

REVIEWS

THE BULGARIAN EXPERIENCE: HEALTH TECHNOLOGY ASSESSMENT AS A DECISION SCIENCE

Adriana Dacheva¹, Slaveyko Djambazov¹, Georgi Slavchev¹, Emilia Krupcheva¹,
Boyan Likomanov¹, Margarita Georgieva¹, Ivelina Yankova¹, Veneta Todorova¹,
Irina Kuneva², Evgeni Grigorov³, Valentin Angelov³

¹HTA Ltd., Sofia, Bulgaria

²Zora Medical Center, Sofia, Bulgaria

³Department of Organization and Economics of Pharmacy, Faculty of Pharmacy,
Medical University of Varna, Bulgaria

ABSTRACT

This review article explores the role of Health Technology Assessment (HTA) as a multidisciplinary decision science that systematically evaluates the medical, economic, social, and ethical aspects of healthcare technologies. Health Technology Assessment supports policymakers, clinicians, and healthcare providers by ensuring that interventions are not only clinically effective but also cost-efficient and aligned with patient needs. In Bulgaria, HTA has become a critical tool for resource allocation, transparency, and the sustainability of the healthcare system.

The paper highlights the advantages of HTA, including transparency in decision-making, strategic resource planning, facilitation of risk-sharing agreements, incorporation of patient perspectives, and promotion of innovation. By aligning national policies with international standards, HTA strengthens evidence-based practices and fosters collaboration among diverse stakeholders, such as government agencies, payers, providers, patient groups, and industry.

Several case studies from Bulgaria illustrate HTA's impact. For oncology, biomarker testing demonstrates significant health benefits (+21,000 life years, +16,600 quality-adjusted life years (QALYs)) and economic gains (€76 million GDP contribution). Analyses of disease burdens such as neovascular age-related macular degeneration (nAMD), peripheral artery disease (PAD), lipodystrophy, and atopic dermatitis quantify the direct and indirect costs, emphasizing the need for improved management and policy prioritization. Similarly, projects on sarcoma care expose systemic gaps, underscoring the importance of centralized care and multidisciplinary approaches.

Innovative policy models, such as pay-for-performance (P4P) in diabetes care, illustrate how financial incentives linked to treatment outcomes can improve patient health while generating long-term savings. Evaluations of medical devices, including wound care systems, show cost-effectiveness in reducing amputations and relapses. National screening programs for breast, cervical, and colorectal cancers highlight how ear-

ly detection significantly improves QALYs while reducing long-term costs.

The analysis also demonstrates the substantial benefits of high-cost innovative treatments for oncology, autoimmune disorders, diabetes, schizophrenia, asthma, hepatitis C, and rare diseases. Collectively,

Address for correspondence:

Evgeni Grigorov
Faculty of Pharmacy
Medical University of Varna
84 Tzar Osvoboditel Blvd
9002 Varna, Bulgaria
e-mail: evgeni.grigorov@mu-varna.bg

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these therapies contribute over 1.24 million QALYs and €6.55 billion (7.13% of GDP) to the Bulgarian economy, proving their dual health and economic value.

In conclusion, the Bulgarian experience with HTA exemplifies its transformative role in shaping evidence-based, sustainable, and patient-centred healthcare policies, reinforcing its importance as a cornerstone of modern health systems.

Keywords: *Bulgaria, experience, health technology assessment, decision science*

1. OVERVIEW

Health Technology Assessment (HTA) has many definitions, but its main one is a *decision science*. It is also a multidisciplinary process that systematically evaluates the properties, impacts, and outcomes of healthcare technologies. Its main goal is to inform decision-making at different levels of the healthcare system, including policy, clinical, and budgetary. Health Technology Assessment looks at the medical, social, economic, and ethical dimensions of health interventions, such as medicines, medical devices, procedures, and healthcare services (1,2,3).

The key tasks of HTA include assessing the efficacy, effectiveness, safety, cost-effectiveness, budget impact, and broader social implications of health technologies. By doing so, it provides evidence-based recommendations to policymakers, clinicians, and healthcare providers, ensuring that the chosen interventions improve patient outcomes and make efficient use of resources (4,5,6,7).

Health Technology Assessment is mainly used in market access, improving transparency and forecasting. It might also be used in various other contexts, beyond market access: from national health policy planning to clinical practice. Its findings help governments allocate funds more effectively, healthcare providers adopt the best treatment options, and insurers determine coverage policies (8). By promoting the use of cost-effective technologies, HTA plays a central role in the sustainability of healthcare systems (9).

Moreover, HTA fosters transparency in decision-making by involving diverse stakeholders, including patients, healthcare professionals, and policymakers. This participatory approach ensures that the assessment of health technologies considers not

only clinical and economic aspects but also the preferences and values of society.

In this paper our team will share our experience in HTA as a decision science, beyond market access, informing impactful health policies in Bulgaria.

