

April
2024



Interconnecting Innovation Ecosystems for Common European Data Space in Health



**Funded by the
European Union**

D2.7 CASE STUDY: HUNGARY
AUTHORS: CEBR, BIOCAT



Grant Agreement No. 101070811

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History of Versions

Version	Date	Status	Page (if applicable)
V0	19-03-24	1 st draft from CEBR	NA
V1	29-03-24	2 nd draft with content from Hungarian Partner	NA
V2	12-04-24	Final version with revisions	NA

Disclaimer

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Executive Summary

The present Deliverable 2.7 “Case Study Hungary” has been developed within the framework of WP2 “Analysis of ecosystems and innovation agendas” of **EDAH**.

EDAH (Interconnecting innovation ecosystems for common European data space in Health) is a 2-year preparatory action funded by Horizon Europe that aims to contribute to the development of the European Health Data Space. The 4-partners-consortium seeks to establish close collaborations with the EU presidencies during the project’s lifetime, to help prioritise EHDA in their successive agendas. EDAH also seeks to engage a wide range of quadruple helix stakeholders from diverse innovation ecosystems across Europe in identifying barriers and enablers to EHDS, channelling the different Member States’ inputs into EU policy processes. By bridging the current digital health divide in Europe, EDAH contributes to the New European Innovation Agenda with more inclusive, dynamic, diverse and interconnected European innovation ecosystems. **EDAH** aims to unlock the power of health data for innovative medicines and future healthcare by helping develop the European Health Data Space.

The project’s key milestones are:

1. Set an open dialogue to facilitate the agreement among Member States, Associated Countries and EU Regions about key aspects related to EHDS.
2. Advancing towards common legal, governance, data quality and interoperability framework to facilitate the advancement of EHDS.
3. Scaling up good practices and addressing important gaps in the regional and national innovation ecosystems, through a better understanding of the digital health innovation landscape.

The following report is the seventh and last of a series of 7 case studies envisaged in this project (namely Portugal, Czech Republic, Sweden, Bulgaria, Spain, Belgium, and Hungary). The studies are connected to the EU presidencies happening during the timespan of this preparatory action, from September 2022 to August 2024, corresponding to the end of Czech Republic’s, Swedish, Spanish, Belgian and the initial weeks of Hungarian Presidency.

At the moment of publication of this deliverable, Belgium holds the Presidency of the EU. Hungary will take over on July 1st 2024 and will hold it until 31 December 2024, ending the Trio¹ that started with Spain. These 3 Member States set as priorities for these 18 months to work together to find common solutions to the challenges and tasks related to the Russian war, increasing global uncertainty and needs to enhance Europe’s resilience and strategic autonomy. There are a number of challenges ahead for this presidency, some of them of political nature, but also some would come of an increasingly complex scenario. Although the authors felt the need to refer to this complexity, a stress needs to be made on the importance of this rotating leadership by a mS, and the agreements achieved in terms of priorities with the 2 preceding presidencies of the Council. The interest of this report is focused on the progress of the innovation agenda related to Health Data in Hungary, in a moment marked by the approval by the Members of the European Parliament on the creation of the European Health Data Space (EHDS)².

¹ <https://spanish-presidency.consilium.europa.eu/en/programme/trio-programme/>

² <https://www.european-health-data-space.com/>

Hungary has a have a huge health database, dating from 10 to 15 years back. Now, the man problem is about data sharing and policy making. This report is the product of desk research and the highly valued support of EIT Health Innostars experts from Budapest, to which we thank for their contributions and revisions.

Introduction to this report

Specific objectives of EDAH

The partnership implementing EDAH has five specific objectives:

- O1 – Ensuring a coherent overview of the (ongoing) strategic developments related to the European Health Data Space (EU level policy processes, important initiatives, and projects) and developing a deeper understanding of seven important EU ecosystems (innovation agendas and ecosystem stakeholders) represented by clusters/networks from Portugal, Czech Republic, Sweden, Spain, Belgium, Hungary, and Bulgaria.
- O2 – Setting up a coordination mechanism to connect important stakeholders from innovation ecosystems all around Europe and engage them in focused dialogue around key challenges and opportunities related to advancing the EHDS.
- O3 – Scaling up the dialogue at the EU level via developing further collaboration pathways with EU presidencies.
- O4 – All of the above will be used for, step-by-step, developing, validating, and finalising the Joint Action Plan (JAP) for synergetic work in the interconnected ecosystems of EU health-related clusters/ networks (facilitated by the dialogue mechanisms and collaboration frameworks developed in this project) to jointly advance the development of the EHDS.

