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Can we do better? Economic analysis of human resource investment to improve home care service for the elderly in Serbia

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Background: Social services aimed at the elderly are facing great challenges caused by progressive aging of the global population but also by the constant pressure to spend funds in a rational manner.

Purpose: This paper focuses on analyzing the investments into human resources aimed at enhancing home care for the elderly since many countries have recorded progress in the area over the past years. The goal of this paper is to stress the significance of performing an economic analysis of the investment.

Methods: This paper combines statistical analysis methods such as correlation and regression analysis, methods of economic analysis, and scenario method.

Results: The economic analysis of investing in human resources for home care service in Serbia showed that the both scenarios of investing in either additional home care hours or more beneficiaries are cost-efficient. However, the optimal solution with the positive (and the highest) value of economic net present value criterion is to invest in human resources to boost the number of home care hours from 6 to 8 hours per week and increase the number of the beneficiaries to 33%.

Conclusion: This paper shows how the statistical and economic analysis results can be used to evaluate different scenarios and enable quality decision-making based on exact data in order to improve health and quality of life of the elderly and spend funds in a rational manner.

Keywords: home care, social investment, human resources, economic analysis, elderly

Introduction

In the 21st century, people are living longer and have a better life quality due to medical and social advances in reducing aging-related disabilities. The other side of the coin is that the implications of an aging population on social and health care systems have yet to be fully understood.[1] Accordingly, this paper aims to contribute by using scenario method, the application of which, through the economic parameters, can predict justification of the decisions on investment in human resources for the provision of home care service for the elderly.

It is a fact that aging is considered as an emerging problem and the most challenging health issue worldwide.[2] The first indication is that the global aging trend requires increased capacities and improvement of home care service for the elderly to deal with this growing demand, thereby home care service is defined as professional care provided to adult people with formally assessed needs at home.[3] This fact is supported by numerous studies focusing on home care services for the elderly, changes in health care trends in search for more efficient solutions, as well as changes in national health care and social protection policies and regulations.[4–6]

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Further deliberation of this problem calls for an analysis of population aging as a demographic phenomenon worldwide.[1] In 2010, 8% of the global population was older than age 65. Between 2010 and 2050, the World Health Organization has projected a rapid global growth in the older population and in 2050, the number of people older than age 65 is projected to be triple of its projected population in 2010.[6] It is obvious that the aging of the population will have wide-ranging implications for the health care systems all around the world. For example, in 2012, in the European Union (EU)-27 countries for every person over the age of 65, there were four people of working age, but by 2050 there will be only two.[7] The projected change in the age composition of a population in the EU countries will present challenges to policy makers such as social and health care. However, it will also affect the families as informal caregivers and rebound adversely on government finances.[8] Furthermore, an aggravating circumstance is that socioeconomic changes already have affected the role of the family as the main care provider, exceeding their physical, mental, and economic potential as caregivers which eventually led to increasing dependence on institutional structures.[9,10]

As a consequence of the trends mentioned earlier, most of the countries across the globe will face a formidable challenge to manage the changes in the structure of health care services. Therefore, due to all these facts, it is not hard to conclude that this global aging trend will cause a significant boost in demand for home care service. For example, between 2010 and 2060, the demand for home care is projected to increase by 79% in Germany, 116% in the Netherlands, and to the greatest extent of 150% in Spain.[11] This increasing demand for home care and at the same time the decreased potential for informal care will certainly result in an increased extent of formal home care services and rapidly increasing costs.[7]

Finally, it is evident that the age-care sector is under pressure to provide older people a range of innovative and contemporary models of care that enhance the quality of life.[12,13] To adapt, an increasing number of countries see the enhancement of home care for the elderly as one of their main goals.[14] Preference for service of home care for the elderly by health care financial administrators comes from cost-efficiency of the concept[15] but also from potential benefits of wide access to care for frail older persons, reduced hospital and nursing home use, and continuum of care enabling higher life quality.[16] Besides the potential benefits from a decreased hospitalization rate and cost-efficiency of the concept,[17] additional reasons for developing this service are preference expressed by the beneficiaries in term of convenience, human care, access to care, and better care.[18] In addition, it should be considered that there is a difference in preferences of older olds and younger olds regarding the concept of home care,[19] that could be addressed as interesting problem in its own right.

In light of the presented problems that are brought along with the population aging worldwide, health and social care sectors are in need of policy changes. The changes that are already adopted brought benefits to both beneficiaries and health and social care sectors but they also affected families and economies of whole countries. Accordingly, this paper aims to analyze investment in human resources as a way to promote the service from an economic point of view, as well as to point to the ways in which the results of the economic analysis can be used to analyze different scenarios and, furthermore, enable quality decision-making when it comes to investments into enhancing the capacity of home care service based on exact data.

