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Effects from state investments in public health care for the period 2010-2016

Analysis of the capital investments in public health care concerning the prevention and treatment of cardiovascular diseases as the most common noncommunicable disease

Authors:
Biljana Indova
Branko Adjigogov

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Policy Study 13

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Authors:
Biljana Indova
Pharmalink B&GP d.o.o.e.l.Skopje, biljana@pharmalinkbgp.com.mk

Branko Adjigogov
Health Insurance Fund of Macedonia, BrankoA@fzo.org.mk

Reviewer: Rubin Zareski

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INTRODUCTION

Health is a factor impacting the social status of the population and is one of the requirements for a sound economic development of every country. Therefore, the commitments of every government should be aimed at developing a health system that takes into consideration the actual needs of its citizens, which will improve, promote and maintain the health of all citizens. As a strategic priority, from the independence in 1991 until today, the health system in the Republic of Macedonia (RM) is continuously being improved and reformed with a view to attaining the objectives envisaged.

The effects from the investments in the health sector are more discussed by the expert and general public from the aspect of the financial value of the investments, their planning and implementation within the periods envisaged, without an in-depth analysis of the objectives achieved and their results. This is partly due to the limited availability and transparency of comprehensive data, which hinders the development of a detailed overview of the funds invested for the implementation of numerous projects and the reforms carried out in the health sector by the competent state institutions. Unlike the RM, we have witnessed positive examples of the industrially developed countries where the manner of investment planning in the health sector, the transparent publication and analysis, and the accountability for the effects produced contribute to the high efficiency of the health system. *This state of play in the RM, which was identified and pointed out in the very beginning, is a huge challenge to performing an economic analysis in the Macedonian health sector in general.*

Initial indicators about the level of investments in the health sector aimed at reforming the health system are the percentage share of health expenditure in the total expenditure of the Budget of RM and in the gross domestic product (GDP) annually, the percentage share of the development sub-programmes in the total expenditure and in the health expenditure. In addition, the analysis covered the data about the level of capital investments, where the investment priority lies, and what effects were produced in terms of improvement and modernisation of the health capacities. The effects will be measured through the mortality rate, healthcare services provided, hospitalisations, interventions and consumption of medicines. In addition to these indicators, concerning the achievements from the reforms in the healthcare of RM, the analysis also covered the assessments for Macedonia according to the European Health Consumer Index (EHCI), as the most frequently quoted health index source in our country by the local healthcare authorities. EHCI is a multiannual project comparing and ranking since 2006 the health systems in the European countries from the perspective of patients, the health service consumers.

The mortality, as one of the key indicators of quality of life and health care in each country, is one of the primary indicators of the efficiency level of the health system. In

the world, all healthcare authorities strive to reduce the rate of premature death. Hence, it has to be determined what is the mortality level in RM in recent years compared to previous years, according to the Institute of Public Health (IPH) and according to the data of the World Health Organization (WHO). At the same time, it also is important to know what is the share of cardiovascular diseases (CVD) as a reason for premature death in our country and compared to Europe. CVD are in the focus of the study because they were also declared as a global pandemic by the WHO, as one of the three noncommunicable chronic diseases, because the largest percentage of the state budget, in addition to renal diseases and diabetes mellitus disease, is spent on CVD therapy. The burden on the state healthcare budget also includes treatment of complications due to CVD, caused by late detection and monitoring of the disease progression. All of the above indicates that CVD are a leading cause for premature death, for loss of productivity and, at the same time, they are also a financial burden to the health system in RM, thus the analysis of the effects from the investments is focused on this area.

Starting from the above mentioned, *the subject of this study is to determine the effects produced by the investments realised by state money only in the public healthcare in the field of cardiovascular diseases for the period 2010-16, specifically in the following segments:*

- investments in equipment (purchase of new equipment for the public healthcare institutions (public HCI) aimed at facilitating accessibility to the services, introducing completely new methods through the purchase of new or purchase of more recent technology);
- investments in the capacities (renovation of the existing facilities in public health care or building new ones);
- investments in staff (education of the existing employees and new recruitments in the public HCIs);
- establishing a state cardiac surgery clinic;
- new prescription medicines (extending the list of medicines covered by the HIFM by new medicines); and
- prevention programmes (early and timely detection of CVD).

The aim of this study is to determine the level of investments, which in the past period defined have been allocated for CVD. At the same time, the data analysis is to determine what share of the total investments in health care has been allocated to the CVD prevention and treatment. In addition to determining the level of investments, the aim is also to identify the effects produced by the investments, the level of efficiency and whether there is a possibility for more optimum investment and achieving greater effects by the funds invested. The measurement and comparison of the effects from the different investments will contribute to reaching conclusions on the issue of the effects' measurability and on the re-allocation of resources based on where the investments have been more efficient.

MATERIALS AND METHODS

Generally, the publicly available media for providing information by the line ministry and by state institutions contain very few available official, comprehensive data and a detailed overview of the funds invested for implementation of the numerous projects and reforms carried out in the health sector by the Ministry of Health (MoH). Partial information can be obtained from the press-centre on the web page of the MoH, communications and statements by the Minister of Health, the Directors of the public HCIs and by other authorised persons from the health sector.

Consequently, for performing the analysis, we first asked from the MoH and obtained partial data about the investments in health care in the CVD area for the period 2010-16. The investment effects were also analysed through several indicators, the data of which were obtained, upon request, from:

- the HIFM from the HIF system for healthcare services provided at a specialist consultation level – ambulatory packages and hospitalised patients (DRG);
- the HIFM from the HIF system for the implementation of prevention measures and activities by general practitioners (prevention check-ups, especially concerning CVD);
- Public HCI - University Clinic for Cardiology;
- "My Term" – Agency for Electronic Communications in Health Care.

For carrying out the analysis, we also used the final accounts of the annual budget of RM from the Ministry of Finance and the annual reports of the HIFM published on its web page, public information, as well as the databases of MAKSTAT, WHO and the reports of the IPH.

We have to mention that for the needs of this study, the period of data collection was time-limited, initially until January – March 2017, and then the deadline was extended until 12 May 2017. This was also the period when the RM was faced with a political crisis and changes in the managerial structure caused by the change of government, which was an additional limiting factor in obtaining the data required. Until the end of the analyses, the data requested were not provided in its entirety to the researchers.

The data available concerning the investments showed that they are directly and exclusively linked to CVD only in a small number of cases (procurement of angiography machines, new recruitments and staff education, introducing the "Clopidogrel" medicine into the list of medicines covered by the HIFM). Most of the equipment invested is also being used for services not related to CVD, therefore the effects from this equipment could only be partially analysed through CVD. Data about the staff investments (recruitment and education) were not broken down per healthcare institution and not all of them were expressed in monetary units, which also affects how the analysis was performed. As a result, we decided to perform a segmented analysis of the investments:

equipment, capacities, staff, state cardiac surgery, medicines and prevention programmes.

The healthcare economy recognises four types of analyses: Cost minimization analysis (CMA), cost-benefit analysis (CBA), cost-effectiveness analysis (CEA) and cost-utility analysis (CUA). CMA is the most basic research methodology where the method of cost minimization analysis determines the treatment alternative, which has the lowest costs. CBA is used when the outcome produced can be expressed in monetary units, which in reality in health care is difficult because, for instance, you cannot put a monetary value to a life that was saved, primarily, for ethical reasons. With CEA, the costs are expressed in monetary units, while the efficiency is measured vis-à-vis the effects produced by the treatment / intervention (number of lives saved, patients cured, increased therapeutic efficiency etc.). CUA analysis is used from the patients' health aspect, and also from the aspect of healthcare budgets and insurance companies for determining the need to give treatment, subject to the analysis. CUA incorporates QALY - Quality of adjusted life.

Guided by the experience in the developed countries, the analysis applied CEA, which estimates the outcomes of the treatment alternatives that are not measured in monetary units, but rather in physical values (years of extended life, complication avoided). This allows to sum up the health benefits vis-à-vis the assets applied with regard to health protection programmes offered. The consequences of the therapy and health service in economic estimates are expressed in two ways: efficiency and benefit. They also represent the basis for: the cost-benefit analysis and the cost-effectiveness analysis.

For the needs of this study, the researchers saw numerous analyses using QALY in combination with CEA because QALY includes a threshold, which is used by the healthcare budget and insurance companies to determine the cost-effectiveness of the treatment in monetary value. The utility, as a measurement of the therapy consequences, shows the quality of life in the extended years .It calculates all levels of the health status – from 0 (death) to 1 (normal life).When the utility is multiplied by the quality of life years, it shows the so-called QALYs - quality of adjusted life years (Zareski, 2011).For QALY to be applicable in RM, it is necessary to have a national register of weightings where living with a specific disease and/or the outcome after the treatment is valued between 0 (death) and 1 (perfect health). The healthcare authorities in RM, until now, have not made or published weightings. The second requirement for QALY are the adjusted life years, e.g. how long will, on average, patients live after the treatment / intervention. These two determinants are fundamental for the estimation of QALY because different countries value life expectancy and disease gravity differently. The third component of QALY is the cost-effectiveness threshold, which is determined differently by different countries (e.g. NHS values 1 QALY at 20,000 – 30,000 pounds from 2004; since 2009, although the threshold was 30,000 pounds, treatments of 50,000 pounds were also being approved; and since 2016, the threshold was increased to 100,000 pounds for treatments of rare diseases (Claxton et. al, 2015).1 QALY is one year of life in one year of perfect health. Because the

cost-effectiveness threshold is not calculated in RM, numerous analyses use a multiplier of GDP per capita and usually it is three times the GDP per capita, in accordance with the WHO's recommendations (Marseile, et. al, 2015). In recent years, QALY sparked off a considerable expert debate and, generally, the health economists from continental Europe and Great Britain have conflicting opinions. While economists from the European Union, without Great Britain, recommend to reject QALY as an indicator and to use a pure CEA, if possible confirmed by interdisciplinary groups, health economists from Great Britain are still of the opinion that QALY should continue being applied in deciding whether to introduce new treatments. The European consortium in healthcare outcomes and cost-benefit research recommends to reject QALY because the health level as an indicator, before and after treatment / intervention is not a scientific data, but is rather obtained from personal views of the patients or doctors, in accordance with standardised questionnaires. In addition, nobody using the QALY method has confirmed or proven what perfect health means (1 as a maximum weighting). Because of the serious debates globally about the application of QALY, and the lack of a QALY definition nationally until now, the researchers of this paper will primarily keep to the level of CEA. However, in the interest of stimulating the expert debate and future analyses with or without the application of QALY, a simulation will be developed for some of the projects that were analysed so as to determine whether the results obtained by CEA will differ with or without the application of QALY.CEA is usually applied in deciding on the allocation of funds, and it measures the increased costs needed to achieve a greater health benefit expressed as a specific health outcome that differs depending on the treatment indication. The researchers performed this type of analysis retrospectively in order to identify the effects from the investments until now.

In order to test whether most of the conclusions coincide with the personal experience of health service consumers, a focus group interview was carried out (Appendix no.1). For the needs of this study, the organiser of the analysis announced a public call for applicants to take part in a focus group through its web page on the social networks on the following topic: "To what extent do citizens feel the investments in the health care"? Without entering into the reasons, from nine persons that initially applied to participate, only two of them showed up on the date that was set. Due to the small number of respondents and the lack of statistical basis, the data obtained from the interview was not taken for further analysis. The authors are aware of the need for obtaining the opinion of health service consumers, but at the same time, assessed that it was better to reduce the analysis quality for the benefit of objectivity. As a result, the further analysis took into consideration only the opinion of consumers obtained through the EHCI.

Despite all constraints identified for a complete CEA, the analysis was made primarily with the purpose of determining the initial effects from the investments until now by calculating the ratio of cost per unit of effectiveness and the ratio of effectiveness per unit of cost. The data available was analysed in order to draw initial conclusions, but also

to help identify the shortcomings of the current situation such as existence, recording and availability of data so as to enable the necessary conditions for pharmacological analyses in the future, which will help in the implementation of efficient reforms.

DATA ANALYSIS AND RESULTS

For the period 2010-16, the health expenditures were, on average, 4.9 percent of GDP, and from the total budget expenditures, on average, 15.7 percent went to the health sector. In absolute values, the annual health expenditures have a trend of continuous growth with an average amount of MKD 1.2 billion annually. The highest growth was in 2015, which was MKD 1.77 billion, compared to the previous year. For the development sub-programmes within the Ministry of Health (MoH), on average, 5.9 percent of the total health expenditures were allocated (the highest percentage was in 2012, i.e. 9.2%), but only, on average, 0.9 percent of the total budget expenditures (the highest percentage was in 2012 with 1.5%).