3

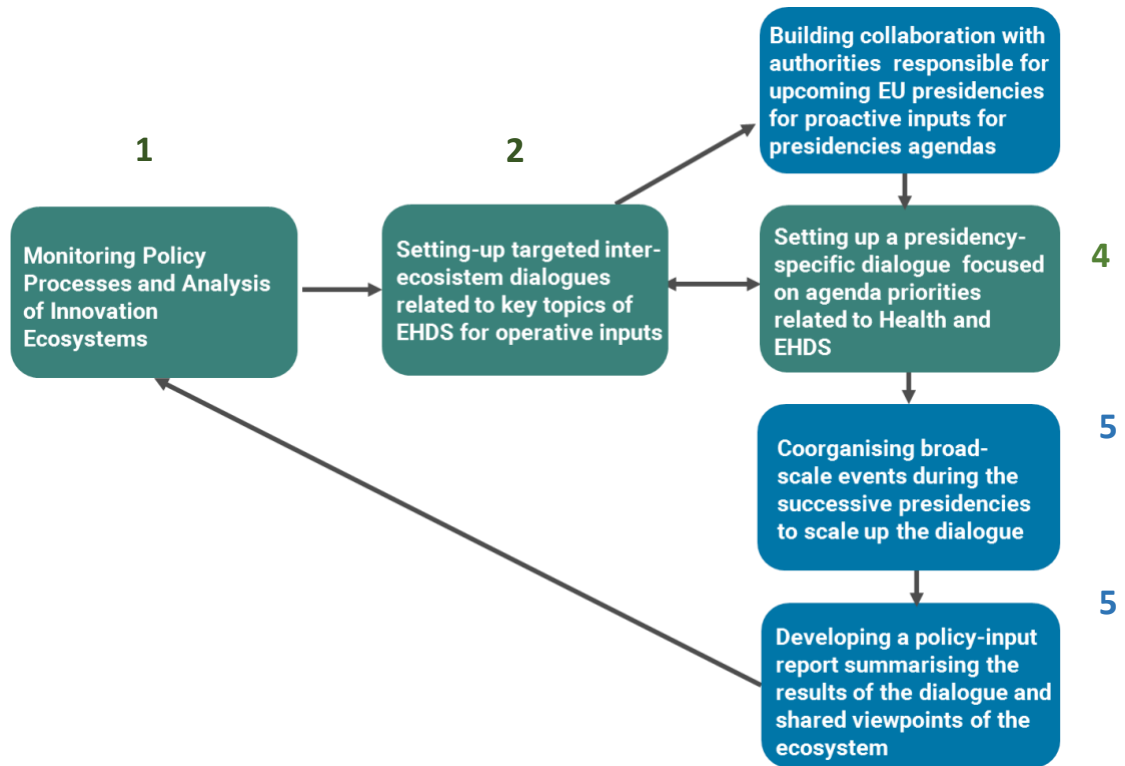


FIGURE N.1: WORKFLOW OF THE EDAH PROJECT: STEP 1 IS THE ANALYSIS OF INNOVATION ECOSYSTEMS

List of consortium partners and beneficiary numbers

Beneficiary #	Name	Acronym	Country
1	BIOCAT LA FUNDACIO BIOREGIO DE CATALUNYA	Biocat	ES
2	HEALTH CLUSTER PORTUGAL	HCP	PT
3	SCANBALT	ScanBalt	EE
4	COUNCIL OF EUROPEAN BIOREGIONS	CEBR	BE

Work Package 2 – Analysis of ecosystems and innovation agendas

Objectives

- Monitoring and analysing strategic EU-level processes related to the development of the European Health Data Space;
- Getting in-depth understanding of seven key innovation ecosystems, namely in Portugal, Czech Republic, Sweden, Spain, Belgium, Hungary and Bulgaria;
- Based on the above, identifying good practices, potential for synergies and complementarities in innovation agendas and with ongoing initiatives/processes to advance the development of EHDS as a joint effort of EU interconnected innovation ecosystems.

Task 2.1 Scanning strategic developments regarding European Health Data Space

The consortium have been continuously tracking advancements in various important EU-level policy processes, monitoring progress related to initiatives such as TEHDAS and GAIA-X (e.g., key milestones achieved), relevant new studies and analyses, etc. This information has been processed and analysed to identify potential synergies, needs for action and inputs by EDAH to support important developments in line with the idea of more dynamic, inclusive, gender diverse, and connected innovation ecosystems for the joint development of the European Health Data Space, fostering innovation in industry and the public sector.

The work under this task materialises into monthly Strategic Progress Updates (SPUs) prepared for the monthly EDAH Coordination Working Group meetings. The SPUs have been covering the key developments as well as suggestions for related response and actions in the context of the EDAH project.