Literature review

The literature review summarizes previous research on key issues for developing home care service. The aim is to identify the most significant trends in policy development to provide the basis for considering different scenarios of policy incentives regarding home care service in the context of Serbia. There are a large number of research studies in the field of health care and social protection policies. However, since the focus of this research is on possible scenarios of investing in human resources for home care service, these will not be reviewed in detail. Accordingly, to make a case for scenario development, the literature review is structured to show the most important issues for developing home care service, but the focal point is on identifying initiatives focusing on evidence on the increase in home care hours per beneficiary as well as in the number of beneficiaries.

First, there has never been a higher level of awareness of challenges in the field of capacity development of home care services than there is today. Both developed and developing countries all around the world are facing the challenges caused by aging population.[10,20] Second, although different European countries have different health care and social protection policies, when it comes to providing home care for the elderly, most countries have explicitly formulated plans that envisage a growth in this area and the substitution of residential and hospital care.[7] For example, in Belgium, Finland, and Germany, there is a clearly articulated vision to provide for the elderly to stay at home and allow them to live in their social environment as long as it is possible.[21] Still, benefits

provided by the long-term care insurance are not necessarily supporting this principle. For instance, in Germany, benefits are intended to cover only essential needs; everything that exceeds that has to be covered by the clients.[7] However, unlike most European countries, Poland is one of the few countries that did not have until recently legal regulations applying to home care.[22] This signals the low prioritization of aging-related policies in this country, and consequently less prominence seemed to be given to developing capacities of health and social care system for the elderly.

Third, these variations are also present in the distribution of responsibilities among national, regional, and local authorities. In most countries, home care policy is developed at the national level, while organization and service provision responsibilities are usually decentralized and depend on local authorities.[23–27] Consequently, in most of the EU countries, home care is located at the intersection between the health care system and the social system, in which the separation between health care and the social system relies on the nature of the service provided at home.[17] For example, in Italy, the home care issue is characterized by a high level of institutional fragmentation, and accountability is spread over local (municipalities) and regional authorities with different modalities in relation to the institutional models of each region.[26] In the UK, the central government is responsible for overall policy on health and social services; health services are financed by the central government, while social services are financed by the local government; in any case, the resources are distributed to local authorities responsible for organization and service provision.[23] On the other hand, in Finland, Denmark, and Sweden, home care, including social and health component, is regulated and organized at the level of local government or municipalities.[17] Regardless of variations in local, regional, or national responsibilities, there is a pending issue of capacities development for meeting challenges of growing demand for home care services. The policy dialog among all playing parties, providers, and payers in public and private settings at local, regional, or national level will decide the direction of future in aging matters that include the development of capacities of health and social care systems to provide the necessary care for the elderly.

Finally, simultaneously with the growth in demand, there is an increase in the number of initiatives focusing on estimating the trends of demand growth, as well as on defining the future direction of policies focusing on the availability and quality of service. The evidence produced in the analyses of trends and data from several different countries clearly indicates that there is an increase in home care hours per beneficiary aiming to boost the quality of life of the elderly, as well as there are more beneficiaries themselves.

The number of home care hours per beneficiary varies by country, and it is mainly determined by application of a set of eligibility criteria in personal needs assessment procedures. The following are cases from the EU countries:

- There are seven levels of eligibility in Austria based on the hours of care that clients receive per month (from 50 to 180 hours).[27]
- In the Netherlands, there are no eligibility levels, and services are adjusted to the needs of the elderly clients.[27]
- In Poland, home-based care, service and care provided to the elderly at their place of residence, is maximally 3 hours daily, which is insufficient to meet specific care needs of these individuals.[9]
- In Germany, beneficiaries who had at least substantial impairments in activities of daily living received on average 36.7 hours of home care per week,[24] while as much as 63% of beneficiaries receive more than 80 hours per month.[28]
- In Slovenia, home care is available 4 hours daily and 20 hours weekly; the number of home care beneficiaries has been growing since 2006 when the service was first introduced.[29]
- In Spain, the average home care intensity was approximately 17 hours per month in 2008.[30]
- In Austria, the development of policies relating to this area mostly revolved around defining the principles that favor home care against institutional care. Accordingly, between 2000 and 2007, the number of home care hours rose on an average by 23%, while earlier research provides evidence that persons aged 65 or older received 8 or more hours of home care per week, and persons above 75 years of age received 18 hours of home care weekly.[27]
- In the same period, Great Britain experienced a kind of transition in providing these services, which led to a drastic increase in the number of home care hours organized by local authorities, from 1999 to 2008, from 6.3 to 12.4 hours per week.[23] This drastic increase was further supported and funded by the government through the Care Service Efficiency Delivery Program.[31]
- In the Netherlands, between 1998 and 2005, the number of home care hours increased by 36%. The period between 2004 and 2007 recorded a significant increase in the number of hours – the total demand for home care grew annually by 3.2% in persons and by 8.6% in hours.[25]

Nevertheless, the issues concerning home care for the elderly are more alarming in underdeveloped countries.