Table no.1: Annual expenditures in health care and their percentage share in the total budget expenditures

FINAL ACCOUNT ('000,000 MKD)	2010	2011	2012	2013	2014	2015	2016
GDP (World Bank)	435,684	498,858	454,626	482,777	574,481	566,656	635,727
Budget expenditures final account	142,692	148,649	155,837	159,505	168,062	180,632	185,407
Ministry of Health expenditures	2,147	2,648	5,545	6,018	5,560	5,851	5,631
Contributions for unemployed persons paid by MoH to HIFM			2,091	2,130	2,106	2,206	2,440
State Sanitary and Health Inspectorate expenditures					16	45	45
HIFM expenditures	19,806	20,967	21,436	21,887	22,571	24,120	26,031
Development sub-programmes health expenditures (part of the MoH expenditures)	939	1,284	2,280	2,184	1,479	1,235	1,175
Capital investments in health care	785	1,239	2,180	2,107	1,434	1,143	1,120
Total annual health expenditures	21,953	23,616	24,891	25,775	26,041	27,810	29,266
% health expenditures of GDP	5.0%	4.7%	5.5%	5.3%	4.5%	4.9%	4.6%
% health expenditures of total expenditures	15.4%	15.9%	16.0%	16.2%	15.5%	15.4%	15.8%
% development sub-programmes of total expenditures	0.7%	0.9%	1.5%	1.4%	0.9%	0.7%	0.6%
% development sub-programmes of total health expenditures	4.3%	5.4%	9.2%	8.5%	5.7%	4.4%	4.0%

Source: Final reports on the final accounts of the Budget of RM, Ministry of Finance and World Bank

Compared to the developed countries in Europe and the countries of the region, Macedonia is among the lowest listed countries according to the allocation of funds for health care. If in 2014, Sweden was listed on the top with health expenditure of 10 percent of GDP, and Albania was listed on the bottom with 2.9 percent, on the list, Macedonia is only positioned before Albania, Cyprus, Ukraine, Lithuania, Romania, Turkey and Montenegro. Hence, if we want to achieve the European quality level of healthcare services, it is necessary to allocate more funds, which will enable further improvement aimed at timely diagnosis and modern treatment.

However, this study should help understand the effects of the funds available and what has been achieved with the investments so far in promoting the healthcare capacities, which will result in improving the health of population. For these reasons, we started an in-depth analysis of the health expenditures, in particular for the development sub-programmes. Out of the total funds invested in development sub-programmes within the MoH amounting up to MKD 10.6 billion for the period 2010-16, 97 percent were allocated for capital investments, namely 60 percent were invested for procurement of medical equipment for the public HCIs, 23 percent for reconstruction of the existing public HCIs, and 14 percent for building clinical hospitals in Tetovo and in Shtip and for the Clinical Centre in Skopje. The remaining three percent are for implementation of other development sub-programmes. The investments distribution is shown on Graph no.1:

Graph no.1: Distribution of capital investments per sub-programmes in the health care for the period 2010-16 ('000.000 MKD)
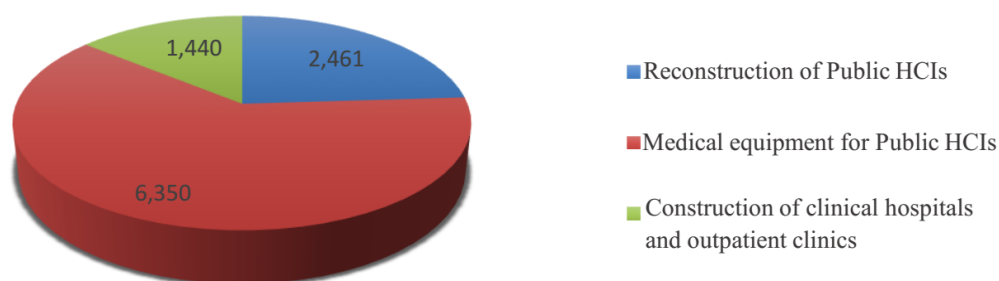
Source: Final reports on the final accounts of the Budget of RM, Ministry of Finance

It is evident from the data shown that the capital investments go exclusively towards reconstruction of existing and building new facilities and mostly in the procurement of new equipment, but not towards investment in education and additional training of the medical staff, which has a key role in the improvement of the health system efficiency and in raising the health service quality.

In the same period 2010-16, there is a rise in the total healthcare services provided to patients, but also in individual ambulatory and hospital services. The number of hospitalised persons was continuously rising throughout that period, with the exception of 2015, when it declined by 6.5 percent compared to 2014. Data about the number of healthcare services per years is given in Table no.2:

Table no.2: Number of healthcare services covered by the HIFM for the period 2010-15

NUMBER OF HEALTHCARE SERVICE	2010	2011	2012	2013	2014	2015	2016
Ambulatory services*					16,932,989	17,615,749	18,899,361
Hospitalisations (Public HCI + Private HCI)	208,674	206,418	210,308	223,439	234,642	219,297	223,163
Average length of hospital stays (in days)	5.9	5.8	5.7	5.5	5.5	5.5	5.3
Total services	208,674	206,418	210,308	223,439	17,167,631	17,835,046	19,122,524

Source: Annual reports of HIFM and annual work reports of DRG, HIFM
*HIFM has no data on ambulatory services until 2014

The decrease in inpatient care at the expense of ambulatory care, which on the one hand reduces the treatment costs, but at the same time also reduces the risk of additional nosocomial infections, is the goal of all health systems. This explains the expectations that investments will contribute to the decrease in inpatient care. It is evident from the data shown that this is not the case in Macedonia. However, to get a more accurate notion of the effects from the individual investments, it is necessary to make an individual analysis for different diseases.

For the needs of this study, and for CVD in the RM, we initiated an analysis of the hospitalisations and rehospitalisations. What is particularly important in the performance indicators of health systems are the rehospitalisations for a specific diagnosis within a given period. The data shows whether the patient was successfully cured and whether he/she was given proper instructions with medical therapy so as to prevent hospital readmission. An interesting fact is that the health systems, such as those in the U.S., have seriously noticed this problem concerning hearth diseases, because over 50 percent of all cases of hospital admission have been readmitted to hospital within six months of discharge. Initially, it was revealed that the problem was due to billing. Namely, the rehospitalisation brings in more money to the hospital treating the patient. Therefore, although that patient due to some pains could have been stabilised in an ambulatory care clinic, hospitals would readmit him/her. Some health insurances in the U.S. have resolved this issue by increasing the price paid to hospitals if the patient appears for the first time, and by reducing the price for rehospitalisation (Desai and Stevenson, 2012). In Macedonia, this is not the case because not only is the price the same, in accordance with the DRG methodology, but in the rehospitalisation cases, due to the greater number of procedures incorporated in the DRG coding, the price is higher compared to the first acute admission of the patient. Concerning rehospitalisations, their intensity is a direct indicator of the health service quality because the higher number of rehospitalisations indicate poorer health service quality. In accordance with the U.S.

source used, 75 percent of the rehospitalisations may be preventable if some recommended measures are undertaken. Rehospitalisations could never be reduced to zero, but the percentage should be as low as possible. In parallel, the percentage of rehospitalisations cannot be reduced to the same level in different healthcare institutions, particularly if they are from a different health care level. For instance, general hospitals would have a high percentage of rehospitalisations unlike clinical hospitals and the University Clinic.
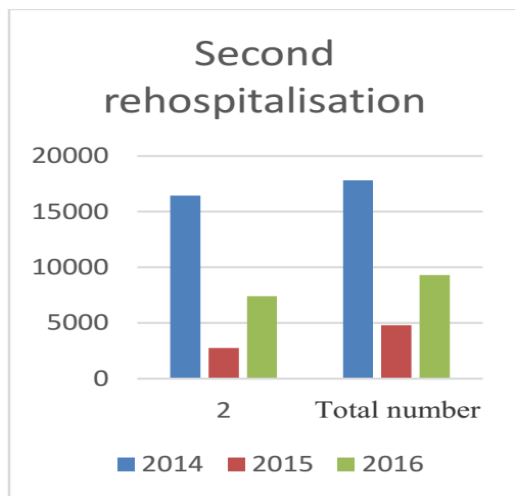
Graph No.2: Number of hospitalisations and rehospitalisations for the period 2010-2016
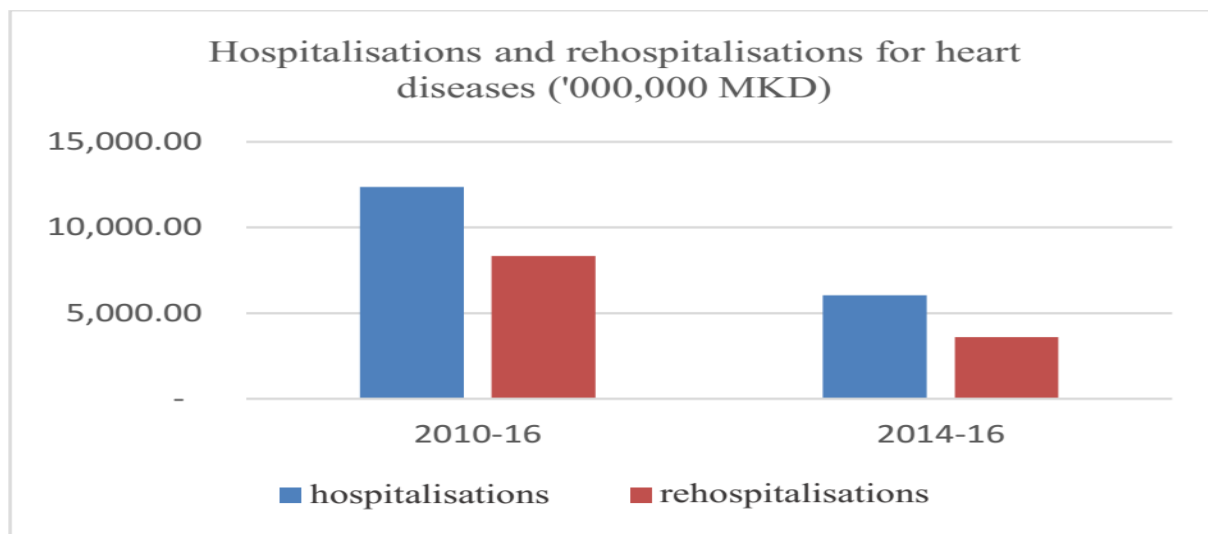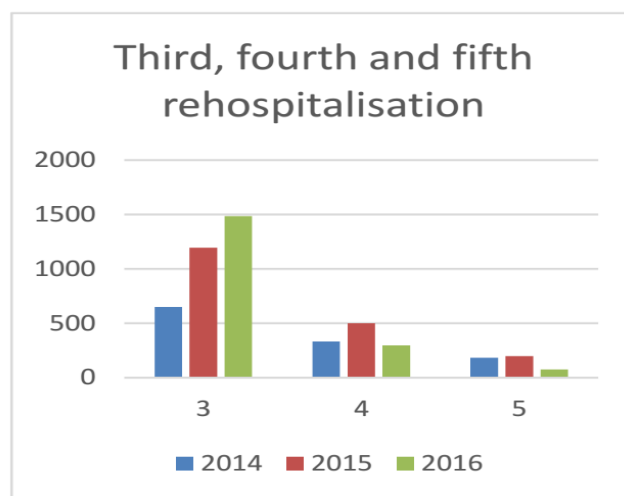

Source: HIFM

It is evident from the data shown in Graph no.2 that out of the total number of hospitalisations, 57.33 percent are rehospitalisations with 67.48 percent of the sum. The percentage of rehospitalisations is slightly better in the three-year period, 2014-2016, when 47.76 percent go to rehospitalisations with 59.45 of the sum. The period 2014-2016 (three years) was separately processed for rehospitalisations, in accordance with the number of rehospitalisations in the same patients, thus patients were differentiated per number of rehospitalisations by 2, 3-5, 6-10 with first admission per year. It was determined that for two hospitalisations, the number in 2015/2014 declined (Graph no.3), but for 2016/2015 it was again on the rise. For three hospitalisations it is continuously rising (Graph no.4), while for 4-10 hospitalisations it is in decline.

