Index Based Funding Model to Depoliticize Outpatient Healthcare: A Case of Lithuania

Funding of healthcare services has recently become a hot topic among economists, thus is attracting new economists with various backgrounds and experiences. The aim of this article is to find exogenous variables which influence the demand for outpatient care services and provide a depoliticized and clear outpatient service funding index model. This is done by analysing the findings of other authors and forming of a possible conceptual model. The goal is to refocus outpatient care payments from being a political decision to a decision based on the market demands, that is – exogenous factors and provide a transparent and more representative funding model. The application of the Index for the years 2010–2015, has showed that in order to maintain the same level of quality of outpatient care services as in the year 2010, additional 130.30 million Euros were needed.

Keywords: healthcare system funding, primary care funding, outpatient services funding, health economics.

JEL Classifications: H51/I11/I18.

Introduction

Lithuania, with a population of less than 3 million, exhibits one of the fastest aging populations in the EU (Šurkienė, 2012) which creates an increasing burden on the already strained healthcare system, especially – outpatient care. With the steady increase of life expectancy, increase of average age of population and decrease of the
workforce primarily due to emigration it became evident, that outpatient healthcare service funding model can no longer be based on sole number of the work force as it is not sustainable to heavily tax available workforce which is already in decline (Bouman, Horne, Milasi and Prasad, 2015).

With the increase of outpatient care service demand and due to the aging population and increasing demand of funding to sustain same level of services, government used the financial crisis of 2007–2012 to cap and freeze the wages of public healthcare sector employees. Such measure was supposed to solve the constantly increasing demand for outpatient healthcare services funding. While capping the total expenditure, it presented a negative push to lower the quality of services in order to be able to fit the same budget. Moreover, Lithuania is undergoing a push to reform its health care sector, thus refocusing funding and infrastructure from inpatient care to outpatient care and outpatient services. Various exogenous factors are influencing the demand for outpatient healthcare services, among which are the constantly changing demographics, out of which one of the biggest influencers is the aging population (Šurkienė, 2012). While there has been an evident decrease of funding for inpatient care, a relevant or proportional increase of funding for outpatient care is yet to be seen.

The aim of this paper is to form a conceptual depoliticized outpatient care funding model based on independent external variables.

This article has the following tasks:

1) Describe the healthcare model for outpatient care funding and Lithuanian case.

2) Distinguish and evaluate variable groups and discrete variables for testing of conceptual outpatient health care model.

3) Evaluate the model and provide conclusions for the feasibility of the model in Lithuanian outpatient healthcare system funding.

The methods used in this article are empirical analysis of previous researches in the outpatient funding field and statistical analysis of Lithuanian statistical data. Statistical analysis is done by the use of SAS/Stat 9.4 statistical analysis software.

**Outpatient Healthcare Funding Model: A Case of Lithuania**

Lithuania features a mixed healthcare funding model. While outpatient healthcare insurance is covered by the state for all of the employed or directly covered population (elderly, students etc.), service providers are of mixed employment and whole systems follows mixed funding model with a tendency to feature more of elements from Beveridge model. Yet outpatient service funding can be considered a purely political decision as it is decided by the ministry based on the pressures from market actors and available funding. There are no market or supply-demand forces present in assigning outpatient services budgeting or fixing individual service compensation sums. From the view of the public funds, this could be seen as an advantage as such budgeting offers complete control over service costs. Yet it also forces the market participants to cope with their rising costs of services by capping or lowering the quality of services (Weisbrod, 1991; Hussey, 2013). As shown in Figure 1, pricing in the current financial model is individualised per service. The pricing is set and adjusted purely on the political will and availability of funding, thus it eliminates the market factor completely (Segall, 1983).
Outpatient healthcare service financial compensation model is priced individually per specialty (Service A; B; C). Each market actor is compensated for his services by predetermined price (Price X; Z; Y) of his services. Pricing for each specialty is set individually, and as per previous mention – largely determined by the market forces behind each actor. Such price setting for compensation model presents several possible key issues:

1) Price setter might not always be aware of all the micro level information and details concerning adequate price for compensation (Ferlie, 2016). This issue alone presents possibility of “over financing” or inadequate financing of services provided. First scenario of over financing would present the issue of unjustified over financing of outpatient healthcare services. Over financing would present heavy burden for the healthcare system and inflate the price of services in the long-run. On the other hand, under financing became systematic. Systematic underfinancing underscores service quality assurance and effectiveness of services provided (Williamson, 1994). Due to systematic underfinancing, there is little incentive provided for the market participants to develop their skills or maintain the assigned quality of provided services.