According to forecasts, between 2010 and 2050, the number of elderly persons will increase by 250% as opposed to 71% in developed countries.[6] Apart from the need to strengthen social protection system for the elderly, communities are under pressure to provide a stable social well-being.[32–34]

The European Social Network identifies the application of public management in social protection services as one of the key issues and stresses that adequate use of financing provided by the EU funding programs is of crucial importance for Central and Eastern Europe and South East Europe countries.[35] This generates the need to see the effects through economic parameters, such as expenses and benefits for the community, but also to analyze different scenarios to make objective decisions regarding the use of these funds.

In order for the solution to work both ways, for example, to bring about the enhancement of home care capacities and ensure the efficient spending of the funding earmarked in the budget and provided by the EU funds, we need to quantify the generated social benefits that would justify the spending used for social care services. This can be achieved with the use of costs, benefits, cost–effectiveness, and cost–benefit analysis in the evaluation of social services.[36–42]

Following the analysis of key issues of home care for the elderly, it is evident that there is a high level of awareness of the need for further capacity development. Regardless of differences in health and social care policies, most of the European countries have explicitly formulated plans that envisage a growth in the area of provision of home care services. Further, the responsibility for the development of home care policy is at the national level while organization and service provision responsibilities are usually decentralized. The most important conclusion from literature review is that there are an increased number of initiatives focused on estimating the trends of demand growth and developing policy initiatives for an increase in home care hours per beneficiary and the number of beneficiaries. But also it is important to notice that the issues concerning home care for the elderly are even more alarming in underdeveloped countries due to the predicted higher rate of increase in potential beneficiaries.

Much of the information used for literature review is the results of the Assessing Needs of Care in European Nations project, which is implemented by the European Network of Economic Policy Research Institutes and financed under the 7th EU Research Framework Programme. At the same time, there is a significant gap in existing literature that will provide us with information on economic analysis of effects of different policy initiatives in this field. While trying to contribute to the theory, this research focus is the economic evaluation of investing in human resources for home care service. The aim is to improve the home care service for the elderly and achieve the standard set by developed European countries.

In order to accomplish this aim, the contextual facts about Serbia need to be taken into account. In Serbia, home care service is regarded as a part of the social protection system and is predominantly funded from the national budget and from the respective budgets of local self-governments.[43] Considering that there is a growing population aging trend that dictates the need for a further development of home care capacities in Serbia,[34] increase in funding of this type of social protection services is only possible if beneficiaries are willing to pay for it. Under these circumstances, policymakers are under extreme pressure to provide a cost-efficient solution for growing demand.

The following section provides the discussion of a combined application of several decision-making methods based on correlation and regression analysis (as a statistical analysis of empirical research), methods of economic analysis, and scenario method. The aim is to provide sufficient evidence for discussion of different scenarios for capacity development for home care services.

Methods

The study was designed as a three-part analysis to present the manner in which different methods can be combined in order to opt objectively for the optimal solution when presented with alternatives for enhancing social protection services for the elderly. The empirical research was conducted in Serbia, subsequently, in a period from 2011 to 2015. The goal was to contribute practically to applying an economical method and forecasting method on the example of improving the provision of home care service by investing in human resources. Participation of beneficiaries was voluntary and all participants were introduced with the purpose of the study. In the Republic of Serbia, there is no Ethics Committee or Institutional Review Board that provides approvals for these kinds of studies. The study was conducted in accordance with the Declaration of Helsinki of the World Medical Association.

The first part of the study is based on empirical research conducted during 2012 in Serbia for the assessment of the level of satisfaction with the service of home care for the elderly and beneficiaries' attitude regarding willingness to pay for social service in question.[42] The second part is economic analysis, conducted in Serbia in 2013, to evaluate the cost-efficiency of investing in human resources for home care service.[42] Finally, the third part uses the scenario method with the aim of ascertaining the amount to which this additional investment in human resources benefits the

community, that is, how many beneficiaries waiting for the service can be satisfied, having in mind that the service has to be cost-efficient, and how many additional hours can be dedicated to an individual beneficiary, which directly influence their satisfaction with the home care service.