Task 2.2 Carrying out case studies

Case studies on seven key EU clusters/networks/ecosystems have been carried out in order to 1) facilitate learning from various good practices of strong EU clusters/networks in advancing digital health and related innovation in their regions/ countries as well as good practices related to quadruple helix collaboration; 2) reach a better understanding of the ecosystems and innovation agendas of these clusters/networks; 3) five case studies have additionally been focusing on the possibilities of advancing specific topics related to the EHDS in the context of EU presidencies during the lifespan of the project, supported by the clusters'/networks' country of origin. The case studies represent Portugal (as a country initiating the policy analysis conducting to this project), Czech Republic, Sweden, Spain, Hungary, Belgium (five EU presidency



countries), and Bulgaria (current Modest Innovator region that can provide insights about key needs for development in terms of digital health and related ecosystem in such context).

1 – Hungarian Ecosystem Overview

Hungary, situated in Central Europe, is a nation of 9.6 million inhabitants, shaped by its complex political history and evolving economic landscape. Following the fall of communism in 1989, Hungary peacefully transitioned into a democratic republic, embracing market-oriented reforms to integrate into the global economy. Its strategic location and membership in the European Union have played pivotal roles in shaping its political and economic trajectory.

Politically, Hungary operates under a parliamentary republic system, with a multi-party democracy and a President as the Head of State. However, the country has garnered attention in recent years due to shifts towards a more centralized governance model characterized by nationalism and a focus on sovereignty.

From an administrative point of view, it is divided into 19 counties but, since 1996, the counties and city of Budapest have been grouped into seven regions for statistical and development purposes.



Figure n.2 - Map of Hungary and its seven regions (NUTS 2)

Economically, Hungary has made significant strides since the fall of communism, transitioning from a centrally planned economy to a market-based one. The country has attracted foreign investment, particularly in sectors such as automotive manufacturing, electronics, and information technology but also food processing, pharmaceuticals, motor vehicles, chemicals, metallurgy, machinery, and tourism can be considered relevant sectors. Budapest, the capital city, serves as the economic and financial hub, driving growth and innovation across various industries.³

Despite its economic progress, Hungary faces challenges such as income inequality, regional disparities, and a need for continued structural reforms to enhance competitiveness and sustain growth. Moreover, concerns over issues such as corruption, judicial independence, and media freedom have drawn scrutiny from international observers and raised questions about Hungary's adherence to democratic norms within the European Union framework.⁴ The Presidency of the EU might be an opportunity both for the country and for the Union, as six-in-ten in Hungary said in 2022 that the EU promotes peace, democratic values and prosperity⁵

1.1 National health system

According to the “*State of Health in the EU – Hungary Country Health Profile 2023*”⁶ report, main source of information for this chapter, Hungary operates a tax-funded universal healthcare system overseen by the state-owned National Health Insurance Fund (NEAK). The fund offers nearly universal coverage, although approximately 5% of the population, including citizens working abroad and individuals without a permanent address, have unclear insurance status. As of 2022, the cost of public health insurance stands slightly above 22 euro.

Secondary and tertiary care provision primarily occurs within the public sector, with responsibilities shared among municipalities and the central government, albeit with limited involvement of private providers. Municipalities and local governments oversee the organization of primary care, where general practitioner (GP) services are predominantly delivered through individual private practices. However, a new reform enacted in December 2022 aims to centralize the establishment of primary care practice boundaries from local governments to the National Directorate-General for Hospitals. Additionally, financial incentives have been provided to GPs to promote the formation of group practices. Some municipalities also own outpatient specialist facilities, known as polyclinics, which offer secondary ambulatory care across various medical specialties to the local population.

Healthcare expenditure in Hungary has exhibited a gradual yet consistent increase over the past two decades.

³ <https://globaledge.msu.edu/countries/hungary>

⁴ [https://www.files.ethz.ch/isn/167427/Wiktorek_Otarashvili - EU and Democracy in Hungary.pdf](https://www.files.ethz.ch/isn/167427/Wiktorek_Otarashvili_-_EU_and_Democracy_in_Hungary.pdf)

⁵ <https://www.pewresearch.org/short-reads/2022/10/18/despite-recent-political-clashes-most-people-in-poland-and-hungary-see-the-eu-favorably/>

⁶ The full report is accessible here: <https://www.oecd.org/publications/hungary-country-health-profile-2023-8d398062-en.htm>

Recurring hospital debt, which is financed from the central budget at the end of each calendar year remains the most significant problem in the country's healthcare system, resulting in delaying surgeries and other necessary treatments.