Graph no.3: Annual number of second rehospitalisation

Graph no.4: Annual number of third, fourth and fifth rehospitalisation after the first admission for the period 2014-16

The large number of rehospitalisations, particularly in the three-year period analysed, is a negative indicator of the health system concerning the hospital part for heart diseases. Certainly, it should be taken into consideration that the iteration of hospitalisations is partly due to the population aging and to the extended life expectancy, the disease gravity etc.

Mortality rate

All investments in the health care should lead to improvement and modernisation of the health capacities, with the purpose of enhancing the quality and efficiency of healthcare service, resulting in a decreased mortality rate, decline in the incidence, better health condition and quality of life. We took the mortality rate as one of the indicators demonstrating the effects of the investments in CVD prevention and treatment.

In the RM, mortality is still on a high level, compared to the European countries, and is on par with the countries of Eastern Europe and the developing countries. Cardiovascular diseases (CVD) are a leading cause for premature death in Europe and in our country. *In accordance with the IPH's public information, the CVD mortality trend in the RM has a tendency to grow, while in the past decades in Europe it is in decline. If in 2008 there were 531.8 deaths per 100,000 population, in 2015 that number increased and was 576.7 cases.* The mortality trend of circulatory diseases for the period 1975-2015, which has a tendency to grow, is shown on Graph no.5. At the same time, WHO's data do not coincide with IPH's data for the period until 2010. According to the WHO, the trend notes a decline in mortality. Unfortunately, 2010 is the last year of available data from the WHO. For this analysis for 2007, we used data from the WHO; and for 2015 from the IPH (as the most recent data).

Graph no.5: Mortality trend of circulatory diseases for the period 1975-2015
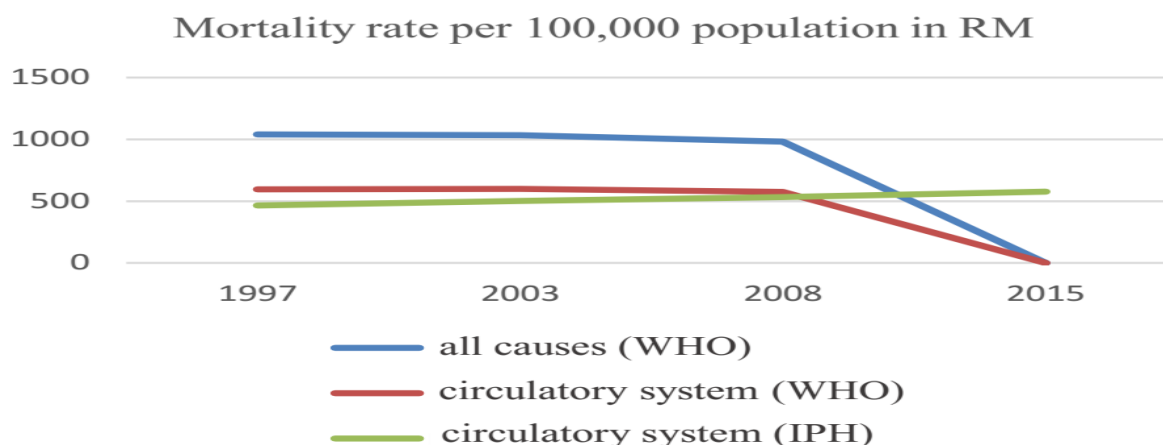
Source: Institute of public health and WHO

The Macedonian health care according to the European Health Consumer Index (EHCI)

EHCI aims at setting standards for a well-functioning and organised health system. According to this index, in 2014, out of the total 35 countries, Macedonia made the most remarkable advance in the EHCI scoring in the history of the index, moving from 27th to 16th place, mainly because of the elimination of waiting lists by implementing the "My Term" e-booking system; and in 2016, it dropped to 20th place. In 2014, according to EHCI, Macedonia got the best score regarding accessibility to healthcare services with 17 points, and it also showed the most remarkable score concerning patient rights and information with high 33 points, if we consider that the highest score of 35 points was achieved by the Netherlands that same year.

The improvement of the access to healthcare services is only one of the prerequisites for an efficient health system. Important parameters, which also demonstrate the efficiency of healthcare services as a result of successful reforms, are the quality of services, prevention, quality of medicines, facilities and equipment, and education of healthcare workers.

Therefore, what is worrisome is the EHCI score concerning the medical treatment results, as one of the most important indicators of a well-functioning health system, where Macedonia in 2014 had only 10 points, placed not only behind the economically more developed countries, but also behind its neighbouring countries, expect for Serbia, which had two points less. This position also did not change in 2016.

One of the indicators through which EHCI measures the treatment outcome is the mortality decrease from cardiovascular diseases (CVD). Unfortunately, the score of RM for this indicator was one, which means poor mortality decrease (Bjornberg, 2017; Stevanovic and Stevanovic, 2016).

In the next part of the study, for clearer inspection of the effects from different investments, we performed a segmented analysis of the different categories of investments: A. Treatment on all three levels of health care (equipment, capacities, staff, state cardiac surgery and medicines) and B. prevention.

A. TREATMENT

EQUIPMENT

Globally, health systems are compared according to the robust medical equipment per population. As a result, we compared the more important investments in order to see where the Macedonian health system stands vis-a-vis the European systems.

Out of the total MKD 6.35 billion invested in medical equipment for the period 2010-16, MKD 1.6 billion were invested in the procurement of 15 computed tomography scanners (CT scanner), six magnetic resonance imaging units (MRI), seven monopolar angiography systems, and two echocardiography ultrasound machines that are completely or partially applied during CVD diagnosis and treatment. The total quantities of some of the equipment with the total amount are given in Table no.3:

Table no.3: Investments in the procurement of medical equipment for the period 2010-15 intended for cardiovascular diseases

| EQUIPMENT	quantity	Total value with VAT ('000,000 MKD)
Computed tomography scanner	**15**	**736.9**
Magnetic resonance imaging	**6**	**624.2**
Monopolar angiography system*	**7**	**357.5**
Echocardiography ultrasound machine, mobile echocardiography machine	**2**	**10.6**

Source: Data received upon request for access to complete public information, Ministry of Health

*****The amount also includes preparation of the area, in accordance with the contract notice published, but unfortunately it does not separate the price of the angiography system from the total value**

Through the purchase of this type of medical equipment, the health system in R. Macedonia comes closer and becomes comparable, but only to a small number of countries in Europe. **With the new 15 CT scanners until 2014 and with the existing four CT scanners or 9.5 per 1,000,000 population, the health system in RM is only ahead of Hungary (8) of the European countries, and almost on the same level as the United Kingdom (9) in that year. Macedonia has 3.5 CT less compared to Slovenia, as the closest country regarding the beginnings of the health systems, number of population and proximity. With the six MRI purchased until 2014 and with the existing two, or four per 1,000,000 population, the health system in RM is again only ahead of Hungary (3), and is now on the same level as Russia (4.4) per one million of population for that year. The number of CT scanners and of MRI per 1,000,000 population for different European countries in 2014 is shown on Graph no.6 and Graph no.7 respectively:**

Graph no.6: Number of CT scanners per 1,000,000 population in 2014
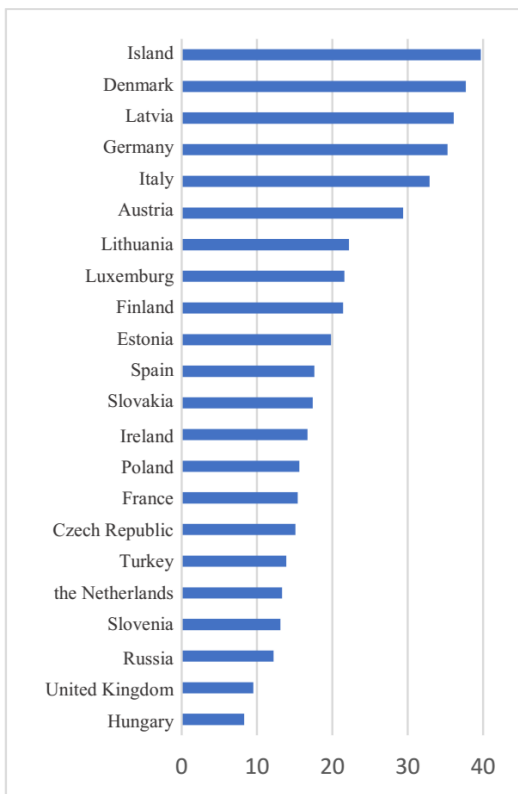
Graph no.7: Number of MRI per 1,000,000 population in 2014
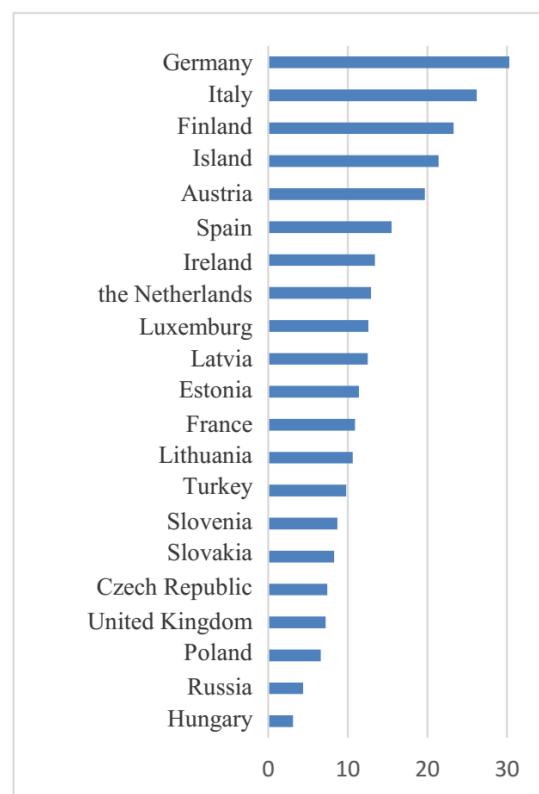
Source: Organization for Economic Co-operation and Development

It should be noted that investments in health systems in the countries worldwide are a continuous process, so the situation throughout the years is changing. Thus, in Slovenia, the number of CT grew from 13 to 14.1 per one million of population in 2016. Similar to the CT scanners, where there was a considerable advance in 2015 compared to the previous year, in Hungary, the number of MRI per one million of population grew to 3.6 from 3.1 in 2014.

Waiting list

The purchase of the equipment and putting it into service, expectedly resulted in enhancement of the health system in terms of modernisation of diagnostic methods, increasing the speed and accuracy and reducing the number of days in waiting lists. The latter is confirmed by the data obtained for 2017, compared to 2013. Thus, for CT, the number of waiting days decreased by 59 percent, from 100 to 41 days; while for MRI, it decreased by 47 percent, i.e. from 75 to 40 days. Data about the waiting lists in 2013 and in 2017 is shown in Table no.4:

Table no.4: Waiting list for diagnostic procedures

Waiting list (in days)	SEPTEMBER 2013	FEBRUARY 2017
Computed tomography	100	41
Magnetic resonance imaging	75	40
Echocardiography	30	20
Echo diagnostics	30	8

Source: HIFM and "My Term"

However, despite the low number of CT and MRI compared to other countries, the extent of the optimum use of the equipment purchased should be taken into account as well as the level of patients' actual satisfaction and whether they feel the benefits of these capital investments.