Empirical research

The survey was conducted to collect empirical data. The instrument comprises a four-part questionnaire. The first part included information about beneficiaries' characteristics, such as sex, age, urban–rural classification, the number of household members, and problems they are facing. The second part included classification of the services provided to the beneficiaries and related problems regarding accessibility of the service. The third part of the questionnaire assessed the level of satisfaction of provided services. The satisfaction of beneficiaries was measured by establishing whether the service: 1) satisfies their needs; 2) has a positive influence on their health; 3) has a positive influence on their quality of life; 4) contributes to the feeling of independence; and 5) influences their socialization. The respondents were required to grade each of the variables using a scale of 1 to 5, with 1 representing "very satisfied" and 5 "very dissatisfied". The fourth part of the questionnaire refers to beneficiaries' willingness to pay for service in terms of ability and readiness to pay for service. The concept of willingness to pay has been studied in various fields,[44] such as health care[45–48] and social protection.[49,50] The participants of the survey were asked to express how much they would be willing to pay for the service if that was an option. The questions were fixed with the possibility to select only one answer or to grade answers using the Likert scale. This type of questionnaire is most often used in social research.[51] The results were processed using the software package SPSS Statistics 20 (IBM Corporation, Armonk, NY, USA).

For the purpose of this study, the data collected from the third and fourth parts of the questionnaire were used. The statistical analysis that was used to investigate the relationship between elements of satisfaction of beneficiaries and readiness to pay is a regression analysis. Even though being one of the most frequent types of analysis in this area, the categorical variables used in this study were not adequate for conducting multiple regressions. Consequently, the questions were summed up in a scale and represent an interval dependent variable, which satisfies one of the prerequisites for using multiple regression analysis.[52]

The sample for this survey included over 200 beneficiaries. The survey team collected 150 questionnaires, three of which were invalid. The remaining 147 questionnaires, or 73.5%, were filled in according to instructions and were acceptable for analysis. The part of the research relating to this service was conducted in 35 municipalities (also not equally developed), that is, in 24% of municipalities in Serbia.

Economic analysis

Economic analysis of home care service for the elderly is the second step in the analysis of solutions for investing in human resources to enhance this social service. In order to properly make the economic analysis, it is necessary to rely on the principles of cost–benefit analysis and to include economic and noneconomic benefits and costs generated for the elderly who use the service.[37,53–56]

With the cooperation of social workers and nongovernmental organizations (NGOs), we conducted research to investigate what are the main benefits that beneficiaries can gain from the home care services.

The following benefits were identified: quality of lives, health status, and socialization. Respondents were asked to select benefits they perceive from the home care service for the elderly and determine the level of satisfaction (using the scale 1 to 5, with 1 representing "very satisfied" and 5 "very dissatisfied") for every benefit generated by the provided service. In addition, respondents were given an opportunity to provide a subjective evaluation of the amount of money they would be willing to pay for the service if they were able to. Since the number of beneficiaries selecting each of the alternative answers is uneven, weighted correlation coefficients were determined for each type of offered answers. The overall benefits from improved health, improved quality of life, and socialization are the products of multiplying the weighted average price for each benefit with the number of beneficiaries of this service. Considering that home care service in Serbia equals 6 hours a week on average, the value of free time for the immediate family was additionally considered.[57] This benefit was valued by multiplying the average price of a work hour, according to the official statistical data, with the average daily hours spent taking care of the senior family member.

Further, relying on the principles of cost–benefit analysis, the costs generated for the elderly who use the service were identified. It was interesting to notice that home care service is a unique type of social protection that does not require investments, infrastructure investments, tangible costs, maintenance costs, depreciation costs, and so on. Home care can be provided by social service centers, departments at social service centers, institutions founded by a local self-government, and NGOs. Basic costs incurred by this service are employees' salaries for geriatric housekeepers and administrative staff, expenses for geriatric

housekeepers' training, and expenses for geriatric housekeepers' commute.

In respect to cost–benefit analysis principles, all expenses expressed in market prices are corrected to reflect true social expenses, without any market influences.[58] The European Commission recommends the correction of market prices using a conversion factor.[59] According to the official statistical data on international trading[60] and the official data on import and export tariffs, the standard conversion factor in Serbia equals 0.96.

The most important delivery expected of economic analysis was the evaluation of cost-efficiency of investing in human resources for home care service. One of the main performance indicators for economic analysis is the economic net present value (ENPV). The ENPV, defined as the difference between the discounted total benefits and costs, is calculated by the following formula:[59]

$$\text{ENPV} = \sum_{t=0}^{N} a_t S_t = \frac{S_0}{(1+i)^0} + \frac{S_1}{(1+i)^1} + \cdots + \frac{S_n}{(1+i)^n} \quad (1)$$

where S_t is a balance of cash flow at time t and a_t is discount factor chosen for discounting at time t.