2) Price setter might not be able to set prices as fast as market fluctuates (Maynard, 2017). Price setter might try to have a dynamic approach to price setting of services, yet this approach requires men power and presents with list post other issues. Such price setting has a tendency to lag behind short-term information relevant to changes in prices; it has a tendency to “guess” the market dynamics, thus present the possibility of “wrong guess”. Such a “guess” can overestimate the dynamics and lead to short-term over/underfunding and greatly contribute to long-term market fluctuations as market participants might try to use fluid situation in their favour. As market develops, these issues pose difficulties to balance the market.

3) Market actors might develop an advantage over price setters (Trein, 2017). Such relationship might lead to one group gaining advantage over the market setting, thus creating imbalances in the market. Such imbalance would favour one group over another and again make price setting a very hard task for the price setters and additionally would compromise effectiveness and financial burden.

With the main issues discussed above, it is evident, that passive price setting model is not an ideal nor effective model for such heavily constrained outpatient healthcare budget. Yet all the issues mentioned above have one variable in common – dynamics of time. All the issues mentioned arise due to inability to adjust
to market dynamics in reference of time or trying to compensate this inability with prediction of various variables of the market. In the end, the price set for services of individual outpatient healthcare services is solely a political decision based on current financial capabilities and considering short-term dynamics, while predicting the future trends of the market (Segall, 1983; Wilsford, 1994).

Conceptual Outpatient Healthcare Index-Based Funding Model

History has seen many attempts to implement some form of dynamics in financial compensation models for the services provided. One of many models was UK's early NHS model (1991) where healthcare ecosystem was split into two: suppliers and providers. Such form of separation introduced the “market concept” into the healthcare system, yet it only inflated the prices of the services and set the whole system on the upward spiral of price increase. Lithuania has chosen a different approach and implemented a semi index model which is not based on external variables, rather on pure political decision and its main task is to speed up the price adjustment process and simplify the procedure of bulk changes of the prices (Lithuanian National Health Insurance Fund data) given the economic situation.

Since the reestablishment of Lithuanian Republic, there has been a consistent push to reduce the massive healthcare system and to reform it to more agile and outpatient care oriented model. Due to reforms there has been a declared shift to outpatient care from inpatient care. As such, there has been a gradual reduction of hospital beds per 1,000 inhabitants, which has seen a reduction of 43 percent from 1991 (1,246.53) to 2016 (709.16) when comparing beds per 1,000 residents. Reduction of hospital beds effectively means decrease of funding for inpatient care. Yet there has not been consecutive re-evaluation of outpatient care funding, nor re-evaluation of compensation of outpatient care services. Last massive re-evaluation was done in the year 2010, thus creating imbalances in services.

In this article we are discussing a possibility to implement a conceptual payment model for reimbursement of outpatient care services. Our analysed conceptual payment model is to be considered as a part of full-scale model, not a standalone solution. The main characteristics for the analysed model are to be:

1. Adapted and useable by the government reimbursement scheme. Model is to be implemented in Lithuanian healthcare system. Thus, the proposed model must consider that price setting and payments are being done by the government, not the patients.

2. Model must provide sufficient dynamics to balance the market fluctuations to adequately represent the demand for services in the market. One of the key issues of current Lithuanian model is the lack of representation of market dynamics, trends in service delivery costs and influence from certain market participant groups.

3. Increase the degree of independence from political decisions in regards of funds allocation and individual pricing for services.

4. Provide degree of market demand representation of demand for funding. It is vital that conceptual model would offer a degree or market demand representation in retrospective and a degree of demand forecasting (prospective), while providing adjustment to the real time pay-outs as shown in Figure 2.
5. Must be easy calculable, based on publicly available open variables.

Based on these characteristics, authors are proposing an implementation of conceptual index-based intermediary model for reimbursement of outpatient healthcare services as broadly detailed in Figure 3. The use of intermediary index-based funding can provide the necessary degree of market demand representation, increase of responsiveness of funding in regards of market changes and reduce the price setter load of manual and constant adjustment of service prices (Enthoven, 2014).