Besides the limiting factors addressed in the introduction to this study, an additional constraint for a full CEA analysis in reference to the equipment was the failure to obtain data about the equipment distribution per public HCI, the date when it was put into service and the individual value (the equipment was purchased in several occasions and a different unit value was achieved in the procedures conducted). Due to the lack of data on the equipment distribution per public HCI, and using the data obtained from the HIFM concerning the packages invoiced for MRI, CT and for angiography, we indirectly analysed the allocation of equipment purchased, and the numbers are shown in Table no.5 and in Table no.6:

Table no.5: Number of packages invoiced to HIFM for CT and MRI for the period 2014-16

Town	Public Healthcare Institution	COMPUTED TOMOGRAPHY				MAGNETIC RESONANCE IMAGING			
		TOTAL PACKAGES				TOTAL PACKAGES			
		2014	2015	2016	2014-16	2014	2015	2016	2014-16
Skopje	"MAJKA TEREZA" CLINICAL CENTRE	13,286	11,528	14,745	39,559	8,339	7,350	9,219	24,908
Skopje	"8 SEPTEMVRI" CITY GENERAL HOSPITAL	5,486	5,349	4,392	15,227	4,154	4,909	4,414	13,477
Skopje	UNIVERSITY CLINIC FOR SURGICAL DISEASES – "SV. NAUM OHRIDSKI"-SK.	3,089	3,493	3,021	9,603	3,214	3,206	2,509	8,929
Skopje	HEALTHCARE INSTITUTION SKOPJE	-	74	1,908	1,982				
Bitola	CH BITOLA	3,177	4,795	4,416	12,388	3,809	4,046	4,533	12,388
Tetovo	CH TETOVO	2,649	3,386	5,138	11,173	632	1,118	625	2,375
Shtip	CH SHTIP	3,040	3,345	2,010	8,395	1,579	883	2,233	4,695
Veles	GH VELES	1,961	2,355	2,274	6,590				
Gostivar	GH GOSTIVAR	3,439	2,691	2,068	8,198				
Kumanovo	GH KUMANOVO	3,568	1,576	3,660	8,804				
Ohrid	GH OHRID	2,508	2,902	3,259	8,669				
Prilep	GH PRILEP	1,727	2,349	2,767	6,843				
Strumica	GH STRUMICA	2,057	2,283	2,824	7,164				
	Total	45,987	46,126	52,482	144,595	21,727	21,512	23,533	66,772

Source: HIFM

Table no.6: Number of packages invoiced to HIFM for procedures in an angiography room for the period 2014-16

Town	Public healthcare institution / private healthcare institution that has concluded a contract with the HIFM	Angiography procedures covered by the HIFM			
		2014	2015	2016	2014-16
Skopje	Public HCI "MAJKA TEREZA" CLINICAL CENTRE	5,030	5,137	5,275	15,442
Skopje	Public HCI "8 SEPTEMVRI" CITY GENERAL HOSPITAL	-	165	908	1,073
Skopje	Private HCI SISTINA – CLINICAL HOSPITAL FOR CARDIAC SURGERY	365	446	327	1,138
Skopje	Private HCI SPECIAL HOSPITAL FOR SURGICAL DISEASES "FILIP VTORI" - CARDIAC SURGERY DEPARTMENT	556	531	532	1,619
Ohrid	Public HCI - CENTRE FOR PREVENTION, TREATMENT AND REHABILITATION OF CARDIOVASCULAR DISEASES	1,042	1,183	1,360	3,585
Bitola	Public HCI - CLINICAL HOSPITAL BITOLA	197	219	442	858
Tetovo	Public HCI - CLINICAL HOSPITAL TETOVO	52	321	404	777
Shtip	Public HCI - CLINICAL HOSPITAL SHTIP	361	622	666	1,649
Strumica	Public HCI - GENERAL HOSPITAL STRUMICA	-	286	394	680
	Total	7,603	8,910	10,308	26,821

Source: HIFM

From the three-year data on the package-services provide in relation to CVD, it is evident that 70 percent of the total number of MRI packages, or 46 percent of the total number of CT, were provided in Skopje. After the City of Skopje, the second town that provided the largest number of this type of services is Bitola accounting for 19 percent of MRI and 13 percent of CT. We noted the low percentage of packages for MRI (7%) and for CT (11%) for the Eastern-South-eastern region (Shtip, Strumica), and in the Polog region (Tetovo, Gostivar, Kichevo) four percent of MRI and 13 percent of CT, considering the number of population.

The reasons for the lower usage of services in Shtip and in Tetovo, vis-à-vis Skopje, could be due to the delayed putting of the equipment into service, lack of sufficient number of staff or timely trained staff for implementation of most of the packages, non-critical use of equipment in the Skopje region etc. **We cannot draw a more precise conclusion because of the absence of initial studies and lack of complete available data.**

Unlike the situation with the CT and MRI, concerning the angiography systems purchased, which have been put into service, the investment is exclusively related to CVD, and it is evident from the data obtained from the HIFM for the period 2014-16 regarding the interventions provided in angiography rooms that there is a more frequent use of angiography machines in the Eastern region, Shtip and Strumica (9%), compared to the Western region, Tetovo (3%), while the highest number of interventions are still provided in Skopje, i.e. 72 percent of the total number of interventions. To determine the reason behind the regional differences in the use of angiography systems, we should also take into consideration the education of staff and the number of staff available, which is subject to further analysis and conclusion in the following section of this study dedicated to staff.

CAPACITIES AND STATE CARDIAC SURGERY CLINIC

In the period that is subject to analysis of this research, out of the total MKD 10.0 billion that the MoH has invested in the period 2010-2016, 1/3 or 33% have been invested in reconstruction of the existing capacities or building new ones. When it comes to cardiovascular diseases, a total of MKD 42.6 million have been invested in setting up a state cardiac surgery clinic. This investment, along with the investments in equipment and staff, enabled the University Clinic for State Cardiac Surgery to have a continuous rising trend in cardiac surgery interventions in 2014.

According to HIFM's reports, 2015 and 2016 have seen a continuous increase in the amount of the co-payments agreed for cardiovascular surgery services in comparison to previous years, which is shown in Table no.7:

Table no.7: Co-payments agreed for cardiovascular surgery services ('000 MKD) and number of services

	Realised income (with co-insurance)				
Healthcare Institution	2014	2015	2016	2015 vs 2014	2016 vs 2015
Public HCI - University Clinic for Thoracic and Vascular Surgery	18,421	14,819	15,564	-19.56%	5.03%
Public HCI - University Clinic for Paediatric Surgery	65,787	54,880	50,670	-16.58%	-7.67%
Public HCI - University Clinic for State Cardiac Surgery	7,865	41,166	86,638	423.43%	110.46%
Private HCI "Acibadem Sistina"	335,102	349,176	349,265	4.20%	0.03%
Private HCI "Filip Vtori"	373,521	367,880	367,981	-1.51%	0.03%
TOTAL (MKD)	800,697	827,920	870,119	3.40%	5.10%
	No. of healthcare services				
Healthcare Institution	2014	2015	2016	2015 vs 2014	2016 vs 2015
Public HCI - University Clinic for Thoracic and Vascular Surgery	82	69	68	-15.85%	-1.45%
Public HCI - University Clinic for Paediatric Surgery	67	57	51	-14.93%	-10.53%
Public HCI - University Clinic for State Cardiac Surgery	20	110	254	450.00%	130.91%
Private HCI "Acibadem Sistina"	1,006	1,085	1,103	7.85%	1.66%
Private HCI "Filip Vtori"	1,133	1,108	1,123	-2.21%	1.35%
TOTAL (number of services)	2,308	2,429	2,599	5.24%	7.00%

What is encouraging is the fact that the state cardiac surgery has had an exponential growth in the number of healthcare services provided since its establishment. If the trend of increase in the number of healthcare services provided continues, and if the budget funds follow this trend of growth, the public healthcare system in the segment of cardiac surgery in the medium term could be expected to reach the number of cardiac surgeries performed in the private healthcare system, thus becoming one of the rare success stories of public health care in the Republic of Macedonia. For now, covering only 10 percent of the total number of cardiac surgeries, it still cannot impose itself as a serious competitor to the private healthcare system. Unfortunately, the lack of comprehensive and well-organised data on previous investments makes it impossible to conduct complete analysis with the aim of establishing and measuring their cost-effectiveness.

STAFF – MoH PROGRAMMES

Staff education in respect of CVD is covered by the cardiovascular disease prevention programmes of the Republic of Macedonia, which began to be implemented as of 2013. Through this programme, in the period of 2013-2016, the MoH invested a total of MKD 76 million. The largest portion, or 68.5 percent of the investment, was allocated to staff education, which at the same time is an investment in the treatment of patients. Programme costs broken down in different segments and years are shown in Table no. 8:

Table no. 8: Cost structure of cardiovascular disease prevention programmes in the Republic of Macedonia for 2013-2016

	2013	2014	2015	2016
Database	1,240,000	12,000	90,000	90,000
Evaluation	2,520,000	60,000	60,000	60,000
Staff education	3,720,000	4,408,000	22,470,000	21,470,000
Treatment	-	-	-	12,000,000
Population education	2,000,000	380,000	380,000	380,000
Planning	520,000	50,000	-	-
Miscellaneous	-	3,090,000	-	1,000,000
Amount in MKD	10,000,000	8,000,000	23,000,000	35,000,000

Source: Ministry of Health

According to the data obtained from the MoH, in the period from 2013, when the education programme for doctors and medical staff was adopted for the first time, up until 2016, there have been continuous investments in education of the existing staff and increase in staff size through new recruitments.

In order to develop the cardiology network, in the period of 2013-2016, the state cardiac surgery clinic for adults and children held 260 education sessions for doctors and middle-level medical staff from the cardiology units of the public HCIs. Also, two sub-specialty courses in the field of cardiac surgery were completed. During the same period, there have been new recruitments: 10 recruitments aimed at developing the cardiology network, 44 recruitments aimed at developing the state cardiac surgery and 7 recruitments aimed at developing the paediatric cardiac surgery.

In addition, in line with the programme, and aimed at educating the doctors and medical staff for development of the cardiology network, the state cardiac surgery for adults and childr

With reference to the data for the period 2014-2016 about the greater frequency of interventions in the angiography rooms in Shtip and Strumica (9%) in comparison to the Western region, and having regard to the fact that it was exactly in the Eastern region that intensive investments were made in educating doctors and developing the cardiology network, it can be concluded that the investments in equipment and staff in this sub-segment yield results.

For the period 2010-2012, i.e. before the introduction of the programme in the MoH, which is also part of this study, the MoH did not submit data on staff education completed. Also, there were no specific data on the distribution of staff education events per public HCI that could make it possible to conduct an analysis of the total investments per public HCI and of the benefits thereof.

This is another example that shows insufficient transparency of the data on healthcare investments.

Public HCI - University Clinic for Cardiology – angiography laboratory

The available information on interventions performed in the angiography laboratory of the Public HCI - University Clinic for Cardiology allow us to make an analysis of the investments in terms of procurement of angiography systems for treatment. Two angiography systems were put into operation in this institution. Their value amounts to MKD 86.5 million. Other investments, according to the information obtained from the clinic, are related to staff and include: education of the existing staff, new recruitments and specialty trainings. For the latter, there is no accurate financial data available that could be added to the investment in equipment and show the total investment value for this type of interventions.

The results from the investments in equipment and staff in the University Clinic for Cardiology can be evaluated through the performance of the angiography laboratories, as one of the indicators. Therefore, an analysis was carried out on the annual number of total interventions performed in the angiography laboratories, as well as on individual interventions (percutaneous, carotid and peripheral) for the period 2007-2016 and they are shown in Table no.9:

Table no.9: Total number of interventions per year in the angiography laboratory of the Public HCI - University Clinic for Cardiology for the period 2007-2016

Total number of interventions in the angiography laboratory of the Public HCI - University Clinic for Cardiology in the period 2007 – 2016					
Year	Total number of patients	Percutaneous interventions	Carotid interventions	Peripheral interventions	Total number of interventions	Total interventions to number of patients ratio
2007	2888	1235	5	4	1244	43%
2008	3465	1428	27	7	1462	42%
2009	4097	1721	67	8	1796	44%
2010	4282	1966	76	16	2058	48%
2011	4679	2301	111	16	2428	52%
2012	4497	2371	110	21	2502	56%
2013	5220	2835	124	31	2990	57%
2014	5417	2826	100	43	2969	55%
2015	5326	2772	117	87	2976	56%
2016	5661	2832	109	70	3011	53%
	45532	22287	846	303	23436	

Source: Data obtained from the Public HCI - University Clinic for Cardiology by submitting an application for access to public information

There is an evident continuous growth in the total number of interventions throughout the period for which data is available, except for 2012 and 2015 when the annual number of interventions has decreased by 3.9 percent, i.e. 1.7 percent, in comparison to the previous years, which after all has no statistical significance. In the last three years, the average annual increase in the annual number of total interventions is smaller in comparison to the period 2011-2013 (for the period 2014-2016, the average increase in the number of interventions amounts to 147 vs 313 for the period 2011-2013).