ENPV is very concise performance indicator. The positive value of ENPV criteria means that investment in home care service generates net benefit. In other words that the generated benefits of the investment are greater than costs, which is desirable as result of the investment. If this is the case, we will consider the investment in human resources in home care service as cost-efficient. Conclusively, the cost-efficiency of the investment in the service will be used for generation of different scenarios for providing the optimal solution for the initiative.

Scenario method

The third part of the analysis is using the scenario method to include different interdependent factors, thus enabling the authors to forecast future outcomes and anticipate the effects of alternative solutions for investment in capacity development in home care service in Serbia. The rationale for using this method included the following considerations.

The increase in the scope of the home care service causes additional expenses; therefore, it is necessary to establish a limit up to which these expenses are justified, including the evaluation of social benefits. So, after considering the willingness to pay and cost-efficiency, the next step is to ascertain the amount to which this additional investment in human resources benefits the community, that is, how many beneficiaries waiting for the service can be satisfied, having in mind that the service has to be cost-efficient, and how many additional hours can be dedicated to an individual beneficiary, which directly influence their satisfaction with the home care service.

In order to establish the efficiency and sustainability of this investments, it is necessary to measure and evaluate the results they yielded over time.[61] To achieve this, the authors used the scientific method of scenario that represents the results of additional investment in human resources from the economic point of view. This method involves the inclusion of numerous interdependent factors that can be expressed qualitatively and quantitatively, thus enabling the authors to forecast future outcomes and anticipate the effects of alternative actions. The literature review illustrates numerous application of the method in the field of social protection.[62,63]

In this paper, we considered three options for investing in human resources in home care sector in Serbia. These options are based on a previous analysis of data relating to the average number of home care hours received by the beneficiaries of the home care service weekly.

The literature review showed that Austria has the lowest number of home care hours, 8 hours on average between 2000 and 2003, with an increase of 23% by 2007.[27] In other countries such as Holland, Germany, and Great Britain, the average number of hours per week exceeds 12. Further, in the territory of Serbia, there are 145 municipalities providing home care service for the elderly. They are employing 2,339 geriatric housekeepers and 435 persons working as administrative staff (close to 19% of the overall number of geriatric housekeepers). The service is available two to three times per week, 2 hours per day, which equals 6 hours per week on average.[57]

The first option includes cost-efficiency analysis of the gradual increase in the number of home care hours per week with the proportional increase in the number of the administrative staff. Accordingly, the scenarios will be generated for the increase in a number of home care hours per week from 6 hours as a current average in Serbia, to 8, 10, 12, and up to a maximum of 13 hours per week, which is higher than the 12-hour average in exemplary countries referred earlier. Simultaneously, the increase in a number of home care hours will be covered by the proportional increase in the number of the administrative staff. The second option includes the cost-efficiency analysis of the alternative solution of increasing the number of beneficiaries by hiring additional staff while keeping the same number of 6 hours of home care per week. Finally, the third option includes cost-efficiency analysis of an

increase in both numbers of home care hours and administrative staff. The optimal solution/scenario will be determined by the positive (and the highest) value of the ENPV criterion.

Results and discussion

The first delivery of the study is the assessment of the relationship between elements of beneficiaries' satisfaction and readiness to pay for home care service for the elderly. The results of the empirical research confirm that the beneficiaries of home care for the elderly are ready to pay for it, if it were an option, according to the level of satisfaction with the service. A statistical analysis of the data confirmed a positive correlation between the said elements and readiness to pay for the service (Table 1).

The results confirm that there is a significant correlation between the mentioned elements (correlation above 0.3). This means that the beneficiaries' willingness to pay for social services increases proportionally to the improvement of their health status, level of independence, quality of life, and socialization.

A regression analysis confirmed that these elements can predict whether a beneficiary is willing to pay for the service or not, which is presented in Table 2.

The regression analysis shows that the dependent variable "payment of service" is significantly influenced by four out of five independent variables.

To evaluate the contribution of each independent variable to the successful forecasting of beneficiaries' willingness to pay for the service, we used standardized coefficients and data from column "Beta".[64]

According to the results of the home care service analysis, assumptions related to: 1) needs satisfaction; 2) influence on health; 3) independency; and 4) socialization can be confirmed (Table 2). Also, it is obvious that the value of the beta coefficient for the "improved quality of life" variable is negative. According to the literature, this implies the following: as the beneficiaries' quality of life improves, the less they are ready to pay for the service.