In this model, all the reimbursements for services would be adjusted based on specified market variables at the predetermined dates and expressed as an Index ($\beta$). Price setters would be able to determine and influence the re-evaluation of index parameters but would be unable to change the value of the index itself. Such indexing of reimbursement would not provide the market with the “best and true price” yet would offer a dynamic approach in the short-run to compensate for fluctuations in the changes of market situation.

The conceptual index has three distinctive stages as shown in Figure 4. The given index would work as a short-term adjustment tool and would be reset at the predetermined period (1; 2; 5 years etc.). The initial value of the index is to be 1. Thus, the monetary transfers at the initial time period would be unaltered. The variable value of index would be adjusted monthly quarterly, dependent on the availability of data. While the new index value of index would be set every 1, 2 or 5 years with the reset of the index value to 1 and re-evaluation of all individual prices of services. Such forced re-evaluation would serve dual purpose, simplify the reimbursement process as there would be less needed to maintain the dynamic index and additionally – force the price setters to re-evaluate individual pricing of services provided. This index is not aimed to replace the process of re-evaluation of individual index, rather as a short-term solution to remedy the political turmoil of such action and maintain the same level of services throughout the period of indexing.

Based on works of Babazono, Kuwabara, Hagihara, Yamamoto and Hillman (2008), Layte (2009) and Keehan et al. (2016) four categories of variables are
selected: 1) Demography; 2) Work force; 3) Economy; 4) Health care.

The variables used in the formation of the model are detailed in Table 1. Due to lack of available reliable data, the timeline selected is from 2000 till 2015. Based on previous research data, as mention before, four groups of variables have been selected: Demographic; Labour force; Economic; and Healthcare sector variables. The main criteria for selection of specific variables was the empirical analysis of previous researcher’s data, but it was also influenced by the availability of statistical data. Due to the lack of available data for the time period before year 2000, it was impossible to include larger number of additional variables, thus the previous research done by different authors was used to select the most relevant.

| Model variables                        | Variable                                                                 | Time            |
|----------------------------------------|--------------------------------------------------------------------------|-----------------|
| Demographic variables                  | Population size 0–19                                                     |                 |
|                                        | Population size 65+                                                     |                 |
|                                        | Male mortality per 1 000 residents                                       |                 |
|                                        | Female mortality per 1 000 residents                                     |                 |
|                                        | Fertility                                                                |                 |
|                                        | Life expectancy                                                          |                 |
|                                        | Net migration                                                            |                 |
| Labour force variables                 | Male market participation                                                | 2000–2015       |
|                                        | Female market participation                                              |                 |
|                                        | Male employment in agriculture                                           |                 |
|                                        | Female employment in agriculture                                         |                 |
|                                        | Male employment in industry                                              |                 |
|                                        | Female employment in industry                                            |                 |
|                                        | Male employment in services                                              |                 |
|                                        | Female employment in services                                            |                 |
|                                        | Unemployment                                                             |                 |
| Economic variables                     | GDP                                                                      |                 |
|                                        | GDP deflator                                                             |                 |
|                                        | Consumer price index                                                     |                 |
| Healthcare sector variables            | Hospital beds per 100 000 residents                                      |                 |
|                                        | MD graduates                                                             |                 |
|                                        | Nurse graduates                                                          |                 |
|                                        | Licenced MD’s                                                            |                 |
|                                        | Licenced nurses                                                          |                 |
|                                        | Nurse and auxiliary staff that year                                      |                 |
|                                        | Number of outpatient consultations                                       |                 |
Evaluation of the Model

First and the biggest issue of the model evaluation was limited data availability. Due to limited data available, the test of the model was constrained to only 14 time series which only allows for generalized evaluation. Everything considered, such limited availability of data only allows to test the concept and not to construct a full model, yet such is sufficient for the purpose of this article. The analysis of the conceptual model was done by the use of SPSS 25.0 statistical package.

In the final model we use financing of outpatient consultations as an independent variable against 12 dependent repressors: DemProp65 (percentage of population over 65); Mort_male (male mortality); Mort_female (female mortality); LifeEXP (life expectancy); LFPRMale (male labor force participation rate); LFPRFem (Female labor force participation rate); EiSrvmale (percentage of total male workforce working in services); EiSrvfemale (percentage of total female workforce working in services); UnEmp (unemployment rate); CPI (Consumer Price Index); HosBEDS (hospital beds); HGradDOC (Graduated MD’s that year). Since the adjusted R-squared of the model is very close to one (0.9999), which is expected from such limited availability of data, we can move forward with the model.