The general conclusion that can be drawn from this is that there is a trend of increase in the total number of interventions in the angiography laboratories of the clinic as a result of investments in equipment and education of staff, and in response to the needs of the patients. However, it should also be noted that the annual figures depend on the service demanded, i.e. the established indication, and of course, they are limited by the existing capacities and available resources.

When analysing the data on individual types of interventions, it can be observed that the increase is present in all three types of interventions: percutaneous, carotid and peripheral interventions, when compared to 2010. *Such an increase in the annual number of peripheral interventions is due to the increased number of staff and their training to perform this type of interventions. However, from the point of view of pharmacoeconomics, in order to determine the cost-effectiveness of the entire investment, it is necessary to have a detailed overview of the invested funds broken down in categories in order to measure the extent of their effect.*

In the last three years, there has been an increased number of hospital deaths following a percutaneous intervention during the hospital stay. If the number of recorded cases in 2014 has been only one, in 2016 it reached 23. Expressed as percentages, although statistically insignificant, 0.81 percent of the patients in 2016 suffered hospital death, which is the highest percentage for the period 2014-2016[21] and is in line with the expected risk margin. This is due to the additional training of staff and to the admission of increasingly more difficult cases of multi-vessel coronary disease and stenting of left main stem coronary artery; procedures that have previously not been performed and where patients were usually sent to bypass surgery.

Table no. 10: Hospital death cases following a percutaneous intervention during the hospital stay in the Public HCI - University Clinic for Cardiology for the period 2014-2016

Year	PCI	Hospital death cases	
		no. of patients	%
2014	2826	1	0.04%
2015	2772	5	0.18%
2016	2832	23	0.81%

Source: Data obtained from the Public HCI -University Clinic for Cardiology by submitting an application for access to public information

MEDICINES

In the RM, the consumption of cardiovascular medicines has been prevalent in the primary health care (PHC). According to HIFM's annual reports, 2016 has seen a total of 9.67 million prescriptions being dispensed, which is the largest number for the period of 2010-2016 and accounts for 43.4 percent of the total number of prescriptions covered by the HIFM. The number of prescriptions dispensed for CVD in 2016 shows a 56 percent increase in comparison to 2010 and a 4.8 percent increase in comparison to 2015. Data about the number of prescriptions dispensed for CVD in PHC expressed as millions of prescriptions are shown in Graph no. 8:

Graph no. 8: Number of prescriptions dispensed for CVD in PHC for the period 2010-2016 expressed as millions
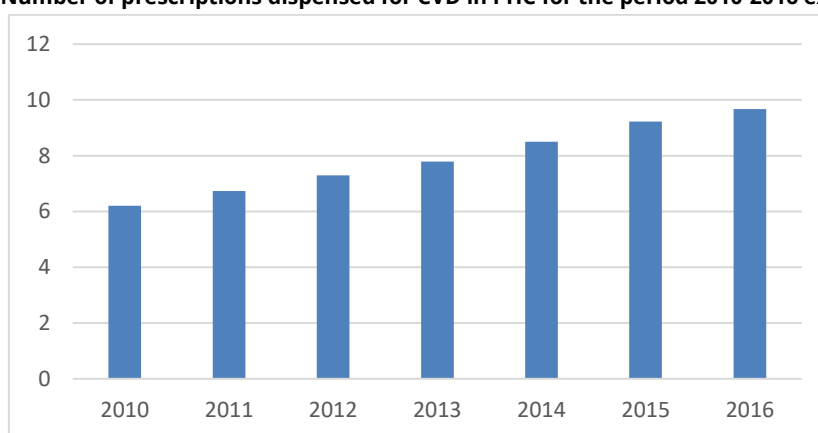
Source: Annual reports, HIFM

The increase in prescriptions dispensed is accompanied by an increase in the amount of funds allocated for this group of medicines on annual level with the total amount exceeding MKD 700 million in 2016, which is a 59 percent increase in comparison to 2010. This growth, however, does not reflect the absolute annual incidence, since HIFM's budget for medicines is limited and proportioned to every legal entity that issues prescription medicines. In the event of exhausting HIFM's funds, the prescription medicine shall be paid by the patient as out-of-pocket expenditure, and as such, it shall not be registered in the records of dispensed prescriptions in HIFM's reports.

In the consumption of medicines in 2015 and 2016, the medicine "Clopidogrel" is included at the expense of HIFM. Namely, as of 01/11/2014, the list of medicines covered by the HIFM has been extended to include the medicine "Clopidogrel", indicated for prevention of atherothrombotic events and prevention of atherothrombosis and thromboembolism in patients with atrial fibrillation. For the purpose of introducing this medicine in the positive list, in 2016, the HIFM allocated MKD 20.9 million, which at the same time can be considered as an investment. Table no.11 shows the number of prescriptions on an annual level and the total amount that the HIFM has allocated for dispensing the prescriptions for this medicine:

Table no. 11: Annual consumption of the medicine "Clopidogrel" covered by HIFM for the period 2015-2016

Clopidogrel	2015	2016
No. of prescriptions	59,977	84,768
Amount (MKD)	14,700,527	20,884,260

Source: Information obtained from the HIFM

It should be noted that this medicine was approved and released for the first time in the U.S. in 1997, and also in Europe a year later. The number of prescriptions dispensed points out to the need for using this medicine to prevent undesired events in 7,000-14,000 patients on an annual level, which for the majority of health insured persons was not available up to 2015.

The introduction of a new medicine in the positive list for CVD is not the case with the other therapeutic groups. *The failure to set up commissions, in accordance with the manner and methodology for introducing new medicines in the list of medicines covered by the HIFM that was introduced in 2012, made it impossible to have continuity in the modernisation of the therapy. In the context of CVD, the introduction of "Clopidogrel" 17 years after its release on the global market is a belated investment, taking into consideration the necessity of its use in large number of patients and the risk of a fatal outcome if not used.*

B. PREVENTION

In line with WHO's guidelines, the HIFM introduced the obligation for prevention check-ups of insured persons by their respective general practitioners. WHO's recommendations regarding the prevention were based on the projections that the health systems will become increasingly burdened by the most common chronic non-communicable diseases – CVD, diabetes and kidney diseases, because the number of people who suffer from those diseases will become increasingly higher and because of the fact that, year after year, the health systems will be facing increasingly higher expenditures for this type of diseases. Treatment is always much more expensive than prevention. The chronic patient, for a long and continuous period of his/her life, will have a limited working ability and, at the same time, will incur bigger expenses to the healthcare budget. Preventive check-ups in the form of obtaining standardised results about the level of risk were introduced as part of the work of the general practitioners, targeting a certain age group of insured persons in a 2-year cycle. The first cycle that was completed in 2014-2015 covered 100 percent of the insured persons at the age between 14 and 65, whereas the second cycle that was completed in 2016-2017 covered 90 percent of the insured persons at the age between 35 and 56. This was done because it was established that the biggest potential risk for developing a CVD in the next 10 years of life of the insured person lies exactly with this age group.

For methodological comparison, the 35-56 age group from the first cycle was singled out, as well as the first year from the second cycle.

For the purpose of prevention and early detection of these diseases, the HIFM measures the performance of general practitioners expressed as percentage for each disease individually, as well as a certain percentage for secondary prevention (advices, monitoring the health condition, brochure on the disease) of patients who have already developed the disease.

This research has only covered the persons with cardiovascular prevention. Data on the programmes implemented in the period 2014-2016 are shown in Table no. 12:

Tabel no. 12: Implemented CVD prevention programmes among insured persons at the age between 35 and 56 for the period 2014-2016

CARDIOVASCULAR PREVENTION GENERAL PRACTITIONERS among healthy persons at the age between 35 and 56	Year		
	2014	2015	2016
Total capitation paid – general practitioners (MKD)	1,820,013,916	1,875,105,657	1,971,961,088
Maximum funds for CVD for potentially healthy patients (MKD)	127,400,974	131,257,396	98,598,054
Capitation percentage	7%	7%	5%
Number of prevention exercises performed on healthy persons at the age between 35 and 56	173,783	149,080	196,266

Source: Information obtained from the HIFM

Capitation percentage is the amount paid as part of the fee calculated by the HIFM for each patient individually. In the first cycle (2014-2015), as part of the capitation fee, the HIFM allocated the maximum amount for cardiovascular disease prevention, which amounted to 7 percent of the capitation of the general practitioner, whereas for the second cycle, it amounted to 5 percent of the capitation. The number of prevention exercises performed on healthy individuals at the age between 35 and 56 refers to insured persons who paid a visit in person to their general practitioner for this purpose. The insured persons who were invited but failed to show up in the office of their general practitioner are not taken into consideration.

The identification of risks is based on lab tests (blood lipids) and on the age group of insured persons along with their blood pressure, and smoking as a risk factor, in accordance with the risk matrix for countries with low and medium living standards and with high risk of developing heart diseases. The HIFM together with the association of cardiologists, the Public HCI University Clinic for Cardiology and the Heartscore risk charts (heartscore.org – interactive tool for assessment and management of the risk of heart attack and cardiac arrest) adjusted and published, and distributed them to all general practitioners. The general practitioners filled out the prevention forms electronically by

entering the data in the software of the HIFM – donation from the Association of General Practitioners of the Republic of Macedonia (ZPLRM). The risk assessment itself is a percentage of the likelihood of death occurring as a result of cardiovascular event (heart attack, stroke, etc.) in the following 10 years. 0-5 percent shows low and medium risk, 6-10 percent shows high risk, and above 10 percent shows extremely high risk. The results on the levels of risk among insured persons covered by prevention programmes are shown in Table no. 13:

Table no. 13: Risk of developing heart disease among the population between 35 and 56 years of age

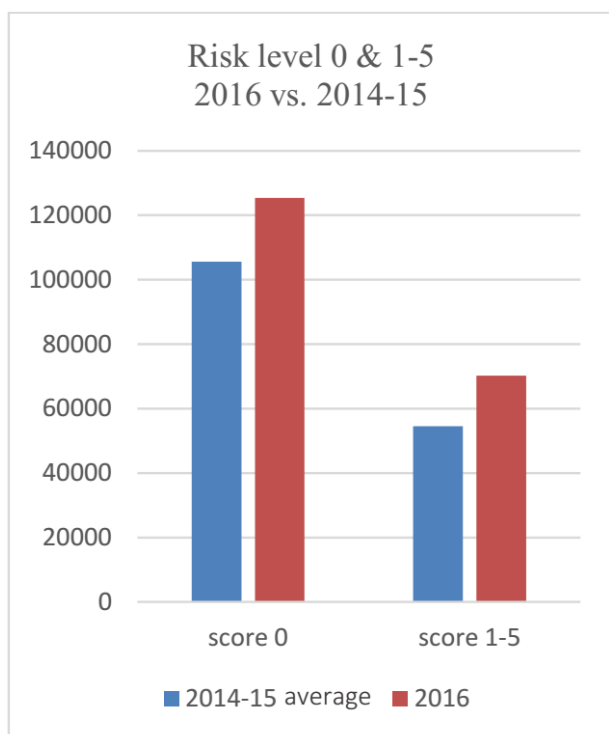| Prevention programme results	2014		2015		2016	
	number	%	number	%	number	%
Low or medium risk (0-5% deaths in 10 years)	172,133	99.05%	148,100	99.34%	195,572	99.65%
High risk (5-10% deaths in 10 years)	1,571	0.90%	916	0.61%	659	0.34%
Very high risk (over 10% deaths in 10 years)	79	0.05%	64	0.04%	35	0.02%
Total number of patients covered by the CVD prevention programme	173,783		149,080		196,266	

Source: Information obtained from the HIFM

In order to calculate the number of patients that belong to each risk group, average values of the percentages in the risk group were used, except for the group of very high risk where it is set at 10 percent of the number in that group.

Risk to insured persons expressed in terms of numbers (from the first cycle of prevention in 2014 and 2015) shows that 8,005 persons with low and medium risk and 201 persons with high and very high risk will die as a result of a cardiovascular event in the next 10 years, provided that they don't change their life habits (stop smoking, lose weight, stop taking in fats and salts, and start exercising). It is important to note that all these persons will still be fit for work in the category of people up to 65 years of age.