Further, it is recommendable to examine additionally such cases by using, for example, the Sobel test, as a specialized Student's *t*-test for categorical variables.[65] In this case, where variables are continuous, the authors presented a correlation analysis with the significance at 0.01 level (Table 1), which confirms the hypothesis: the beneficiaries who believe that the service provided has a positive influence on the quality of their lives would be willing to pay for the service in question. This model accounts for 41.5% of the sample (R^2=0.415).

The second delivery is the economic analysis of the home care service for the elderly. The analysis enabled to include all economic and noneconomic benefits and costs and evaluate cost-efficiency of the service in question. The overall benefit from improved health, quality of life, socialization, and additional free time for immediate family members is presented in Table 3. The highest priced benefit was socialization with the total benefit of €18,711,446. While the bottom benefit was additional free time for immediate family members with perceived benefit of €5,079,711, which is expected considering that beneficiaries and not family members were determining the price for each benefit. The total amount of overall benefits of home care service in Serbia is the amount of €57,374,320 per annum.

Further, the overall converted expenses for the provision of this service amount to €6,764,889 (Table 4). The analysis showed that the highest portion of overall costs of home care service is employees' salaries and specifically geriatric housekeepers' salaries, approximately 67% of total costs. It was interesting to notice that only 6.67% of total expenses is allocated for training.

However, the most important result of the economic analysis is the assessment of performance indicator of the net benefit of the service and accordingly the value of ENPV. Based on the converted costs and the evaluated social benefits, ENPV is positive and equals €27,838,544 which means that this service is cost-efficient from the social point of view. The calculation refers to a 15-year period, with a discount rate of 5.5%, by the recommendation of the European Commission.[59]

Table 1 Correlations between dependent and independent variables – home care service

Variable	1	2	3	4	5	6
Does this service satisfy your needs?	1					
Is your health status changed?	0.510[a]	1				
Has the quality of your life changed?	0.632[a]	0.763[a]	1			
Do you feel more independent?	0.527[a]	0.520[a]	0.643[a]	1		
How socially active are you?	0.344[a]	0.402[a]	0.361[a]	0.366[a]	1	
Would you be willing to pay for this service?	0.447[a]	0.571[a]	0.445[a]	0.470[a]	0.398[a]	1

Notes: [a]Correlation is significant at the 0.01 level (two-tailed). Reprinted from Evaluation and Program Planning, Volume 45, Mihic M, Todorovic M, Obradovic V, Economic analysis of social services for the elderly in Serbia: Two sides of the same coin, Pages 9–21, Copyright 2014, with permission from Elsevier.[42]

Table 2 Regression analysis for the accommodation of the elderly and home care services

Model	Unstandardized coefficients		Standardized coefficients	Student's t-test	Sig	Collinearity statistics	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	0.380	0.144		2.639	0.009		
Does this service satisfy your needs?	0.195	0.092	0.181	2.118	0.036	0.566	1.766
Is your health status changed?	0.507	0.107	0.485	4.755	0.000	0.399	2.509
Has the quality of your life changed?	–0.248	0.126	–0.234	–1.975	0.050	0.297	3.368
Do you feel more independent?	0.239	0.095	0.220	2.523	0.013	0.548	1.826
How socially active are you?	0.114	0.057	0.144	1.994	0.048	0.793	1.261

Notes: Dependent variable: Would you be willing to pay for this service? R=0.644[a], R^2=0.415. Reprinted from Evaluation and Program Planning, Volume 45, Mihic M, Todorovic M, Obradovic V, Economic analysis of social services for the elderly in Serbia: Two sides of the same coin, Pages 9–21, Copyright 2014, with permission from Elsevier.[42]
Abbreviations: Sig, significance; VIF, variance inflation factor.

The presented result is the basis for evaluation of cost-efficiency of investing in human resources for home care service by using the scenario method. Accordingly, the third and most important delivery of the study is scenario analysis.

The results showed that if the number of home care hours were to be eight instead of six, the number of geriatric housekeepers would have to increase by 33.3% and, accordingly, the number of persons working as administrative staff. Even if the price that the beneficiaries are willing to pay stays the same and the number of hours increases, the benefit of additional free time for family members will grow. Table 5 represents different scenarios relating to the increase in the number of home care hours per week. The cost-efficiency of additional investment in human resources with the aim of boosting the number of home care hours per week was calculated for each scenario.

If we analyze the data represented in Table 5, we can conclude that it is cost-efficient, from the economic aspect, to invest in human resources in order to boost the number of home care hours per week. This cost-efficiency can be applied to an increase in home care hours up to 12 hours weekly (ENPV higher than 0), which is in accordance with the standards of the leading European countries, such as Austria and Great Britain. Nevertheless, from this perspective, the German standards stay beyond reach. However, the fact stands that it is cost-efficient to improve the existing home care service for the elderly in Serbia.