2. ADVANTAGES OF HTA

Health Technology Assessment serves as a critical tool for evidence-based decision-making in healthcare, offering several distinct advantages:

2.1. Transparency

Health Technology Assessment provides a transparent framework for evaluating healthcare technologies by employing rigorous, evidence-based methodologies. This ensures that decisions regarding the adoption of health technologies are grounded in publicly available data, fostering trust among stakeholders. Transparency in HTA also enhances accountability, as decision-makers must base their recommendations on clearly documented evidence. The structured communication of findings promotes stakeholder engagement, particularly among governments, healthcare providers, industry representatives, and patients, and supports informed decision-making processes.

2.2. Structured Planning and Resource Allocation

A key strength of HTA is its role in strategic planning and resource allocation. By systematically assessing the cost-effectiveness and clinical utility of new and existing technologies, HTA ensures that healthcare resources are directed toward innovations which provide the greatest value. This leads to more efficient and sustainable healthcare systems, particularly in contexts of limited budgets. Furthermore, HTA aids in long-term planning, anticipating future healthcare needs and aligning technological adoption with broader health policy goals.

2.3. Risk-Sharing Agreements

Health Technology Assessment facilitates the development of risk-sharing agreements between healthcare payers and manufacturers, particularly for high-cost technologies with uncertain long-term outcomes. These agreements, often linked to real-world performance, enable healthcare systems to mitigate financial risk while encouraging innovation. Outcome-based pricing models, supported by HTA, allow for payments to be tied to demonstrable clinical benefits, ensuring that healthcare systems pay for value rather than theoretical benefits alone.

2.4. Patient-centred Care

The patient perspective is a central component of HTA, which evaluates not only the clinical effi-

cacy of health technologies but also their impact on quality of life and patient preferences. By incorporating patient-reported outcomes, HTA ensures that healthcare decisions are aligned with the needs and values of the population served. This patient-centred approach supports personalized care while also promoting access to effective and affordable treatments.

2.5. Promoting Innovation and International Comparisons

Health Technology Assessment encourages innovation by signalling the types of evidence required for market approval and reimbursement. This guidance steers research and development toward meaningful health outcomes and cost-efficient solutions. Additionally, HTA enables cross-country comparisons, fostering collaboration and harmonization of

Table 1. Stakeholders and their role in the HTA process.

Stakeholder Group	Role in the HTA Process	Influence	Interest
Ministry of Health (MoH)	The primary governmental body responsible for healthcare policies, including setting priorities for HTA and its integration into the healthcare system.	High	High
National Council on Pricing and Reimbursement (NCPR)	The main body responsible for HTA, tasked with assessing the clinical efficacy, cost-effectiveness, and pricing of new health technologies.	High	High
HTA Committee (part of NCPR)	A specialized advisory committee that conducts assessments of health technologies, including cost-effectiveness and clinical value, for decision-makers.	High	High
National Health Insurance Fund (NHIF)	Main payer in Bulgaria's healthcare system, responsible for funding the inclusion of new technologies, treatments, and medicines based on HTA outcomes.	High	High
Bulgarian Drug Agency (BDA)	Regulates medicines and medical devices, working closely with the HTA bodies to ensure that the safety and efficacy of health technologies are considered.	Medium	High
Healthcare providers (hospitals, clinics, and physicians)	End users of health technologies; provide input on the practical implications and clinical outcomes of adopting new technologies.	Medium	High
Medical associations (e.g., Bulgarian Medical Association)	Advocate for the interests of healthcare professionals and provide input on how new technologies impact medical practice and patient outcomes.	Medium	Medium
Pharmaceutical and medical device companies	Developers and suppliers of new health technologies; they provide evidence for HTA evaluations and enter into negotiations with payers and regulatory bodies.	High	High
Patients and patient advocacy groups	Represent the interests of patients, particularly in terms of access to innovative treatments and ensuring that HTA decisions reflect patient needs and preferences.	Low	High

Academia and research institutes	Provide clinical research, economic analysis, and data to support the HTA process, contributing to evidence generation and knowledge dissemination.	Medium	Medium
Non-governmental organizations (NGOs)	Involved in health policy and advocacy, ensuring that public health goals are met and that the HTA process is transparent and accountable.	Low	Medium
International bodies (e.g., EUnetHTA, WHO)	Provide guidance, support, and frameworks for the HTA process, helping align Bulgarian HTA with international best practices.	Medium	Medium
Health economists and consultants	External experts who may be contracted to conduct economic evaluations, cost-benefit analyses, and assist in complex HTA assessments.	Medium	Medium

standards across healthcare systems, while reducing unnecessary duplication of assessments.