What could be noted as a positive indicator is the number of insured persons at the age between 35 and 56 in the category of high and very high risk, which shows a decreasing trend after the first cycle, whereas the number of persons with low and medium risk is increasing, which is evident from Graph no. 9 and Graph no. 10:

**Graph no.9: Risk level 0 and 1-5
2016 vs 2014-2015**

**Graph no.10: Risk level 5-10 and >10
2016 vs 2014-2015**
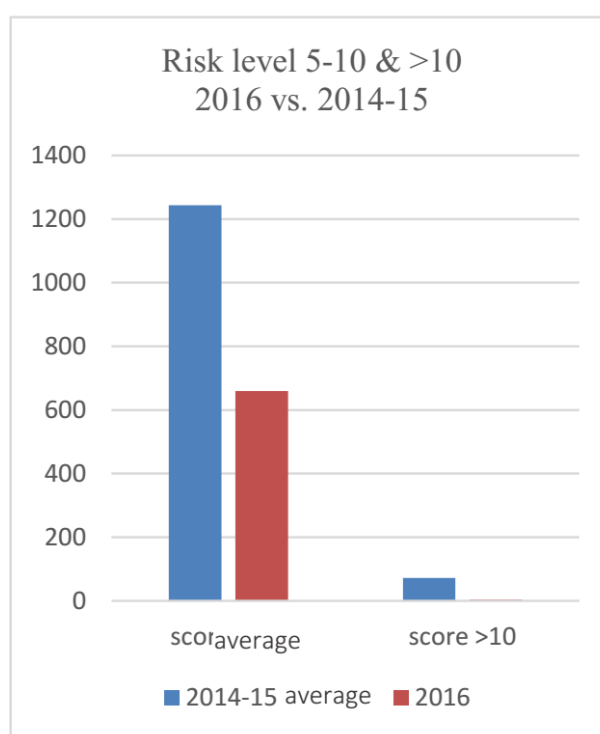
Source: Information obtained from the HIFM

This speaks of the positive effects of the prevention programmes aimed at reducing the death rate in such a way that the insured persons take measures for the benefit of their own health, after receiving recommendations and advice.

COST-EFFECTIVENESS ANALYSIS

In order to identify and measure the effects of the investments that have been made so far, a retrospective CEA (cost-effectiveness analysis) was conducted. With the aim of triggering an expert debate and further analyses, QALY was additionally applied to some of the analyses by simulating some of the projects analysed. Concerning the cost-effectiveness threshold, the recommendation of WHO was taken into account, i.e. three times GDP per capita, and without the two weightings.

C= monetary units
E= non-monetary value of effectiveness (for example, lives saved)

C/E = ratio of cost per unit of effectiveness – (having a lower ratio from various projects is better)

E/C = ratio of effectiveness per unit of cost (higher ratio is better)

1GDP per capita (2015) = EUR 4,377.00 = MKD 269,186

QALY cost-effectiveness threshold = 3 x GDP per capita = 3 x MKD 269,186 = MKD 807,557

Q – health weighting

Y – adjusted life years

Although it does not fall within the period of 2010-2016, which is subject to this analysis, in some of the analyses that were performed, 2007 was taken as an initial year before the beginning of the investment cycle, which is subject to this analysis, in order to have an insight into the situation before and after the investments were made.

In accordance with the data that is available, an analysis was conducted on four different projects, for which data is available for a period of at least five years, or where the effects were evident within a shorter cycle. From all individually analysed data presented in the results, the following four topics have the required minimum parameters for further analysis. The projects that lack the required minimum parameters for CEA are not included in this analysis, however, they are discussed in the separate chapters within this study and individually they have a certain value.

From the analysis of the four projects, the following results were obtained, as shown in Table no. 14:

Table no. 14: Project ranking according to their cost-effectiveness

Projects E/C sorted – higher is better; C/E sorted – lower is better	C/E	E/C
1. Lives saved from CVD risk through prevention check-ups by general practitioners	31,520.64	0.0000317252
2. Justification for increasing investments vs patients treated in hospitals 2010 vs 2015	33,700.46	0.0000296732
3. Patients treated in an angiography room vs purchased angiography machines (Public HCI University Clinic for Cardiology) 2007/2015	49,967.01	0.0000200132
4. Lives saved vs total investments	8,748,277.90	0.0000001143

1. **Lives saved from CVD risk through prevention check-ups by general practitioners**

2014-2015		C/E	E/C
C (total amount paid for CVD prevention in potentially healthy insured persons)	258,658,370	31,520.64	0.0000317252
E (potential deaths detected)	8,206		

C/E – MKD 31,520.64 for one life saved from CVD

E/C – 31.73 insured persons saved from potential death from CVD per MKD 1,000,000 paid out

The HIFM has paid MKD 258.7 million for preventive screening for CVD to general practitioners, whereby a total of 322,863 insured persons at the age between 35 and 56 were examined in the period 2014-2015. *According to the level of risk of a fatal CVD outcome in the next 10 years detected through the screening, out of all risk groups, 8,206 insured persons will have a fatal cardiovascular outcome in the next 10 years. Since this preventive screening made it possible to detect the risk before the disease has even developed, it is believed that the lives of these 8,206 patients will be saved if they observe the recommendations, hence their life expectancy will be extended for additional 10 years at least, which is within the expected life expectancy in the RM.* In this case, QALY is additionally used with a weighting 1 (perfectly healthy before and after screening).

In the graphs, the threshold is presented with a green line, so everything below the green line shows cost-effectiveness.

Graph no.11: QALY of lives saved from CVD risk through prevention check-ups by the respective general practitioner

Life years without prevention   Adjusted life years with prevention
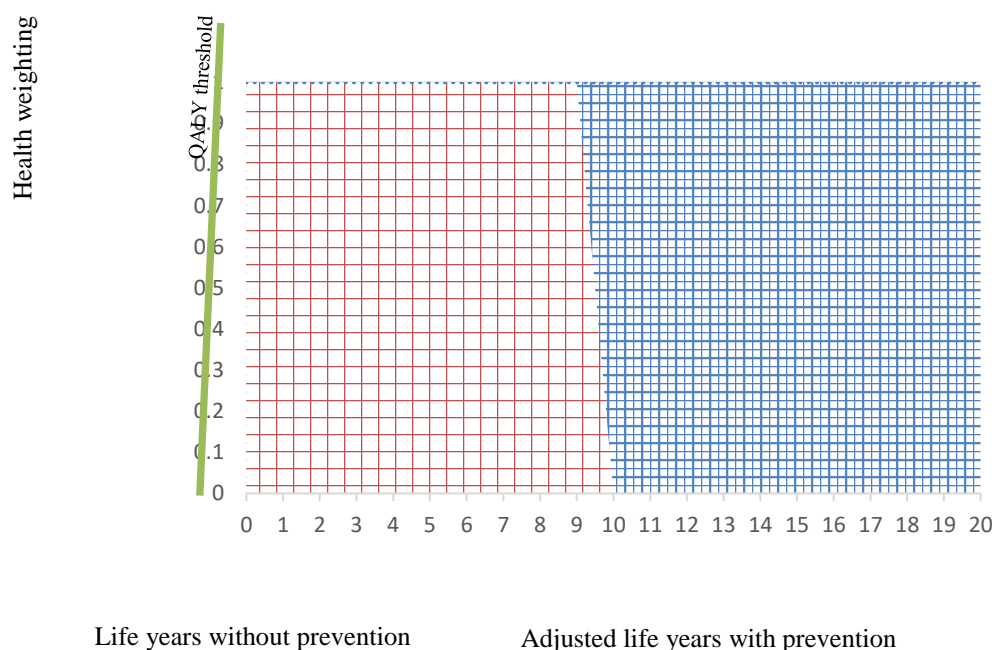
Y = 20 years – 10 years = 10 years
Q = 1
10 QALY = MKD 31,521
QALY = MKD 3,152

The result of MKD 3,152 obtained for QALY (1 additional year in perfect health) is much below the cost-effectiveness threshold which amounts to MKD 807,557. In terms of lives saved, it is even an ultra-efficient health measure according to the WHO that categorises as ultra-efficient all health treatments/interventions that are lower than GDP per capita, which in this case in Macedonia amounts to MKD 269,186.

2. **Justification for increasing investments vs patients treated in hospitals in 2015 compared to 2010**

			C/E	E/C
2010	**C (MKD)**	785,000,000	**3,761.849**	**0.000265827**
	E (hospitalisations)	208,674		
2015	**C (MKD)**	1,143,000,000	**5,212.110**	**0.000191861**
	E (hospitalisations)	219,297		
2015/2010	**C (MKD)**	358,000,000	**ICER** **33,700.461**	**0.00002967**
	E (hospitalisations)	10,623		

C/E – MKD 33,700.46 additionally invested funds per additionally treated patient in hospital

E/C – 29.67 additionally treated patients per additional MKD 1,000,000

This analysis shows that with the increase in the level of investments as of 2010, for additional MKD 358,000,000 that are spent, at the same time, there is an increase in the total number of hospitalisations for 10,623 in 2015, including those as a result of CVD, when making a year by year comparison. Although, as an indicator, it makes a direct link to the additionally invested amount of MKD 33,700 per additional hospitalisation, it is not an absolute value because the increased number of hospitalisations is, primarily, affected by the health condition of the insured persons and the need of hospitalisation. **This increased value should not be used as an indicator, i.e. it doesn't mean that if MKD 1,000,000 is invested in healthcare now, additional 30 patients will be hospitalised. This value refers to the period analysed and it cannot be reflected in an upcoming period. Especially due to the fact that every healthcare system aims at reducing the number of hospitalisations in the long term, thus reducing the inpatient care cost.**

When analysing this project, we do not use QALY cost-effectiveness threshold because the weightings before and after hospitalisation, due to the different pathology, are not known, and neither are the adjusted life years after hospitalisation.

3. **Patients treated in an angiography room vs angiography machines purchased (Public HCI University Clinic for Cardiology) 2016 in comparison with 2007**

| 2016/2007		C/E	E/C
C (total value of angiography machines purchased in MKD)	85,319,900	48,285	0.0000207
E (additionally treated patients in the angiography room)	1,767		

For the purpose of this CEA, the data that is used refers to investments for procurement of new, additional angiography machines and adjustment of premises, as well as additional diagnostic and interventional equipment that did not exist prior to the period of investment. The investment value does not include the amount spent on staff education due to the absence of precise data in the form of monetary units, which if available, would have provided a more realistic picture.

An investment of MKD 85.3 million makes it possible for 1,767 patients to be treated additionally in 2016 compared to 2007 (the year before the investment cycle). The results obtained are as follows:

C/E – MKD 48,285.00 additionally invested per additionally treated patient

E/C – 20.71 additionally treated patients per additional MKD 1,000,000

Graph no.12: QALY for patients treated in angiography room vs angiography machines purchased (Public HCI University Clinic for Cardiology) in 2016 compared to 2007
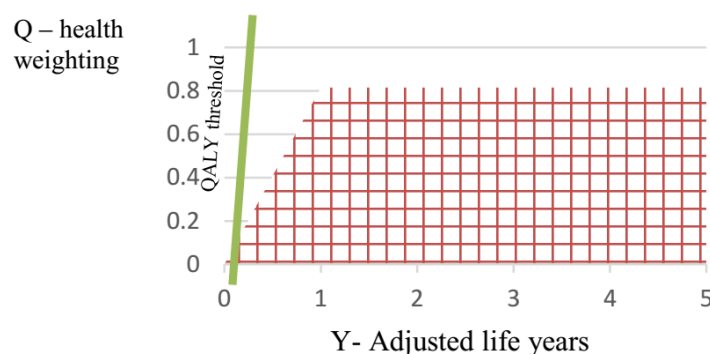
In order to measure the QALY, it was assumed that all patients treated in the angiography room are in a life-threatening health condition and that a stent has been inserted to save their lives. Therefore, as an initial Q, the researchers take 0 (death). After the intervention, in the absence of local data, the U.S. weighting in value of 0.815 (Maud et. al 2010) was used. At the same time, in accordance with the assessment of the community of cardiology professionals, a period of five years was taken as an average period of

extended life expectancy without additional complications or need for repeated intervention. Therefore:

Q = 0.815

C/E = MKD 48,285

Y = 5

QALY = Q x (C/E) / Y = 0.815 x MKD 48,285 / 5 years = MKD 7,870

The result of MKD 7,870 obtained for QALY (one year without any health problems) is much below the cost-effectiveness threshold which amounts to MKD 807,557. In terms of lives saved, this value also shows an ultra-efficient health measure in accordance with the categorisation by WHO.