In 2021, Hungary allocated 7.4% of its GDP to healthcare, notably lower than the EU average of 11.0%. While there was a significant annual growth rate of 11.9% in current health expenditure between 2019 and 2020, this rate decelerated to 7.7% in the period of 2020-21. Hungary's healthcare spending per capita, adjusted for purchasing power differences, stands at EUR 1.866, which is less than half of the EU average. Over the last decade, there has been a gradual rise in the proportion of public financing for healthcare, reaching 72.5% in 2021, as opposed to the EU average of 81.1%. Consequently, households in Hungary bear a relatively high burden of out-of-pocket (OOP) payments, amounting to 25% of healthcare expenditure in the same year, compared to the EU average of 15%. Outpatient medical care, pharmaceuticals, medical devices, and dental care are identified as the primary contributors to OOP spending.

In 2021, Hungary allocated approximately one third (31%) of its healthcare expenditure towards inpatient care, surpassing the EU average of 28%. Outpatient care received 29% of Hungary's healthcare spending, aligning with the EU average. Given Hungary's comparatively lower total health expenditure, a significant portion, 25%, was directed towards outpatient pharmaceuticals and medical devices, which is notably higher than the EU average of 18%. Conversely, only 4% of Hungary's healthcare spending was allocated to long-term care (LTC), significantly below the EU average of 16%.

One of the country's challenges is related to the fact that over the last ten years, more than 8.000 healthcare professionals have departed Hungary for other European nations. Therefore, Hungary faces one of the EU's lowest doctor-to-population ratios. Despite governmental initiatives, Hungarian medical professionals are migrating to Western Europe in pursuit of improved working conditions, leaving the nation's healthcare system grappling with staff shortages and extended wait times. In 2022, over 800 Hungarian doctors sought certification to practice abroad, potentially leading to a dire scenario in a country with slightly over 33.000 doctors serving a population of 9.7 million, translating to approximately 3.5 doctors per 1.000 inhabitants—lower than the EU average of 3.9. Working conditions, including the availability of equipment also influence doctors' decisions to leave Hungary.

It is important to mention that Hungary stands out as a premier destination for **medical tourism** within Europe, particularly renowned for its excellence in dental care. Since the 1980s, the country has attracted patients seeking affordable yet high-quality treatments: offering modern facilities, skilled professionals, and a wide range of specialties including cosmetic surgery, orthopaedics, and fertility treatments, Hungary provides cost-effective options compared to Western Europe and the US. Its central location, accessibility, and therapeutic spa offerings further enhance its appeal. As a result, Hungary continues to attract a growing number of international patients seeking top-tier healthcare in a culturally rich environment.

1.2 EHealth and health data landscape

Electronic Health records organization is implemented on a national scale, with two national Electronic Health Record (EHR) systems in place alongside several local systems.



The main system is the national Electronic Health Service Space, also referred to as the National eHealth Infrastructure (EESZT). Governed by Chapter III/A of the Medical Data Act and detailed regulations specified in Decree No. 39/2016 issued by the Minister of Human Capacities, the eHealth Space commenced operations in November 2017.⁷

EESZT connects publicly funded and private healthcare providers – hospital, outpatient and general practitioner care –, pharmacies and the general public throughout Hungary. Patient data shared in this way promotes faster, more accurate diagnosis and more targeted therapy.

On the Resident Portal of the EESZT (eeszt.gov.hu) - after identifying the customer gatekeeper and entering the TAJ number - anyone can view their own health data, i.e. their prescriptions, final reports, laboratory findings, test results and all documents created during their health care. It is also possible to request a notification when a new document - referral, prescription, lab result or other medical documentation - has been uploaded. The system is easy to use, and it can be used by the citizens to track which doctor and when viewed their individual data. The EESZT performs various functions:

- eRecipe: Electronic prescriptions can be accessed here. It displays orders that have been redeemed and those awaiting redemption for the specified period. While detailed ePrescription content is available, traditional paper prescriptions appear only among triggered prescriptions, entered into the system by pharmacists during triggering.
- Health documents: Digital health documents prepared in healthcare institutions after joining the EESZT are accessible here. This includes findings, outpatient records, final reports, and PCR test results related to coronavirus.
- Event catalog: All healthcare events attended at outpatient and inpatient specialist institutions or family doctor services are listed here. Institutions upload this data, allowing patients and treating doctors to track past examinations and treating doctors. Rapid COVID test results can also be viewed here.
- eReferral: Prescribed eReferrals from doctors can be viewed here. Users can query both valid and used eReferrals for the specified period.
- eProfile: This section stores never or rarely changing health data uploaded by doctors, such as information about allergies, pregnancy, and implanted implants, which can be crucial for emergency care.
- Digital self-determination: Users can control access to their health data managed by the EESZT. They can monitor access requests and set notification preferences for EESZT events. The data visible to treating physicians depends on the user's self-determination settings, permissions, and restrictions.