3. THE BULGARIAN EXPERIENCE – SOME EXAMPLES

3.1. Biomarkers in Oncology

This analysis was done to demonstrate the value of biomarker diagnostics in oncology care by quantifying both the health and economic benefits to support informed decision-making for healthcare funding in Bulgaria. The analysis estimates a total cost of EUR 5.44 million to the NHIF for oncology biomarker testing in 2024. However, it also highlights the substantial health (+21,035 life years [LY] and +16,617 quality adjusted life years [QALY] for the targeted population of 18 480 people) and economic benefits (EUR 76 million contribution to GDP) (Fig. 1). This exemplifies HTA as decision science by providing evidence-based insights into the value of

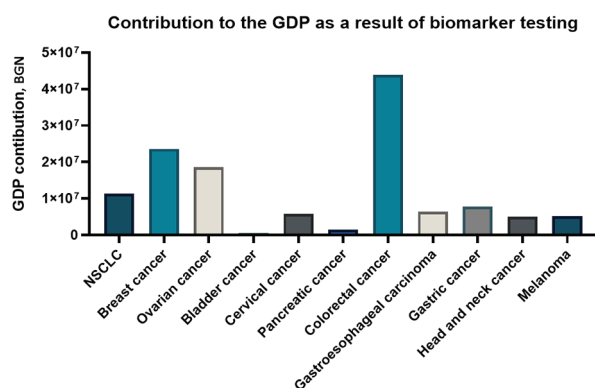


Fig. 1. Contribution to GDP due to biomarker testing and increased health benefits for patients in quality-adjusted life years (QALYs).

biomarker testing, enabling policymakers to weigh costs, health outcomes, and economic impacts, leading to more informed decisions on healthcare funding (10).

3.2. Burden of Disease: nAMD

The goal of this analysis is to quantify the economic and societal burden of neovascular age-related macular degeneration (nAMD) in Bulgaria, providing insights that support resource prioritization and policy formulation for more effective management and treatment. The economic burden of nAMD in Bulgaria was assessed, including direct costs (medical activities, therapies) and indirect costs (patient care, productivity loss) (11). The study estimates a total of 32,061 patients, with direct costs at EUR 16.6 million and indirect costs at EUR 77.4 million in 2024. Neovascular age-related macular degeneration is also a significant burden on life quality, leading to 8,291 disability-adjusted LYs (DALYs) due to conditions like anxiety and impaired vision.

3.3. Burden of Disease: PAD

The aim of this analysis is to assess the economic and health burden of peripheral artery disease (PAD) in Bulgaria, providing data to support improved treatment, management, and resource allocation for this condition. Direct medical costs amount to EUR 225.36 million, with EUR 49.20 million for pharmacotherapy and the rest for medical activities in 2024 (Fig. 2). Indirect costs, mainly due to productivity loss, are estimated at EUR 336.45 million, representing 0.4% of the GDP of Bulgaria. To quantify the impact of PAD on the quality of life, a 2023 study shows DALYs from PAD in Bulgaria rose by 31.96% from 1990 to 2019 (3). Moreover, PAD-relat-

ed deaths increased from 52 to 90 in the same period (12). The findings underscore the importance of effective treatment and management to reduce the financial and health-related burdens, emphasizing the need for better disease monitoring and control.

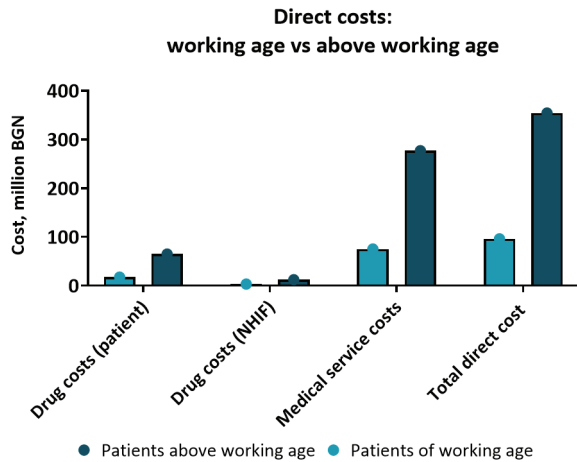


Fig. 2. Direct costs of PAD: working age and above working age patients.

3.4. Burden of Disease: Lipodystrophy

Berardinelli-Seip congenital generalized lipodystrophy (CGL) is a rare disorder marked by severe lipoatrophy and significant metabolic complications. The goal of the analysis is to evaluate the economic impact and healthcare burden of Berardinelli-Seip CGL in Bulgaria, providing insights to support the development of effective treatment strategies and support systems for affected patients. In Bulgaria, five confirmed cases (three adult and two paediatric females) are reported, which result in substantial healthcare and economic costs. The annual direct cost of treating paediatric CGL patients is estimated at EUR 808 296.13 in 2024. Data for the three adult patients' treatment costs are incomplete, but it is anticipated that the expense of managing complications in adults is higher, primarily due to the absence of leptin replacement therapy. The total estimated GDP loss attributable to both working and non-working CGL patients over their lifetimes amounts to EUR 3 911 718.80 (Fig. 3). This analysis underscores the considerable economic burden posed by CGL in Bulgaria, highlighting the need for effective treatment strategies and comprehensive support systems for affected individuals.