Table 3 The overall benefits of home care service

Benefits	€ per annum
1. Improved health	15,841,145
2. Improved quality of life	17,742,018
3. Socialization	18,711,446
4. Additional free time for immediate family members	5,079,711
Total	57,374,320

One of the alternatives for decision-makers is to invest in hiring additional staff that can lead to an increased number of beneficiaries while keeping the same number of home care hours (presented in Table 6). The expenses would stay the same, as in the previously analyzed scenarios, but an additional number of elderly people would benefit from the service (which directly affects all benefits since they are expressed in relation to the number of beneficiaries).

Tables 5 and 6 represented above show that the choice of an alternative for improving the home care service depends on a community's goal – additional home care hours or more beneficiaries. If the expenses stay the same, it is not cost-efficient to increase the number of home care hours to 13 per week; nevertheless, it is cost-efficient if the number of beneficiaries increases with the number of care providers. Due to these conflicting facts, it is possible to apply the same method that would combine an increase both in the number of home care hours and staff as represented in Table 7.

If we combine an increase in the number of home care hours per week with an increased number of beneficiaries, we can conclude that it is not cost-efficient to invest in additional staff and their training if the number of home care hours exceeds 8 hours per week, under the condition that there are also more beneficiaries. From Table 7 we can clearly see that Scenarios 1 and 2, where the investment

Table 4 The overall converted costs of home care service

Costs (€)	Sum	Conversion factor	Converted costs
1. Employees' salaries	5,614,225	0.964	5,412,113
1.1. Geriatric housekeepers	4,733,785	0.964	4,563,368
1.2. Administrative staff	880,440	0.964	848,744
2. Expenses for geriatric housekeepers' training	467,765	0.964	450,926
3. Expenses for geriatric housekeepers' commute	935,531	0.964	901,851
Total	7,017,521		6,764,890

Table 5 The scenario of investing in human resources to increase the number of home care hours per week

Present number of geriatric housekeepers	Number of administrative staff	Number of home care hours per week	Overall economic expenses[a] (€)	Overall economic benefits[b] (€)	ENPV[c] (€)
Current status					
2,339	435	6	6,764,890	57,374,320	27,838,544
Scenario 1					
3,118	580	8	9,019,909	59,067,557	19,685,703
Scenario 2					
3,898	725	10	11,274,887	60,760,794	11,533,477
Scenario 3					
4,678	870	12	13,529,864	62,454,031	3,381,250
Scenario 4					
5,267	943	13	14,657,353	63,300,649	–694,863

Notes: [a]Proportional to the increase in the number of geriatric housekeepers and administrative staff; [b]the benefit of additional free time for family members included; [c]ENPV was calculated for a 15-year period, at the discount rate of 5.5%, according to the recommendation of the European Commission.[59]
Abbreviation: ENPV, economic net present value.

in staff leads to the additional home care hours in a cost-efficient manner, do not represent a valid choice if we also want to increase the number of beneficiaries, because the additional home care hours automatically require a decrease in the number of beneficiaries, which as such endangers the existing beneficiaries. The optimal solution is Scenario 4 – investment in human resources in order to boost the number of home care hours by 33.3%, from 6 hours to 8 hours per week, with an increase of 33%, for example from 16,969 to 25,337 beneficiaries with the positive (and the highest) value of ENPV criterion. On the other hand, Table 3 shows that the same investment, from the point of view of home care hours, cannot be cost-efficient, as it leads to negative ENPV. If we take a look at the three tables, the option carrying the lowest risk factor is Scenario 3 since it generates positive economic value according to all three criteria: number of home care hours, increased number of beneficiaries, and combination of the two criteria. Consequently, each of the scenarios is cost-efficient. When compared to Scenario 4, Scenario 3 has the same percentage of increase in home care hours, a bit lower increase in the number of beneficiaries, and somewhat lower ENPV – nevertheless, it also carries a lower risk.