Healthcare data are also accessible through the portal of the National Health Insurance Fund (NEAK) which aggregates and maintains records of all healthcare services provided to insured individuals. Patients can review past healthcare services and prescribed medications using their personal electronic access to the Governmental Portal and their social insurance number. However, it's important to note that this database only contains a list of health services (including diagnoses, treatments, and prescriptions) received by patients, not their complete health records because the primary objective of this database is to gather and retain information for the purpose of financing medical services.

⁷ https://health.ec.europa.eu/document/download/4b4cc0f2-05ec-4d3a-8017-eea635b5f611_en?filename=laws_hungary_en.pdf

Nevertheless, numerous opportunities remain untapped within the digitization of the domestic healthcare sector, presenting avenues for enhanced efficiency across all levels and areas. The onset of the coronavirus pandemic notably hastened digitization in Hungary, amplifying the demand for digital channels among healthcare stakeholders. Despite this momentum, obstacles persist, including legislative, financial, and attitudinal barriers among the population and professionals toward innovation. Nevertheless, ongoing advancements indicate that the Hungarian healthcare sector is nearing a stage where AI, or artificial intelligence, will play a pivotal role in bolstering sector efficiency.

Hungary plans to participate in eHDSI⁸ (eHealth Digital Service Infrastructure) with sharing prescriptions and patient summaries by 2025. Hungary has been an active member of the EU eHealth Network, as well as a partner in the EU eHealth Joint Actions including JASEHN and eHAction, and in this way participated in the creation of eHDSI.

1.3 Life sciences and healthcare ecosystem

Industry

According to the US Commercial Service,⁹ the **medical technology industry** in Hungary is relatively consolidated, encompassing nearly 180 enterprises primarily focused on export-driven manufacturing, contributing to 5.3% of Hungarian exports. Within the life sciences sector, Hungary employs approximately 53.000 individuals. Several Hungarian companies, such as 77Elektronika, Mediso, Sanatmetal, Innomed Medical Zrt., and Lasram Engineering Ltd., boast diverse portfolios.

Although Hungary possesses a robust foundation for manufacturing various medical devices, the limited domestic market presents challenges for competing with Western standards of quality and innovation. Nevertheless, the Hungarian MedTech sector actively engages in cutting-edge research and development collaborations with universities, particularly in areas such as medical imaging, electric and biosensor devices, and laboratory diagnostics. Local production and imports typically complement each other in the Hungarian market. Hungary is striving to establish itself as a globally significant player in various sectors where it possesses robust infrastructure and expertise. These sectors include clinical trials for innovative drugs, biopharmaceutical development, in-vitro diagnostics, animal biotechnology, molecular medicines, and bioreactor utilization.

The nation's **pharmaceutical industry**, with its rich history and skilled workforce, has fostered the emergence of a red biotech subsector (human health), specializing in areas such as gene therapy, stem cell research, and genetic engineering. This specialization sets Hungary apart within the Central and Eastern European region and positions it strongly on the international stage.

