Table C3 – Ratio of number of outpatient consultations to number of inpatient discharges

Country	Year					
	2004	2005	2006	2007	2008	2009
Austria	25.6	25.7	25.4	25.6	25.9	26.1
Belgium	43.7	43.0	43.2	44.0	40.9	
Denmark	25.6	26.1	26.1	26.2	27.6	27.0
Estonia	35.8	36.9	36.1	37.1	36.5	37.1
Finland	20.5	21.4	21.9	22.1	22.8	22.8
France	39.9	40.2	39.3	39.8	39.2	39.3
Germany	32.0	33.9	33.1	33.1	34.0	35.5
Hungary	54.3	55.1	56.9	57.0	61.3	64.3
Luxembourg	35.3	36.3	36.4	37.4	38.0	39.9
Netherlands	52.1	51.9	52.4	52.1	52.4	49.2
Poland	41.6	38.2	37.3	38.9	38.3	33.8
Portugal	42.0	43.0	38.6	40.1	39.7	36.5
Sweden	17.7	17.7	17.5	17.3	17.9	17.8
United Kingdom	39.2	36.9	38.1	37.5	43.4	36.7
Average	**36**	**36**	**36**	**36**	**37**	**36**

Source: OECD Dataset: Health Expenditure and Financing

APPENDIX D

NHS Income by Income Source

These figures are based on the 2001 NHS Law.

Source of income	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Salaried employees	582	603	628	654	682	705	733	763	794	826
Self-employed persons	26	27	27	28	29	29	30	30	31	32
GSIS pension	84	86	89	94	98	103	108	114	120	126
Other pension	38	39	40	41	42	43	45	46	47	48
Other income	28	29	31	32	34	35	37	38	40	41
TOTAL	**758**	**783**	**815**	**849**	**885**	**915**	**952**	**991**	**1,031**	**1,073**

APPENDIX E

Proposed HIO Co-payments

Proposed HIO co-payments		
Healthcare Providers		**Co-payment per visit/ test/ pharmaceutical/ inpatient day**
Adult Family Doctors	Other activities	0.0 €
	Home visits	0.0 €
Pediatrician Family Doctors	Other activities	0.0 €
	Home visits	0.0 €
Outpatient Specialists	Haematology	0.0 €
	Pathological Oncology	0.0 €
	Allergology	0.0 €
	Endocrinology	0.0 €
	Gastro-enterology	0.0 €
	Nephrology	0.0 €
	Rheumatology	0.0 €
	Cardiology	0.0 €
	Pneumology	0.0 €
	General Surgery	0.0 €
	Thoracic Surgery	0.0 €
	Vascular Surgery	0.0 €
	Paediatric Surgery	0.0 €
	Plastic Surgery	0.0 €
	Neurosurgery	0.0 €
	Orthopaedics	0.0 €
	Urology	0.0 €
	Ophthalmology	0.0 €
	Otolaryngology (ENT)	0.0 €
	Obstetrics - Gynaecology	0.0 €
	Neurology	0.0 €
	Psychiatry	0.0 €
	Dermatology - Venereology	0.0 €
	Diagnostic Radiology	0.0 €
	Radiation Oncology	10.0 €

Proposed HIO co-payments		
Healthcare Providers		Co-payment per visit/ test/ pharmaceutical/ inpatient day
Outpatient Specialists (cont)	Physical Medicine and Rehabilitation	0.0 €
	Anaesthetics	0.0 €
	Nuclear Medicine	0.0 €
	Cytology	0.0 €
	Pathological Anatomy (Histopathology)	0.0 €
	Maxillofacial Surgery	0.0 €
	Home visits	15.0 €
Allied Health Professionals	Clinical Dieticians	10.0 €
	Occupational Therapists	10.0 €
	Physiotherapists	10.0 €
	Psychologists	10.0 €
	Nurses and Midwives	10.0 €
	Speech Language Therapists	10.0 €
Labs	Ungrouped lab tests	0.5 €
	Grouped lab tests	5.0 €
	Per Referral	5.0 €
Pharmaceuticals	Generics	1.0 €
	Originals	4.0 €
Inpatient	Per day of inpatient treatment	50.0 €
A&E	-	0.0 €
Ambulance	-	0.0 €

Based upon forecast activity, we would estimate that these co-payments should total € 90m in 2016.

Please note that various co-payment combinations can be used in practice.