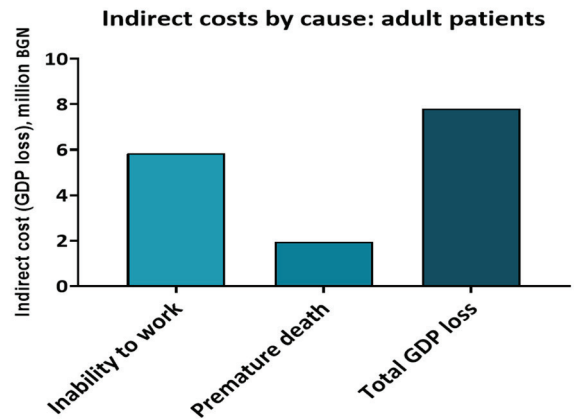


Fig. 3. Indirect costs of Berardinelli-Seip congenital generalized lipodystrophy in Bulgaria.

3.5. Burden of Disease: Atopic Dermatitis

Atopic dermatitis (AD) is a common chronic inflammatory skin disease, primarily affecting children but also occurring in adults, with prevalence rates of 15–30% in the paediatric population and 2–10% in adults. The goal of the analysis is to provide a comprehensive understanding of the economic and healthcare burden of AD in Bulgaria, supporting the formulation of effective, long-term treatment strategies that can be funded through the NHIF. Atopic dermatitis incurs a significant economic burden, with direct costs per patient estimated at EUR 2 169.80 annually for drug therapy and medical care, and indirect costs of EUR 838.79 due to productivity loss (as estimated in 2020).

The burden of disease stems mainly from the daily use of emollients, hygiene products, and frequent need for medical care. The overall economic burden of AD in Bulgaria is estimated at EUR 835 million, representing 1.39% of the 2019 GDP, with the paediatric population generating the greatest share of costs. Predictions indicate that by 2050, costs could rise by another EUR 750 million annually as more children are affected. These data highlight the need for effective long-term treatment strategies that address both the direct and indirect costs, aiming to improve patient adherence, manage symptoms, and reduce the broader socioeconomic impact.

3.6. Sarcoma Project

The Sarcoma Care Project in collaboration with the non-governmental organisation Together Against Sarcoma aims to assess the existing best

models of care for sarcoma, focusing on identifying the problems in the Bulgarian Health System and offering effective solutions to improve the treatment of sarcoma. In this context the critical role of HTA is exemplified by identifying gaps and guiding improvements in healthcare systems. In the following table, a set of quality markers and local data are presented.

Despite the existence of treatment guidelines and full financial coverage by the NHIF, Bulgaria's healthcare infrastructure for sarcoma care remains underdeveloped, lacking dedicated sarcoma centres and multidisciplinary teams. This hinders timely

and optimal medical decisions, leading to suboptimal patient outcomes. Through a qualitative analysis, the need for centralization of care, improved diagnostic capabilities, and better access to advanced therapies is highlighted. The HTA process in this context provides a roadmap for addressing these deficiencies, aiming to enhance patient survival and quality of life by aligning Bulgaria's sarcoma care with more advanced standards seen in Western Europe and the USA.

Table 2. Quality markers for the treatment of sarcoma and local data for Bulgaria.

Criteria	Quality Marker	Clinical Trial Data from Bulgaria
Diagnostic process	Percentage of patients with sarcoma undergoing preoperative scan and pretreatment biopsy (MRI and/or local computed tomography and computed tomography of the lung)	70%
	Diagnosis made by an expert pathologist (or second opinion carried out in an expert center if the diagnosis was not made by an expert pathologist)	11% had a second opinion (however, in Bulgaria there was no appropriate definition of <i>expert pathologist</i> for the main indicator).
Adherence to treatment	Percentage of patients with low grade and R0 resection margin undergoing standalone surgery.	80.7%
	Percentage of patients with high grade and R0 resection who underwent surgery and radiotherapy or radiotherapy and chemotherapy	20%
	Percentage of patients with R1 or R2 resection margin undergoing reoperation or radiotherapy or chemotherapy and radiotherapy.	31%
Quality of surgical care	Complete tumor resection at definitive surgery	65%
	Reoperation after primary definitive surgery	2%
Quality of pathological report after surgery	Percentage of pathology reports with a complete set of basic data recorded in accordance with ESMO guidelines	12%
Presence of multidisciplinary approach	N/A	There are no indicators collected through a high-fidelity survey because the information cannot be retrieved
Participation in other clinical trials	N/A	There are no indicators collected through a high-fidelity survey because the information cannot be retrieved.