⁸ https://health.ec.europa.eu/system/files/2019-04/ev_20181113_mi_en_0.pdf

⁹ <https://www.trade.gov/country-commercial-guides/hungary-medical-technologies>

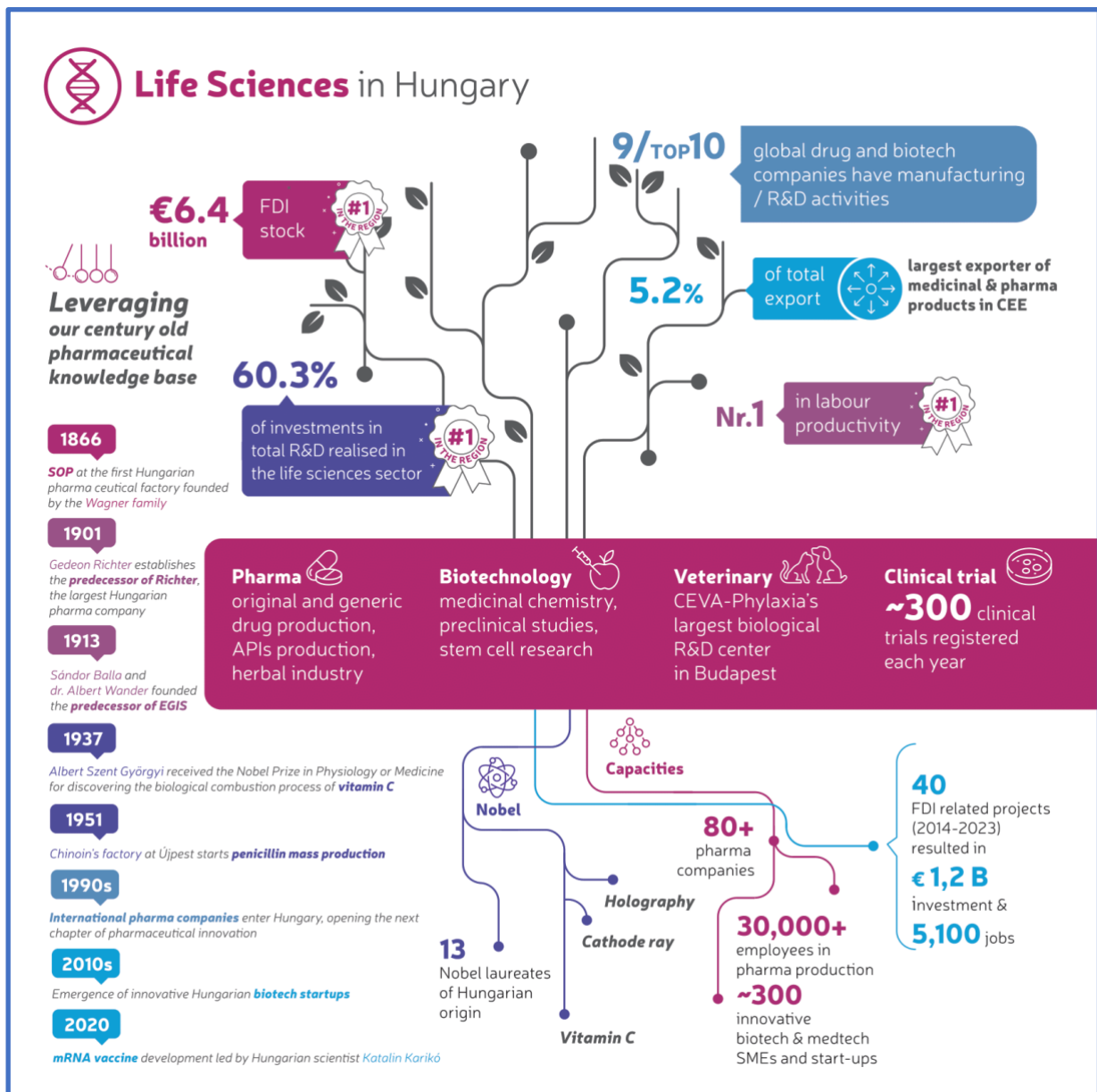


Figure n.2 - Life Sciences in Hungary Infographics (Source: [Hungarian Investment Promotion Agency, 2024](#))

Key players from international biotech companies, including Richter, Amgen, Omixon, Biogen, Servier, UD-Genomed, and Solvo Biotech, are actively engaged in the Hungarian market. Additionally, Hungarian biotechnology firms have expanded their footprint into major European markets, supported by government initiatives through the National Research, Development, and Innovation Office, which identifies biotechnology as a strategic area for growth.

Significant advancements have been made in nanotechnology, molecular chemistry, and biotechnology services. Red biotechnology, particularly in the realm of biopharmaceuticals, thrives in Hungary, with market players eager to enhance their global presence. The Hungarian Biotech Association plays a pivotal role in advancing biotech research, while collaborations between Hungarian universities - such as Budapest Semmelweis Medical University and Medical Universities of Debrecen, Pecs, and Szeged - and international biotech research entities are actively pursued. Hungary hosts approximately 300 clinical trials annually, with

innovative pharmaceutical companies investing over 76 Meuro annually, involving approximately 17.000 patients.

Investments in new medical equipment within Hungary's healthcare sector are poised to rise alongside the growth of public hospitals, outpatient clinics, and private healthcare services. Healthcare technology has emerged as a focal point for the Hungarian Government in recent years. Worth to mention is the "Healthy Hungary" program¹⁰, spanning from 2019 to 2030, comprising five core elements: the National Cancer Program, the National Cardiovascular Program, the National Locomotion Program, the National Mental Hygiene Program, and the National Pediatric Program. To bolster healthcare services and upgrade medical technology in public healthcare institutions in Budapest from 2021 to 2024, the government has earmarked 28 MEUR from the central budget. This funding aims to enhance basic healthcare services and outpatient care, consequently reducing waiting times for specific medical procedures. Allocation of these funds will be distributed across both inpatient and outpatient clinics as well as hospitals throughout Budapest, focusing on developments in MedTech, digital healthcare, and the refurbishment of healthcare facilities.