### Table 2

| Source       | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|--------------|----|----------------|-------------|---------|--------|
| Model        | 12 | 15037          | 1253.05080  | 20023.6 | 0.0055 |
| Error        | 1  | 0.06258        | 0.06258     |         |        |
| Corrected Total | 13 | 15037          |             |         |        |

### Table 3

| Variable   | Label     | DF | Parameter Estimate | Standard Error | t Value | Pr > |t| |
|------------|-----------|----|--------------------|----------------|---------|-------|
| Intercept  | Intercept | 1  | -2717.06701        | 89.21981       | -30.45  | 0.0209|
| DemProp65  | DemProp65 | 1  | 2538.23620         | 180.53259      | 14.06   | 0.0452|
| Mort_male  | Mort_male | 1  | 3.11315            | 0.08464        | 36.78   | 0.0173|
| Mort_female| Mort_female| 1  | -3.72065           | 0.11730        | -31.72  | 0.0201|
| LifeEXP    | LifeEXP   | 1  | 36.82153           | 0.84383        | 43.64   | 0.0146|
| LFPRMale   | LFPRMale  | 1  | 9.82828            | 0.64477        | 15.24   | 0.0417|
| LFPRFem    | LFPRFem   | 1  | -8.04931           | 1.41914        | -5.67   | 0.0111|
| EiSrvmale  | EiSrvmale | 1  | 2.80031            | 0.20357        | 13.76   | 0.0462|
| EiSrvfemale| EiSrvfemale| 1  | -16.11978          | 0.90077        | -17.90  | 0.0355|
| UnEmp      | UnEmp     | 1  | 5.02742            | 0.35503        | 14.16   | 0.0449|
| CPI        | CPI       | 1  | 10.98122           | 0.31389        | 34.98   | 0.0182|
| HosBEDS    | HosBEDS   | 1  | -0.48018           | 0.03069        | -15.65  | 0.0406|
| HGradDOC   | HGradDOC  | 1  | 0.61772            | 0.02564        | 24.10   | 0.0264|
The model displays correctness as ANOVA is less than 0.05 (0.0055<0.05) thus model is correct (Table 2).

After the final test, this enabled us to construct the index model for Lithuanian outpatient healthcare services compensation. Observed and finalized index parameters are presented in Table 3. A total of 12 variables have been selected for the construction of outpatient care services funding index.

\[
\text{Finans} = -2717.07 + 2538.236\times \text{DemProp65} + 3.11315\times \text{Mort\_male} - 3.72065\times \text{Mort\_female} + 36.82153\times \text{LifeEXP} + 9.82828\times \text{LFPRMale} - 8.04931\times \text{LFPRFem} + 2.80031\times \text{EiSrvmale} - 16.1198\times \text{EiSrvfemale} + 5.02742\times \text{UnEmp} + 10.98122\times \text{CPI} - 0.48018\times \text{HosBEDS} + 0.61772\times \text{HGradDOC} \quad (1)
\]

On the next stage we construct an index based on formula 1. We use year 2010 as a base year and construct the index for 5 years. The conceptual index is constructed with initial value of index as 1 (Table 4).

| Year | Index value |
|------|-------------|
| 2010 | 1.00        |
| 2011 | 1.14        |
| 2012 | 1.16        |
| 2013 | 1.16        |
| 2014 | 1.27        |
| 2015 | 1.32        |

As we have seen from the calculation of the index, it is evident that demand for outpatient healthcare services has risen by 32 percent when comparing year 2015 to 2010. Thus, we can rephrase the change in index as we need to have additional increase of funding by 32 percent to keep the same level of quality as in the year 2010.

We have used the basic compensation rate of dermatovenereologist to calculate the indexed value. In Table 5 we can see that the calculation of value demonstrates the increase of demand for services and underscores the needed increase of service complexity in order to accommodate the variance in demand. Since the index is formed on variables which can be used to represent the quality of services, the authors of this paper hold the position that their variance is relevant in representing the quality and the change in demand.

| Year | Average price of dermatovenereologist consultation based on Lithuanian National Health Insurance fund’s rate |
|------|--------------------------------------------------------------------------------------------------------|
| 2010 | 13.36                                                                                   |
| 2011 | 15.24                                                                                   |
| 2012 | 15.50                                                                                   |
| 2013 | 15.47                                                                                   |
| 2014 | 16.90                                                                                   |
| 2015 | 17.68                                                                                   |

When we have applied the Index in retrospective for the year 2010–2015, in Table 6 we can see that in order to maintain the same level of quality of outpatient care services as in year 2010, additional 130.30 million Euros were needed. Thus, we can see the effect of index services. The use of index model has shown that funding was inadequate and could be insufficient.