3.7. Diabetes: Pay-for-Performance Programme

Pay-for-performance (P4P) is a healthcare reimbursement model that provides financial incentives to healthcare providers based on their ability to meet specific quality and outcome measures (criteria). Given the significant public health burden of diabetes mellitus, a proposal for a three-year pilot programme to implement the P4P model for diabetes management in Bulgaria has been developed.

The primary goal of this programme is to improve the therapeutic outcomes and quality of care for diabetes patients. To ensure the programme's success and transparency, the initiative incorporates risk stratification of patient groups (Fig. 4) and identifies target biomarker values.

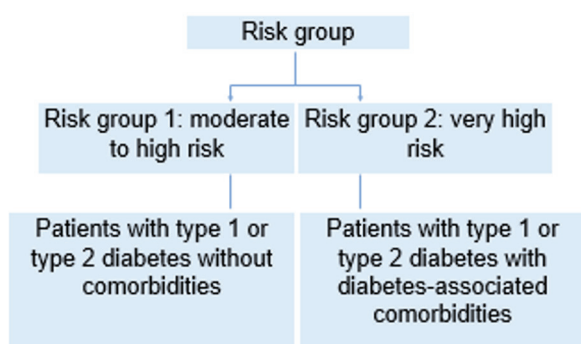


Fig. 4. Risk stratification for patients with type 1 and type 2 diabetes.

The selected biomarkers are glycated haemoglobin HbA1c, total cholesterol, and body mass index (BMI). Patients with type 1 and type 2 diabetes are classified into two risk groups – Group 1 (moderate to high risk without comorbidities) and Group 2 (very high risk with diabetes related comorbidities). The target HbA1c in group 1 is $\leq 7.5\%$. For Group 2 the target HbA1c value is $\leq 8\%$. The target value for total cholesterol is < 4.5 mmol/L in adults and < 4.4 mmol/L in children. The BMI target for adults is 18.5 to 24.9 kg/m², and for adult patients with a baseline BMI above 30, the target is a 5% weight reduction within one year. For children and adolescents, the value is below the 85th percentile.

In the context of the programme medical providers are going to receive certain payment for completing the criteria in each target level – for Level 1

and Level 3 (4 patient visits in one year and BMI target) the practitioner will receive EUR 11.95. For Level 2 (achieving the criteria for HbAc) the clinicians are going to receive EUR 23.91 for low-risk patients and EUR 47.82 for high-risk patients.

Achieving the set criteria demonstrates high professionalism and dedication of the attending medical professional. Projected programme implementation results demonstrate to stakeholders that payment based on the quality of services provided can significantly improve patient health and generate savings from avoided diabetes-related complications.

From a population of almost 500,000 people diagnosed with diabetes in 2024 in Bulgaria, it is expected that in a 3-year period the cumulative number of patients with type 1 diabetes included in the programme will be 50,000 and those with type 2 diabetes will be 620,000, or around 16,000 people with type 1 diabetes and 200,000 people with type 2 diabetes. This accounts for around 50% of the total population diagnosed with diabetes in the country.

It is expected that the introduction of the P4P model will elevate the costs of treating diabetes in Bulgaria to EUR 84,942,500 in contrast to a world without the programme in which the treatment of all patients with diabetes will cost EUR 59,236,968.50. A model for projecting the expected savings from the introduction of P4P was included in the analysis. The results show a proportionality between the number of patients included in the P4P programme and the overall savings generated. For the 216,000 patients treated each year in the P4P setting the savings for the National Healthcare Fund are expected to reach EUR 8,000,000.

3.8. Hartmann's Medical Devices for Treatment of Chronic Wounds

Chronic wounds, defined as wounds that fail to progress through the normal healing stages within the expected timeframe, represent a significant global health challenge. The prevalence of chronic wounds is estimated to be 2.21 per 1,000 individuals in the general population. To support treatment decision-making during market access and the HTA process for medical devices, an evaluation system called the TIMERS principle (Tissue, Infection/Inflammation, Moisture, Edge, Regeneration/Repair, Social situation) was developed. It addresses the key com-

ponents necessary for effective wound bed preparation and management (13,14).

From the conducted economic analysis, it is found that adequate control of severe chronic wound for the entire treatment cycle is a cost-effective approach to reduce the incidence of amputation. A 50% reduction in the incidence of lower limb amputation translates into a saving of EUR 1,144.16 in medical costs per patient. In patients with poor adherence to treatment, the incidence of wound recurrence was more than 69%. With adequate treatment, including compliance with dressing change intervals, follow-up by a specialist, and surgical treatment, if necessary, the recurrence rate in the first year is 12%. Considering the difference in relapse rate and the cost of its control, the savings per patient could amount to EUR 1,304.34. The total cost saved from amputation and subsequent relapse over a one-year period is estimated to reach EUR 2,448.51.