4. **Lives saved vs total investments**

This analysis used the latest mortality rate data published by the Institute of Public Health for 2015 and compared them with the mortality rate data from 2007 published by the WHO as a source of more relevant statistics, because the data republished by the Institute of Public Health for 2007 do not tally with the figures of WHO. In respect of this discrepancy, a separate recommendation was given which appears as a third general recommendation in the section that refers to discussion and conclusions.

The analysis takes into account the difference in the total mortality rate versus the total investments in health care.

| 2015/2007		C/E	E/C
C (2010-2015 in MKD)	8,890,000,000	8,748,277.90	0.000000114
E (lives saved, mortality rate difference in 2015 compared to 2007)	1,016.20		

C/E – invested additional MKD 8,748,277.90 per life saved

E/C – 1.143 patients saved per additional MKD 10,000,000 invested

In this case, because we are talking about mortality caused by various diseases, we cannot apply a deduced health weighting. At the same time, due to the different age groups of patients included in the total mortality rate, adjusted life years cannot be established either. Therefore, the analysis is reduced only to a CEA, adjusted for the time period that is used for comparison. The adjustment factor in this case would amount to six, since it involves investments for a six-year period of comparison (2010-2015), unlike the comparison of the mortality rate in 2015 and 2007 on an annual level. *The newly established*

value amounts to additional MKD 1,481,333 per life additionally saved on annual level. This value, in comparison to the recommended cost-effectiveness threshold that amounts to MKD 807,557, is higher and points out to lack of cost-effectiveness of the total additional investments compared to the additional effect from them. **The results are presented in Graph no. 13 where the X-axis shows the period that is being analysed, whereas the Y-axis shows the amount of investments on average or per years adjusted to the decreased mortality rate during the period (1,016.2 of the total population). The mortality trend is also included.**

Graph no.13: Total capital investments vs cost-effectiveness threshold vs mortality trend in the period 2010-2015
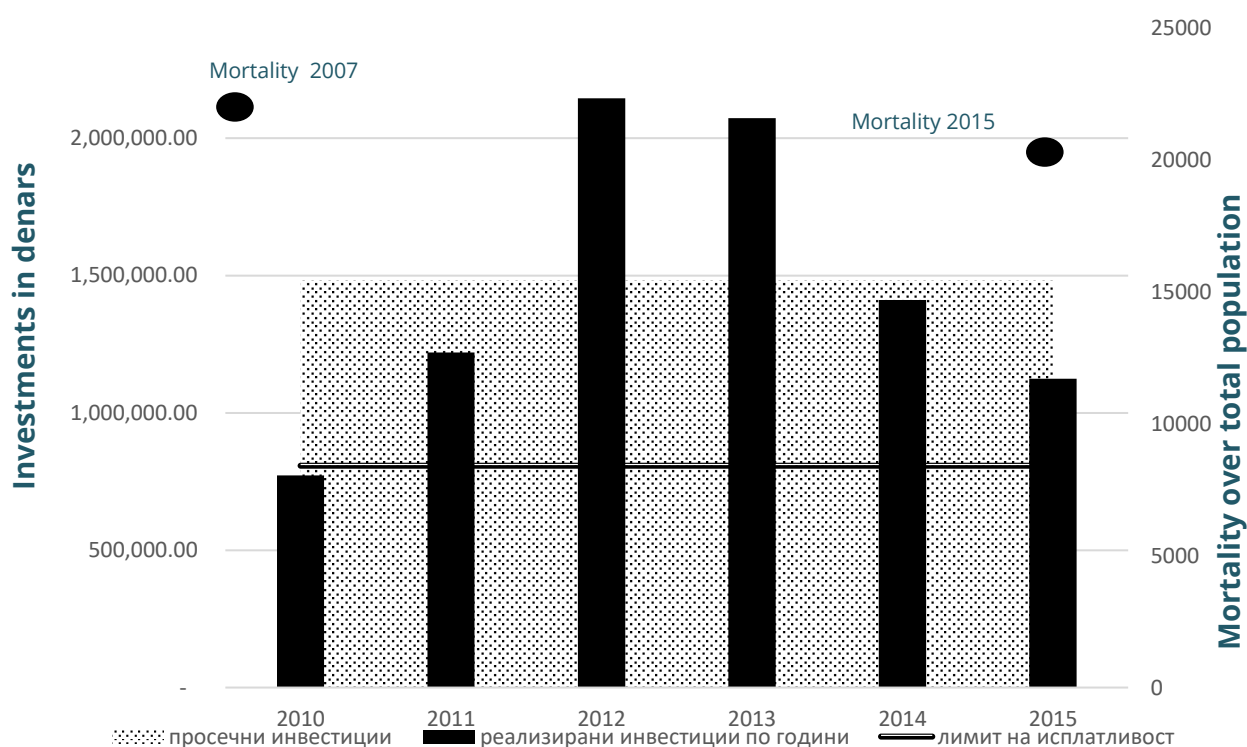
By looking at the data shown in the graph, it can be concluded that the additional total investments for the period 2010-2015 exceed the cost-effectiveness threshold. At the same time, the slight decrease in the mortality rate during the period analysed does not coincide with the funds that have been invested.

The analysis of the individual projects can affirm the cost-effectiveness of additional investments only in some of the projects (CVD prevention check-ups by the respective general practitioner, procurement of angiography machines), but not in all of them. Therefore, targeted investment of the available funds is needed for increasing their cost-effectiveness, which in the end would result in improved outcome from the treatments and improved health condition of the population. The projects that were subject to QALY analysis correlate with the ranking of the projects by the CEA analysis. In these cases, the

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value of QALY gives a clearer picture because it includes the adjusted life years. Therefore, it is necessary for the healthcare authorities to keep health statistics on health weightings and adjusted life years, at least from a purely methodological point of view for comparison purposes when developing health strategies.

DISCUSSION AND CONCLUSIONS

Health as a factor that has an impact on the social status of the population, and as a prerequisite for economic development of the country, is a strategic priority, hence, the investments in continuous improvement and reform of the health system. The real effects from the investments made in the health sector through the implementation of numerous projects would become visible and would be felt after a period of 5 to 10 years following their implementation. Given that the health investment cycle that is subject to this analysis ends in 2016, it is too early to draw final conclusions on the effects produced. However, the analysis that was conducted, and the discussion involving the data that is available, provided certain conclusions and recommendations that are useful for the health authorities. Some of the conclusions can be used as indicators for further research and monitoring of the effects from the funds invested.

For further improvement of the health services and for their approximation to the European standards, it is necessary to make a short-term increase from 4.5 percent of GDP for the healthcare budget in 2016 to 6.0 percent, in comparison to the average of the countries in the region (Serbia, Croatia, Bulgaria and Slovenia), which are also reference countries for the HIFM. This increase should be based on identified priorities supported by pharmacoeconomic analyses. This growth should be driven by continuous efforts for meeting the increased needs of keeping the population healthy as one of the prerequisites for economic development of the country, and considering the current situation of the healthcare system, where high CVD mortality rate of 577 per 100,000 people, low level of successful therapy outcome in comparison even with the other developing countries, and lack of diagnostic and therapeutic capacities point out to lack of investments or low cost-effectiveness of investments, if any. However, before making a step towards allocating additional funds, it is necessary to look into the effects produced by the investments that have already been made: whether cost-effectiveness can be increased with the current resources and how, and where additional investments are needed.

In terms of improving the management of resources that are available in the country, as well as in the healthcare system, it is necessary that the health authorities rely on evidence based on cost-effectiveness analyses, and to adopt decisions on future

investments by following the example of the European countries. This necessity is also pointed out by the World Bank in its report from 2015, where it describes the public spending efficiency in Macedonia in comparison to the first 16 European Union member states (World Bank, 2015). The index of public spending efficiency in Macedonia is ranked at the low 10th position, which points out to the possibility of achieving better results with the existing resources or achieving the same results with fewer public resources. This also refers to giving priorities in the decision-making process concerning the introduction of new treatments, procurement of equipment, introduction of new procedures or modern innovative medicines on the positive list.

Therefore, one of the main general recommendations is that in the future, before making decisions on new investments in the healthcare sector, pharmacoeconomic and health economic analyses should be conducted. Applying the recommendations from the analyses when deciding where to invest taxpayers' money and additional, multi-annual monitoring and analysis of the effects of investments will contribute towards improving the effects of the funds invested.

When conducting the analysis, it was impossible to fully analyse the data and to measure the effects produced by the investments, mainly because of the absence of available and precise data (for example, investments in state cardiac surgery, staff, etc.). *Therefore, the second general recommendation is to establish a regular practice of transparency and accountability for the budget funds spent by the Ministry of Health and all the public HCI.*

The existence of epidemiological data, which at the same time is essential, is the basis of every health policy, which is not the case in the RM. For a country that claims to have a developed health system, it is unacceptable not to have data on mortality, incidence and prevalence of all diseases, especially of the most common and life-threatening ones, for a period of seven years. Basic objective of the transparency of the healthcare authorities, apart from informing the general public, is to enable the data to be analysed by independent experts who will have access to them, thus giving their contribution in the improvement of the health policy and future reforms. Therefore, we give the third general recommendation according to which the *Ministry of Health, together with the IPH and the WHO, should take measures and activities on harmonisation and publication of all epidemiological data related to the indicators that are being monitored and compared in countries around the world*.

The CEA undoubtedly confirmed that the investment of the healthcare Denar is more efficient when it is invested in prevention, which at the same time contributes to a healthy and fit-for-work population. Early detection of the disease, continuous monitoring and timely treatment of the patient will not only reduce mortality, but it will also indirectly contribute towards reducing inpatient care costs. *Due to the aforementioned reasons, the recommendation is to continue in future with ongoing and long-term investments in CVD prevention. With relatively small amounts, and with an observable*

effect even in the short-term, prevention programmes should continue to be the main focus of future investments/reallocation of available funds.

However, it should be noted that every citizen of the RM is legally entitled to health care which is based on the unity of the preventive, diagnostic-therapeutic and rehabilitation measures, and on the principles of affordability, efficiency, continuity, fairness, comprehensiveness and provision of good quality and reliable healthcare treatment. Therefore, it is necessary to create conditions for timely diagnosis and efficient treatment of the patients. *The continuous growth in the total number of hospitalisations year after year, the increase of CVD rehospitalisations, which at the same time is a negative indicator of the health system, should be a red flag for the health authorities that should deeply commit themselves to identifying the reasons and taking health measures to reduce them.* Exhausting the options for outpatient treatment or treatment in a day care hospital in accordance with the medical assessment, if the patient has a slight deterioration of his/her health condition, should continue being a goal in the treatment, before considering inpatient care. Introducing, for example, deterrence measures affecting the budget of the institution in the event of rehospitalisations, and indicators, both for public and private healthcare inpatient clinics, for monitoring their work, should help in improving outpatient treatment and reducing the number of hospitalisations.

The following recommendations give an overview of the individual investments and the effects of investments on treatment.

Equipment – *The procurement and putting into service of modern equipment as part of the capital investments has initial positive effects on: increasing its accessibility to the patients and reducing the number of days spent on the waiting lists for CT and MRI.* The possibility for modern diagnostics and the use of available capacities are reflected positively in some segments through the increase in the number of services provided for the period 2014-2016. *On the other hand, comparative analyses with other European countries show that the Macedonian health system still needs to continue purchasing large diagnostic equipment, such as CT, MRI, etc. However, before making a decision on starting a new cycle of investments of this type, a more detailed previous analysis should be conducted concerning the level of usage of the existing equipment and its rational use and* to identify the reasons for disproportion in the number of realised packages in different public HCIs in Skopje and in Macedonia. In fact, conducting regional/institutional pharmacoeconomic analyses identifying the specific needs of the population in different regions will help in identifying precisely how many new MRI and CT machines are needed, if any, and where they should be put into service, thereby taking into account the long-term strategy for disburdening the tertiary health care based in the capital city from cases that could be treated on secondary level. *Before proceeding with the purchase of new equipment, in addition to the decision based on pharmacoeconomic analysis, it is necessary to ensure that all prerequisites have been met*

both in terms of space and in terms of recruitment and training of staff in order to be able to put the equipment into service as soon as it is delivered.