Telemedicine also holds a prominent position in Hungary's healthcare sector, with e-health playing a pivotal role in expanding healthcare infrastructure, enhancing services, and improving working conditions for healthcare personnel. Despite a lack of HTA framework for DHTs, some telemedicine procedures have received coverage in 2020. Act 58 of 2020 defined the concept of telemedicine to ensure the continuity of patient care. The procedures are listed in the box below.

Professional assessment of the patient's state of health
Detecting diseases and their risks
Identification of the specific disease(s)
Order further tests to assess the patient's condition more accurately, and start treatment
Teleconsultancy (establishing the effectiveness of treatments)
Monitoring the patient's condition and making a diagnosis based on ICT
Psychotherapy, crisis intervention, parent consultation, counseling, supportive psychotherapy
Physiotherapy using a remote consultation device
Breastfeeding counseling
Telephone, online or other forms of advice and consultation

¹⁰ <https://national-policies.eacea.ec.europa.eu/youthwiki/chapters/hungary/7-health-and-well-being>

Covered telemedicine activities in Hungary¹¹

Patient associations

In Hungary, the primary patient advocacy body is the Hungarian Alliance of Patient Organisations (BEMOSZ-HAPO). Functioning as an autonomous umbrella organization, BEMOSZ-HAPO comprises various Hungarian patient groups, dedicated to championing patient interests within Hungary and on the global stage.

The following organisations are members of BEMOSZ-HAPO:

- Hungarian Celiac Society
- Hungarian Cancer League
- Hungarian Association Williams Syndrome
- Hungarian Stroke Prevention and Rehabilitation League
- Hungarian Osteoporosis Association
- Hungarian Federation of Rare Diseases
- Heart SN Society
- Hungarian Fabry Foundation
- Association Haemacromatosis
- Association for the care of premature babies (Melletted a Helyem Egyesület)

Main goals of the association are to promote health literacy, to guarantee equal access to quality healthcare, ensure patients engagement and patients education and to fight any form of discrimination.

For additional information: <https://www.bemosz.hu/in-english>

Cluster organisations and networks

Hungarian Medical Cluster (HMC)

The Hungarian Medical Cluster (HMC) serves as a network of economic entities and institutions involved in healthcare device and service development in Hungary. Established in 2006 by 21 SMEs, it has since grown to include 41 members, including SMEs and three scientific institutes (the University of Szeged, the University of Pécs, and Széchenyi István University); together, they form pivotal players within Hungary's medical technology sector. The cluster aims to strengthen Hungarian medical electronics manufacturing by promoting innovation, inclusivity, and market presence. Collaborations with universities and knowledge centers support education and innovation. Positioned as a leader in Industry 4.0 and digitalization, the HMC fosters an innovative healthcare environment, preserving sector traditions and cultural heritage.

For additional details: <http://mediklaszter.hu/en>

Thermal-Health Industrial Cluster

Established in 2005 with 18 founding members, the Northern Great Plain Thermal Cluster Association facilitates collaboration among stakeholders in thermal and health tourism. Its goal is to advance thermal-health tourism in the region by engaging stakeholders actively. The association supports its members through informational sessions, policy papers, and coordination of tourism-related development projects. It also

¹¹ <https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2023.1197949/full>

conducts professional training events to boost local tourism offerings. In 2013, it merged with the Thermal-Health Industrial Cluster to align with the Regional Development Plan.

For additional details: <https://www.termalegeszsegipariklaszter.hu/>

Association of Innovative Pharmaceutical Manufacturers

The Association of Innovative Pharmaceutical Manufacturers, established in 1992, comprises at present 26 research and development-focused pharmaceutical firms in Hungary. These companies collectively contribute to over 50% of the country's medicine turnover. All the members are dedicated to pioneering advancements in healthcare and enhancing quality of life. Through the creation and advancement of innovative medications, we address medical conditions that lack effective treatment options.



Figure n.4 - Present members of AIPM (source: AIPM website)

Overarching objective of the association is to ensure broad and timely access to cutting-edge medical solutions for the Hungarian population, leveraging modern discoveries. To achieve this, the association and its members maintain collaborations with various stakeholders, including government bodies, health authorities, patient groups, social organizations, and educational institutions.