A budget impact analysis was performed to determine the total cost of the implementation of the device and the generated savings from avoided complications in two groups of patients – patients treated with vacuum patches (VAC group) and such treated with standard patches (non-VAC group).

The cumulative size of the non-VAC group in a 3-year period reaches almost 6,000 people and the VAC group reaches 1,500. It is expected that the total savings in the VAC groups are going to exceed EUR 1,750,000 and in the VAC group – EUR 2,000,000. The net budget impact, including the expected savings, is expected to reach EUR 1,902,500 in the non-VAC group and EUR 1,400,000 in the VAC group.

3.9. Colorectal and Cervical Cancer Screening Programmes

A pilot project for the introduction of screening programme for cervical and colorectal cancer was developed by our team. The process involved a thorough study of global and local practices and outcomes of implemented programmes; determination of risk groups and prediction of their size and dynamics within a time horizon of 3 years; selection of screening methods and analysing the patient's path through the programme (15,16).

The results from the preliminary analysis of the cervical cancer screening programme project were demonstrated in two scenarios – in Scenario 1 a PAP

test was performed followed by a DNA test for PAP-positive patients with abnormal cytology. The analysis demonstrated that the cumulative population included in the programme will reach 440,000 women in 4 years and the total cost of the programme is expected to be EUR 29,691,500. In Scenario 2 only DNA test is performed every 5 years to women aged between 30 and 64 years. The total included population is expected to reach 212,000 women, and the cumulative cost is expected to reach EUR 19,089,500 (15).

For the cost-effectiveness analysis, health benefit data (QALYs) from a cervical cancer screening programme was modelled. The approach of PAP tests every 3 years with triage of patients with ASC-US (HPV DNA test) was analysed. A comparative analysis of the health benefits of early diagnosis of RMS (stage I/II) versus late diagnosis (advanced disease, stage III/IV) was conducted.

The added QALYs for a patient diagnosed with early disease (stage I/II) were 25.64 versus 1.36 QALYs for a patient with advanced disease (stage III/IV). Diagnosing and treating a patient in the early stages of PMS generates 24.29 more QALYs than treating an advanced disease (15).

In a patient with an early stage of cervical cancer, the following medical activities are evaluated for disease control – the need for hysterectomy and radiotherapy/brachytherapy. In a patient with advanced disease, the cost of control includes administration of platinum-based therapy with/without bevacizumab and medical activities for hysterectomy. The control of cervical cancer in the early stage is a dominant approach compared to the treatment of the late stage of the disease – savings are generated in the amount of EUR 32,044.93 per patient with an addition of 24.29 QALYs per patient (16).

The results from the analysis of the colorectal cancer screening programme project in which FOBT and colonoscopy test are used as main screening test were demonstrated in two scenarios – Scenario 1 was developed according to the parameters in the National Cancer Programme – a 4-year period with 100,000 people tested. This is expected to cost the payer more than EUR 3,000,000.

In Scenario 2, local data from experts was used to calculate the size of the population expect-

ed to participate in the program. According to the performed analysis the population is going to reach 437,000 people and will cost the healthcare system EUR 22,754,500. In the second scenario a cost-effectiveness analysis was also performed to calculate the expected savings that the programme will generate.

The results from the cost-benefit analysis demonstrated that in an active programme, the number of newly infected cases can decrease up to 60%, and the number of deaths – up to 80%. Assuming an average duration of treatment for a colorectal cancer patient of 6 months, which costs EUR 1,758.33, the savings from averted cases of colorectal cancer would amount to an average of EUR 2,700,000 each year (16).

3.10. Breast Cancer Screening Programme

The breast cancer screening programme has been developed with the aim of maximizing the coverage of the identified target population and integrating general practitioners to enhance health awareness and facilitate access to medical services. Strictly aligned with internationally accepted standards, the programme includes the introduction of innovative diagnostic methodologies, ensuring increased diagnostic accuracy, optimizing therapeutic response, and significantly improving the prognosis and quality of life for patients (17).

The costs, again, are analysed in two scenarios. The main analysis was conducted over a period of 4 years and utilizes the recommendations according to the National Cancer Control Plan for 2030. Additional analysis was conducted, incorporating current local data based on the population of women in the target age group of 40 to 69 years.

The diagnosis of breast cancer includes preventive examinations for women over 18 years old with risk factors for disease development, amounting to EUR 15.00, and mammography of both breasts, costing EUR 24.50.

The economic evaluation shows that early identification of breast cancer is significantly more cost-effective, at EUR 154.66 per QALY compared to EUR 451.54 for late diagnosis.

According to the main budget impact analysis (including target criteria set by the National Cancer Plan for 2030) in Year 1 the expected costs are going

to reach EUR 1,930,000 and in Year 4 the number is expected to be EUR 7,720,000.