Capacities – From the capital investments, it is evident that they are exclusively focused on reconstruction of the existing and construction of new facilities, immediately after the procurement of the medical equipment. *The refurbishment of the existing facilities and/or the construction of new facilities in times of limited financial resources, regardless of their necessity, points out to the need of previous detailed analysis, timely and comprehensive planning and timely implementation. The outdated capacities that have not been renewed for many years cannot justify the lack of planning and rationality when investing in their renewal.*

Staff – *The data analysed shows that the past capital investments have been primarily focused on the procurement of new equipment and partly on modernising the capacities; however, they have not been focused on education and additional training of the medical staff.* **Investments in staff are unfortunately only partially visible and the effects are partially measurable. Positive effects were identified through the increase in the number of interventions and the introduction of new interventions. In the absence of more detailed information on this type of investments (individual amount, allocation per healthcare institution and effectuation period), we could not give a more precise overview.** *The advancement and modernisation of medicine speaks clearly of the future need to plan funds for continuous education, in such a way that it will accommodate the specific needs of the current situation, thus further upgrading the knowledge in a particular field. Further balanced and continuous training of specialists from different regions is needed, in order to strengthen the cardiology network and reduce the pressure on the healthcare institutions in Skopje region.* **Effects can be observed by monitoring certain indicators and by perceiving the customers and measuring their satisfaction with the health services.** *Ensuring sufficient and high-quality staff is vital for improving the efficiency of the health system, maximum utilization of the equipment and of the other available capacities and raising the quality of health services.*

- ❖ **Medicines – Investing in new modern medicines is, certainly, one of the factors that has a positive impact on the final outcome and on the effects from the therapy. According to the example with the CVD, there are 7,000-14,000 patients every year who have direct benefit from the introduction of "Clopidogrel" on the list of medicines at the expense of HIFM. Considering that this medicine became available to health insured persons in Macedonia 16 years after its initial release in Europe, it raises the question whether earlier and much better effects could have been achieved had funds been allocated to this medicine much sooner?** *If the modern innovative therapy is seen as an investment that will improve the health condition of patients, by identifying the expected benefits from the therapy and from the financial implications, the funds could be planned timely and in the long term. Nevertheless, the objectivity and criticism in the decision-making should be left to the experts in the respective field, whose engagement will restore and maintain the process of regular and timely updating of the positive list.*

Finally, with regard to the new investment cycle, the recommendation to the healthcare authorities would be that future policies and decisions should be based exclusively on analyses produced by the expert and professional community, and the effects from the public money invested should be measured by using previously established indicators. In order for this to happen, they should provide accurate and public information, transparency and accountability in their work. Only in this way we can be sure that taxpayers' money is spent rationally and with a view to improving the health and quality of life of the population in the Republic of Macedonia.

Acronyms:

RM	Republic of Macedonia
GDP	Gross domestic product
EHCI	European Health Consumer Index
CVD	Cardiovascular diseases
IPH	Institute of Public Health
WHO	World Health Organization
Public HCI	Public healthcare institutions
MoH	Ministry of Health
CBA	Cost-benefit analysis
CEA	Cost-effectiveness analysis
CUA	Cost-utility analysis
QALY	Quality adjusted life years
NHS	National Health Service – United Kingdom
U.S.	United States of America

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FOCUS GROUPS

In the period of initial presentation of the analysis and research results, the organiser recommended that we introduce a more humane aspect in the analysis. That is to say, to test a larger part of the conclusions to see whether they coincide with the opinions of the beneficiaries of the health system, and with the personal experiences of the citizens who used health services. In July, the organiser announced a public call for applicants to take part in a focus group regarding the topic: "To what extent do citizens feel the investments in health care"? Out of the total of nine participants who were initially registered, only two of them showed up. In order to obtain more appropriate answers and information, the participants responded not only about their personal experiences with the health system, but also about the experience of close family members. The two participants were from different sex and different city. They were below 30 years of age, and responded about themselves, and in addition, participant number 1 responded also about the experience of her mother and father, and participant number 2 responded also about the experience of his mother and underage child. The interview was conducted by researchers in the premises of the organiser. Before asking the questions, some general health topics were covered, i.e. the participants talked about the health services that they used in the past period, as well as the services used by members of their family. Participant number 1 had a minor surgery six years ago, after previously been subject to a huge number of specialist examinations in the public and private healthcare system. She stopped using gynaecological health services from her gynaecologist because echo-imaging was always charged. The father of participant number 1 used cardiology services, i.e. he suffered a cardiac arrest, and participant number 1 accompanied him from the moment of developing the condition at home up to the discharge from the university clinic. Her mother used a lot of specialist health services, mainly at the university clinics. Participant number 2 had a medium-major surgery in 2015. His mother takes regular therapy for blood pressure and blood lipids on regular basis, as well as pain killers. Three months before, she used specialist health services from ophthalmologists and from an orthopaedist at the university clinic. At the beginning of the calendar year, his child used health services of a general practitioner, doctor on duty, because of high temperature and cough. Both participants share their good and bad experiences sincerely and openly, and they gave sincere recommendations that the researchers to a large extent agree with. The participants confirmed that their gynaecologists charge them illegally, since they believed that the examination covers only the discussion that they are having with their gynaecologist, and if he/she uses equipment during the examination, they believed that this is not covered by the Health Insurance Fund, so therefore the gynaecologists charge them. Both participants pointed

out that sometimes general practitioners do not have a lot of time for the patients because of queues and administrative tasks, and therefore, they refer them to specialists, although they have the knowledge to provide treatment, for example, for eye infection, etc. Both participants agree that the investments in health care do not have equal coverage, not only within the same healthcare institution, but also between different healthcare institutions. Both participants suggested that the general practitioner should be allowed to treat them independently for certain diagnosis, without referring them to a specialist. Participant number 1 said that the emergency service in her town was equipped with the necessary apparatus and managed to diagnose cardiac arrest immediately. However, the department of internal medicine did not have the necessary equipment to affirm the diagnosis, so they referred her father to the University Clinic for Cardiology where the diagnosis was confirmed immediately and the necessary intervention was carried out. Regarding the intervention that was performed on her, she said that the department of surgery was equipped to the maximum, unlike the department of internal medicine. Participant number 2 said that for the purpose of diagnosing his mother's eye infection, she had to be referred from one specialist in ophthalmology to another, since the first ophthalmologist was not able to establish diagnosis and prescribe therapy as he/she didn't have the necessary equipment, so she had to go to the other end of the city. Both participants reported that some doctors should improve their relationship with the patients and that this also applies to pharmacists/technicians in the pharmacies. Although the required information was pointed out to them, some pharmacists acted more professionally than others. For example, when buying fever syrup in the same pharmacy, the pharmacist warned them that the product has a shelf life, whereas the technician failed to do so. Both participants agree that doctors should not be financially burdened, i.e. they should have higher salaries, and they believe that this will lead to patients receiving better health services. Both participants emphasised that more investments in healthcare are necessary, as well as reconstruction of the buildings and investment in education of medical staff. When making investments and performing reconstruction, the entire building or department should be taken care of, because, for example, in one healthcare institution in one settlement, the specialists do not have any equipment and use old and manual equipment, while in another part of the city, the same profile of specialists have the latest computerised equipment. The other participant said that in the same hospital, one department has new equipment and is fully refurbished, both the interior and the exterior, whereas the other department neither has equipment, nor is internally or externally refurbished, and they are both on the same floor. According to their experience with the healthcare system, both participants underlined that specialists from different fields have a different level of knowledge, for example, surgeons immediately establish diagnosis, whereas dermatologists and internal medicine specialists are not so skilful in this. One of the participants had a really bad experience. In a period of two years, she

made use of more than 20 specialist services from specialists in dermatology and venereology, even private specialists, but in the end, the diagnosis was established by a surgeon as soon as he/she examined the case and performed the required intervention. Her mother visited the clinics of internal medicine and haematology during a period of 18 months and had more than 30 specialist reports with different diagnosis. On the other hand, in the case of her father, the cardiologist immediately performed an intervention and there has not been any deterioration so far. Participant number 2 confirmed that the same applies to another hospital in another city, where he was admitted to the surgery department and within three hours he was examined and subject to lab tests, echo diagnostics, anaesthesiology assessment, surgery and waking up. Following this personal experience, according to his statement, maybe the hospitals here do not look like the hospitals in Germany, but the doctors show highest level of professionalism and the healthcare system, in comparison with the neighbouring countries, is way better.

Based on the questions included in the questionnaire, the following responses and comments were received: The questions prepared for the participants are provided below, and for the purpose of greater efficiency, the answers will be given underneath each question:

1. Both participants have their own general practitioner, and they are satisfied with their work; one of the general practitioners has work experience of over 5 years and the other has work experience of 15 years. Both participants agree that the general practitioners can independently treat large number of diseases, without referring the patients to a specialist.

2. When asked: In the past two years have you or a member of your family been referred to a diagnostic examination (specialist/clinic)? (Yes, responded by both of them)
a. Have you been subject to an examination performed by large diagnostic equipment (CT/MRI/angiography machine)? *(Challenging to draw a conclusion) (One of the participants referring to the experience of his/her mother – amazed by the CT equipment itself and by the short time in which they got the results and the medical report, as well as by the fact that they were able to open and see the images at home).*

3. What is your experience when it comes to the waiting period for appointment/referral to a specialist for further examination? (In some cases, excellent, and in some cases not, depending on the area of specialism.)
a. Were the examinations performed in your place of living? (*If not, it should be examined why the patient was referred to another town*) *(Both participants had their examinations performed both in the town where they live and in the capital, because of the specificity of the examinations.)*
b. How would you assess the waiting time for undergoing an examination/ medical procedure: fast/ normal/ slow? (One responded fast and the other responded normal.)

c. How many days / months did you have to wait? (One responded that the examination was performed in the same day and the other responded that he/she had to wait for 7-10 days. However, for certain specialist, there was no available term for appointment in the upcoming three months (*Challenging to draw a conclusion*)).

4. **Have you or a member of your family had a surgery in the past two years? (Yes, responded by both of them.)**

5. **What is your experience with the time needed to make an appointment for surgery? (Excellent, responded by both of them.)**
a. **How would you assess the waiting time: fast/ normal/ slow? (Fast, responded by both of them.)**
   b. **How many days / months did you have to wait?** *(Challenging to draw a conclusion) (Zero days, responded by both of them)*

6. **Generally, how would you assess the attitude of the medical staff? (Mixed experience. In some cases, excellent, in some cases - not.)**
a. **Did they explain to you the procedures and the meaning of the diagnosis? (Some of them yes, some of them no.)**
   b. **According to your opinion, what level of knowledge did the medical staff show in terms of your health problem? (For some diagnosis they had the knowledge, for some they didn't.)**
   c. **Did the medical staff came to see you, or you were the ones looking for them? (Both.)**
   d. **Was it necessary for you to look for a second opinion on the results and recommendations provided? (For some diagnosis no, and for some diagnosis yes.)**

7. **What is your experience with the medication therapy that is available?**
a. **Have you bought a prescription medicine in the past two years? (Yes, responded by both of them.)**
   b. **Did you have any problem obtaining the required medicine?** *(If yes, please explain the problem in more details: not having a prescription, having to look for the medicine in several pharmacies, having to pay additional money, obtaining the medicine but from another producer, etc. Was the problem resolved and how?)* **Some time ago, one of the participants was not able to obtain the medicine in the closest pharmacy because the quota was exhausted.**
   c. **How satisfied are you with the service of the employees in pharmacies? (Both participants are satisfied with the service provided by the pharmacists, but not so much with the service of the pharmacy technicians.)**
   d. **To what extent did the pharmacy employees explain to you about the therapy that you should take? In some cases, everything was explained to them, and in some cases, they were just given information about the number of times per day that they should they take the medicine and nothing else.**

8. **How much do you agree with the statement that in the past three years the waiting time for examination/medical procedures has been reduced as a result of investments in health care?**
   (chose from 1 to 5)
   5 – I completely agree (one of them)
   4 – I largely agree
   3 – I neither agree nor disagree
   2 – I slightly agree (the other)
   1 – I do not agree at all

9. **How much do you agree with the statement that in the past three years the patients are more often referred for examination/medical procedures to Skopje despite investments in health care in other larger towns?**
   (chose from 1 to 5)
   5 – I completely agree
   4 – I largely agree (one of them)
   3 – I neither agree nor disagree (the other)
   2 – I slightly agree
   1 – I do not agree at all

10. **What are your major remarks/ suggestions concerning the use of services in the public healthcare system? (Because of the large volume, all of them are provided in the text on this topic.)**

FISCAST
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