**Conclusions**

Lithuanian outpatient care service funding model is funded by individual political decision regarding the size of compensation. Current model does not account for market dynamics, nor is influenced
by anything outside the will of decision makers. The variance of financial compensation is solely based on the political decision.

After evaluating the available data for Lithuanian outpatient care model, we have distinguished four groups of variables, and a total of 26 variables which could be used for model evaluation. After the analysis of the data, we have concluded that 12 variables are relevant and could be used to determine the conceptual Index model. The variables selected are: Population over 65 years old, Male mortality per 1 000 inhabitants, Female mortality per 1 000 inhabitants, Life expectancy at birth, Male labour force participation rate of total male population, Female labour force participation rate of total male population, Males working in services sector, Females working in services sector, Unemployment rate, Consumer Price Index, Hospital beds per 1 000 inhabitants, Doctor graduates. These variables have been used to calculate the final index model. Models effectiveness was demonstrated through the dermatovenerologists outpatient care service funding.

After forming of the Index and testing it with available data, we have demonstrated the need of additional 130.30 million Euros for outpatient dermatovenerologist care service compensation for the period of 2010–2015. During this six-year period we have revealed that this amount of additional funds is needed to keep the service quality at the same level as it was in the year 0 (i.e. 2010), given no other internal or external factors influencing service delivery have changed. The authors acknowledge that this Index should and must be used in accordance with other active instruments for cost and service quality regulation and cannot be used for individual service pricing based different fields.

The authors also acknowledge that using the Index alone to maintain the service quality will lead to perpetual increase in long-term service costs if the Index would not feature time constrains. For such reason we have suggested that time frame for the index before full service price re-evaluation should not exceed more than five years.

Table 6

| Year | Health insurance fund compensated consultations for outpatient care (II and III levels) (million Eur) | Health insurance fund pay-outs for outpatient care (II and III levels) (million Eur) | Pay-outs for outpatient care based on Index (million Eur) | Difference |
|------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------|------------|
| 2010 | 7.2                                                                                             | 98.5                                                                                 | 98.5                                                     | 0          |
| 2011 | 7.6                                                                                             | 112.3                                                                                | 128.02                                                   | 15.72      |
| 2012 | 7.8                                                                                             | 114.3                                                                                | 132.59                                                   | 18.29      |
| 2013 | 7.8                                                                                             | 114.1                                                                                | 132.36                                                   | 18.26      |
| 2014 | 8.0                                                                                             | 124.4                                                                                | 157.99                                                   | 33.59      |
| 2015 | 8.2                                                                                             | 138.9                                                                                | 183.35                                                   | 44.45      |
|      |                                                                                                 |                                                                                      |                                                          | **Total 130.30** |


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laikomasi išankstinės nuostatos, kad sveikatos priežiūros sektorius yra išskirtinai valstybės prerogatyva ir kontroliuojama sritis.

Remiantis empiriniu kitų autorių darbų tyrimu, nustatyta, kad politiniu procesu pagrįsta įkainių keitimo ir šių paslaugų kontrolės schema nėra veiksminga kaip atžvilgiu ir išlieka politikų įtakos objektu. Šio straipsnio tikslas – rasti išorinius kintamuosius, darančius poveikį ambulatorinės priežiūros paslaugų paklausai, ir pateikti depolitizuotą, objektyvų, lengvai pamatuojamą šių paslaugų finansavimo modelį. Tam atliekamas empirinis tyrimas ir analizuojami kitų autorių darbai, statistiniu tyrimu formuojant galimą koncepcinį ambulatorinių sveikatos priežiūros paslaugų finansavimo modelį. Tam buvo atrinkta 12 kintamųjų iš keturių kintamųjų kategorijų. Straipsnyje formuojamas siekis perorientuoti ambulatorinės sveikatos priežiūros išimtis nuo politinio sprendimo į pamatuojamą, rinkos dinamika grįstą rinkos modelį. 2010–2015 m. suformuotas ir taikytas indeksas parodė, jog tokiam pat ambulatorinės priežiūros paslaugų lygiui ir kokybei išlaikyti kaip ir 2010 m. reikėjo papildomų 130,30 mln. eurų.