In the additional cost analysis conducted, which includes 60–80% of the target population, Year 1 is expected to incur costs of EUR 24,391,949.90 and Year 5 – EUR 32,470,273.70. Nevertheless, the significant addition to the healthcare budget is justified by the GDP contribution per patient estimated at EUR 189,685.15 (17).

3.11. Analysis of High-Cost Treatments and Their Benefits for Patients in Bulgaria

A multi-disease analysis was undertaken to assess the benefits of novel, high-cost treatments for oncological and haematological diseases, autoimmune diseases (psoriasis, psoriatic arthritis, rheumatoid arthritis), schizophrenia, diabetes, nAMD, deep vein thrombosis (DVT) and pulmonary embolism (PE), hepatitis C, asthma and spinal muscular atrophy (SMA).

Immunotherapy and targeted therapies for lung, prostate, breast cancers, and melanoma work by specifically targeting cancer cells or abnormal immune responses. This approach enhances treatment effectiveness, extends patients' lifespans, improves their overall quality of life, and causes fewer side effects compared to traditional treatments like chemotherapy or radiation. The analysis estimates an increase of 83% in treated patients with these therapies between 2021 and 2023. Moreover, the treated patients have an added health benefit of a total of 17,696.00 QALYs (for 3,897 patients, 4.5 QALYs per patient). This can be translated into EUR 184,483,462.00 added contribution towards the GDP of Bulgaria.

Treating patients with non-vitamin K antagonist oral anticoagulants (NOACs) for DVT and PE results in significant health benefits in the form of added quality adjusted life years, as well as a significant contribution to GDP (EUR 3,398,868,000, or 3.7% of the GDP of Bulgaria for 2023). Between 2021 and 2023, the patients treated with these drugs have increased by 34% from 72,060 to 96,360. The total number of gained QALYs for this population is estimated at 1,064,226.53 QALYs (10.7 QALYs per patient).

Intensified treatment of diabetes mellitus with incretin-based therapy, SGLT-2 inhibitors, GLP-1 receptor agonists, and fixed combination thera-

py with long-acting analogue insulins improves glycaemic control, reduces complications, and increases years of healthy life. For the 13,022 patients currently treated, there have been estimated a total of 71,944.50 QALYs gained. This can be translated into EUR 1,332,488,009 added contribution towards the GDP of Bulgaria.

Age-related macular degeneration (AMD) is the leading cause of irreversible central vision loss in adults. In developed countries, nAMD is the most common cause of blindness, accounting for 8.7% of global blindness cases in the 45–85 age group. Anti-VEGF therapies significantly slow the progression of nAMD by inhibiting abnormal blood vessel growth in the retina, helping preserve or improve vision. In 2021 there were only 544 patients treated with anti-VEGF therapies. In 2023 there were 1,188 patients, marking a drastic increase of 118%. Moreover, the added health benefits for these patients are estimated at 6,374.19 QALY, which can be translated into EUR 3,107,140.67 contribution to the GDP (accounted for working age patients only).

Treating patients with innovative hepatitis C therapies (direct-acting antivirals) leads to their full recovery and significantly increases the added quality adjusted life years (21,187.61 QALYs for 860 patients, 24.6 QALYs per patient) and overall contribution to the country's GDP (EUR 28,644,820.00).

Effective treatment of schizophrenia reduces the long-term economic burden associated with hospitalizations, disability, and lost productivity while improving outcomes for patients. It has been estimated that novel treatments for schizophrenia lead to added health benefits of 13,992.89 QALYs (8.7 QALYs per patient, total of 1,614 patients in 2023). This amounts to an overall contribution to the country's GDP of EUR 341,046,115.00.

Innovative biological treatments for severe asthma help reduce asthma exacerbations, improve lung function, and enhance quality of life. According to the analysis, these therapies lead to an overall added health benefit of 7,399.74 QALYs for the 320 analysed patients in 2023 (23.12 QALYs per patient), resulting in an overall contribution to the country's GDP of EUR 104,120,695.00.

Spinal muscular atrophy causes muscle weakness due to motor neuron loss. Novel therapies now

target the genetic cause by boosting SMN protein production, significantly improving motor function and slowing disease progression. For the currently treated 57 patients, it has been estimated that these novel therapies lead to a total of 1,341.21 QALYs.

Novel treatments for autoimmune diseases such as psoriasis, psoriatic arthritis, and rheumatoid arthritis bring significant health improvements for patients. As of 2023, an estimated 4,613 patients receiving these therapies have gained a total health benefit of 31,222.26 QALYs, contributing EUR 700,971,012.00 to the GDP.