Conclusion

This paper discusses the combined application of several decision-making methods based on facts. Namely, based on the statistical data on the correlation between the level of satisfaction expressed by the beneficiaries of home care service and their willingness to pay for the said service, the authors have established and evaluated social benefits in accordance with the procedure of applying cost–benefit analysis. Also, the authors presented the scientific method of scenario applied to the provision of home care service from an economic point of view. The paper contains information

Table 6 Scenario of investing in human resources aimed at increasing the number of beneficiaries

Present number of geriatric housekeepers	Number of administrative staff	Number of home care hours per week	Number of beneficiaries	Overall economic expenses[a] (€)	Overall economic benefits[b] (€)	ENPV (€)
Current status						
2,339	435	6	16,969	6,764,890	57,374,320	27,838,544
Scenario 1						
3,118	580	6	21,829	9,019,909	73,719,859	31,013,090
Scenario 2						
3,898	725	6	27,286	11,274,887	92,149,824	38,766,363
Scenario 3						
4,678	870	6	32,744	13,529,864	110,579,788	46,519,635
Scenario 4						
5,267	943	6	35,472	14,657,353	119,794,771	50,396,271

Notes: [a]Proportional to the increase in the number of geriatric housekeepers, administrative staff, and beneficiaries; [b]proportional to the increase in the number of beneficiaries.
Abbreviation: ENPV, economic net present value.

Table 7 Scenario of investing in human resources to increase the number of home care hours and number of beneficiaries

Present number of geriatric housekeepers	Number of administrative staff	Number of home care hours per week	Number of beneficiaries	Overall economic expenses[b] (€)	Overall economic benefits[c] (€)	ENPV (€)
Current status						
2,339	435	6	16,969	6,764,890	57,374,320	27,838,544
Scenario 1[a]						
3,118	580	6 (0%)	21,829 (22%)	9,019,909	73,719,859	31,013,090
3,118	580	8 (33%)	15,592[a]	9,019,909	54,211,062	7,304,571
3,118	580	10 (67%)	12,474[a]	9,019,909	44,612,066	–2,294,426
3,118	580	12 (100%)	10,291[a]	9,019,909	37,830,608	–9,915,828
Scenario 2[b]						
3,898	725	6 (0%)	27,286 (38%)	11,274,887	92,149,824	38,766,363
3,898	725	8 (33%)	19,490[a]	11,274,887	67,763,828	9,130,713
3,898	725	10 (67%)	15,592[a]	11,274,887	55,765,082	–2,868,032
3,898	725	12 (100%)	12,864[a]	11,274,887	47,288,260	–12,394,785
Scenario 3						
4,678	870	6 (0%)	32,744 (48%)	13,529,864	110,579,788	46,519,635
4,678	870	8 (33%)	23,388 (27%)	13,529,864	81,316,593	10,956,856
4,678	870	10 (67%)	18,711 (9%)	13,529,864	66,918,099	–3,441,638
4,678	870	12 (100%)	15,436[a]	13,529,864	56,745,912	–14,873,742
Scenario 4						
5,267	943	6 (0%)	35,472 (52%)	14,657,353	119,794,771	50,396,271
5,267	943	8 (33%)	25,337 (33%)	14,657,353	88,092,976	11,869,927
5,267	943	10 (67%)	20,270 (16%)	14,657,353	72,494,607	–3,728,442
5,267	943	12 (100%)	16,723[a]	14,657,353	61,474,738	–16,113,221

Notes: [a]Every increase in the number of home care hours leads to a decrease in the number of beneficiaries; [b]proportional to the increase in the number of geriatric housekeepers, administrative staff, and beneficiaries; [c]proportional to the increase in the number of beneficiaries.
Abbreviation: ENPV, economic net present value.

on the changes in key elements of the additional investment in human resources, for example, the increase in 1) expenses for salaries, training, and commute (both geriatric housekeepers and administrative staff) and 2) social benefits, in terms of additional home care hours and the number of beneficiaries. After applying the method of scenario, the authors presented methodologically confirmed facts that can be used for a reliable forecast of circumstances if one of the alternatives is selected.

The scientific contribution of this paper consists of the following: 1) the synthesis of the results found in researches and studies discussing home care for the elderly in developed European countries, with a focus on home care hours and differences in the provision of these services in leading European countries and 2) the representation of the manner in which different methods can be combined in order to opt objectively for the optimal solution when presented with alternatives for enhancing social protection services for the elderly. The practical contribution of the paper is reflected in the representation of applying an economical method and forecasting method on the example of Serbia, based on statistical data provided by empirical research. The paper features a pessimistic scenario; for example, the authors presume that the beneficiaries would be willing to the pay the same amount of money regardless of the fact that they are receiving a greater number of home care hours. In addition to this, the authors opted to disregard benefits generated by additional jobs, because this investment would not only generate benefits for the beneficiaries but also for the state and the newly employed staff. If these benefits were to be included, the final result would be even more prominently positive. Another limitation of the paper is the number of factors encompassed by the scenario method. Therefore, further research should include additional factors when forming a scenario but also a discussion of additional investments in human resources in other services within the social protection system. Having in mind that not many papers have been written on social protection system for the elderly in the Balkans, and concerning a previous paper,[42] this paper represents a contribution to data gathering on European transitional countries.

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