The analysis demonstrates that innovative therapies for diseases such as cancer, diabetes, and autoimmune disorders yield substantial health benefits, totalling 1,240,856.91 QALYs for 126,000 patients, and add a cumulative EUR 6.55 billion to Bulgaria's GDP (7.13% of GDP for 2023). These findings underscore the critical value of these therapies in improving patient quality of life, increasing productivity, and contributing significantly to the economy. The data provide a foundation for decision-makers to prioritize funding for treatments that balance healthcare investment with long-term economic benefits.

4. CONCLUSION

The Bulgarian experience with HTA underscores its transformative potential for society and healthcare decision-making. By systematically evaluating the medical, social, and economic dimensions of health interventions, HTA empowers stakeholders to make data-driven choices that optimize patient outcomes and resource allocation. The impact of HTA extends beyond individual health benefits, fostering innovation, improving transparency, and ensuring cost-effective investments in healthcare technologies. As demonstrated in Bulgaria, HTA not only supports the sustainability of the healthcare system but also drives significant economic contributions, enhancing national productivity and societal well-being. This approach positions HTA as a cornerstone for strategic health planning, delivering measurable benefits to patients, decision-makers, and the broader economy alike.

REFERENCES

1. Drummond M, Sculpher M, Claxton K, Stoddart G, Torrance G. Methods for the economic evalu-

- ation of health care programmes. 4th ed. Oxford, United Kingdom; New York, NY, USA: Oxford University Press; 2015.
2. WHO. Health technology assessment of medical devices [Internet]. www.who.int. Available from: <https://www.who.int/publications/i/item/9789241501361>
 3. O'Rourke B, Oortwijn W, Schuller T; International Joint Task Group. The new definition of health technology assessment: A milestone in international collaboration. *Int J Technol Assess Health Care*. 2020;36(3):187–190. doi: 10.1017/S0266462320000215.
 4. Velasco-Garrido M, Busse R. Health Technology Assessment: An Introduction to Objectives, Role of Evidence, and Structure in Europe. WHO Regional Office for Europe; 2005.
 5. Battista RN, Hodge MJ. The evolving paradigm of health technology assessment: reflections for the millennium. *CMAJ*. 1999;160(10):1464-7. PMID: 10352637; PMCID: PMC1232608..
 6. Jonsson E, Banta D. Management of health technologies: An international view. *BMJ*. 1999;319(7220):1293. doi: 10.1136/bmj.319.7220.1293.
 7. Hailey D. Health technology assessment. *Singapore Med J*. 2006;47(3):187-92. PMID: 16518551
 8. Vekov T, Petrova G, Kolev J. Pharmaceutical policies for controlling the demand and supply of medicinal products in EU. *Med Rev (Med Pregled)*. 2024;60(4):26-32.
 9. Grigorov E, Belcheva V, Salchev P. Place and role of health economic and pharmacoeconomic analyses for the stability of the healthcare system. *Health Econ Manag*. 2014;53(3):3-10.
 10. Todorova V, Krapcheva E, Slavchev G, Dzhambazov S, Vekov T. Reimbursement of biomarkers in oncology: advantages and economic analysis of their application for diagnostics as part of the personalized medicine approach. *Annu Hosp Pharm*. 2024;10(1):12-22. doi: 10.14748/AHP.V10I1.9861
 11. Retina International. The impact of AMD on Germany, Bulgaria and the USA [Internet]. 2022. Available from: <https://retina-international.org/wp-content/uploads/2022/10/AMD-Economic-assessment-Final-06102022.pdf>
 12. GBD 2019 Peripheral Artery Disease Collaborators. Global burden of peripheral artery disease and its risk factors, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Glob Health*. 2023 Oct;11(10):e1553-e1565. doi: 10.1016/S2214-109X(23)00355-8.
 13. Dowsett C, Ayello E. TIME principles of chronic wound bed preparation and treatment. *Br J Nurs*. 2004;13(15). doi: 10.12968/BJON.2004.13.SUP3.15546
 14. Atkin L, Bučko Z, Montero EC, et al. Implementing TIMERS: the race against hard-to-heal wounds. *J Wound Care*. 2019;23(Sup3a):S1-S52. doi:10.12968/JOWC.2019.28.SUP3A.S1
 15. Slavchev G, Dacheva A, Vutova Y, Djambazov S. Health Benefits and Cost-Effectiveness Analysis of Early Cervical Cancer Diagnosis in Bulgaria. *Value Health*. 2023;26(12):S153.
 16. Todorova V, Krapcheva E, Dacheva A, et al. Presentation of a draft project for a population survey screening program for colorectal carcinoma. *Medicinski žurnal UMBAL Sv. Anna*. 2023;9(1-3):3-7.
 17. Krapcheva E, Georgiev A, Todorova V, Vutova Y, Georgieva M, Belcheva V, et al. Screening program for early detection of breast cancer in Bulgaria. *Annu Hosp Pharm*. 2025;11(1):34-42. doi: 10.14748/ahp.v11i1.10422.