Website: <https://aipm.hu/en/aipm-english/>

Association of Healthcare Technology and Medical Technology Suppliers (ETOSZ)

The main objective of ETOSZ is to provide modern and innovative technologies for the care of Hungarian patients, to which it contributes focusing on:

- Enhancing access to innovative therapies and technologies, ensuring patients receive cutting-edge care comparable to neighboring countries. This helps align Hungarian healthcare standards with Europe.
- Ensuring stable healthcare financing by engaging policymakers to implement sustainable financial solutions, safeguarding the functionality and development of healthcare services.
- Advocating for an ethical business and regulatory environment, promoting transparency, integrity, and fair competition based on quality and service standards.
- Promoting a unified approach in the healthcare industry, emphasizing collaboration among stakeholders to optimize patient care while ensuring technological and financial sustainability.

Website: <https://etosz.org/>

Hungarian Society for Experimental and Clinical Pharmacology (HUPHAR)

The HUPHAR, established in 1962 as a public benefit organization, is dedicated to advancing the fields of pharmacology, clinical pharmacology, pharmaceutical research, and innovation. This includes fostering pre-clinical and clinical development, conducting clinical trials for medical equipment and medication combinations. Additionally, the Society is committed to promoting graduate and postgraduate training for professionals across all pharmacological disciplines and supporting the growth of these fields.

The HUPHAR serves as a unifying body for various branches of pharmacology, emphasizing professional collaboration in both experimental and clinical pharmacology. Recognizing the interdependence of these areas, especially in the 21st century where pharmaceutical research and development rely heavily on multidisciplinary translational research, the organization is dedicated to facilitating cooperation and innovation.

Furthermore, the HUPHAR plays a vital role as a representative entity for international pharmacological organizations such as IUPHAR, EPHAR, EACPT, and IFAPP within Hungary, thereby contributing to the exchange of ideas and the dissemination of research findings on both national and international platforms.

Website: <https://huphar.org/en/>

Hungarian Healthcare Management Association (MEMT)

The Hungarian Healthcare Management Association aims to enhance the management practices within healthcare organizations and the healthcare system of Hungary. This objective is pursued through the coordination of scientific and professional endeavors among Hungarian healthcare managers.

The Association endeavors to accomplish its mission through the following activities:

- Facilitating regular professional gatherings
- Engaging in national and international conferences, both in participation and organization
- Compiling, publishing, and disseminating informational materials and professional publications
- Providing support for participation in educational and scientific programs
- Establishing an accreditation system for educational programs and institutions
- Contributing to the enhancement of educational program qualifications
- Addressing inquiries regarding the career progression of health and medical managers

- Cultivating and nurturing domestic and international relationships, including partnerships with organizations, chambers, colleagues both abroad and within Hungary, and domestic health management training workshops
- Conducting educational and organizational initiatives
- Undertaking research endeavors and analyses
- Providing consulting services



Figure n.5 - Data-Driven Healthcare and Cybersecurity conference 2024 organised by MEMT

Website: <https://memt.hu/>

Association of Hungarian Medical Societies and Associations

Founded in 1966, the Association of Hungarian Medical Societies and Associations (MOTESZ) is an association based on the voluntary association of professional and scientific associations and societies of doctors and dentists, as well as natural and social science societies and associations directly related to them. Through its 124 member organizations, it encompasses approximately 30.000 Hungarian doctors, researchers and scientists.

Website: <https://motesz.hu>

Academia

Semmelweis University - Budapest

Semmelweis University, situated in Budapest, Hungary, has been a leading medical institution since its establishment in 1769. Renowned for its excellence in medical education and research, the university comprises six faculties and a doctoral school, covering a broad spectrum of medical and health sciences. Not only is Semmelweis University esteemed in academia, but it also serves as a major healthcare provider in Hungary, specializing in treating severe cases and complex medical interventions.

Ranked as Hungary's top institution in the 2023 Times Higher Education World University Rankings, Semmelweis University holds a prestigious position among the top 250 universities globally.

Research and development, alongside training initiatives, are seamlessly integrated into the university's clinical and health sciences domains and educational curriculum. These efforts extend to specialized networks in nanotechnology, bioimaging, genomics, and biobanking, as well as research modules focusing

on diagnostics, technology, therapy, and prevention, fostering collaborations and partnerships in vital areas of study. For further details: <https://semmelweis.hu/>

University of Debrecen - Debrecen

The University of Debrecen holds the distinction of being the oldest continuously operating institution of higher education in Hungary, having been founded in 1538. Renowned for its English-language programs catering to international students, especially in the fields of Medicine and Engineering, the university has a rich history of offering English-medium education since 1886. Currently, it boasts a diverse community of nearly 6.000 international students. Main faculties of the university include Dentistry, Medicine, Informatics, Pharmacy, Engineering and Public Health. For further details: <https://unideb.hu/en>

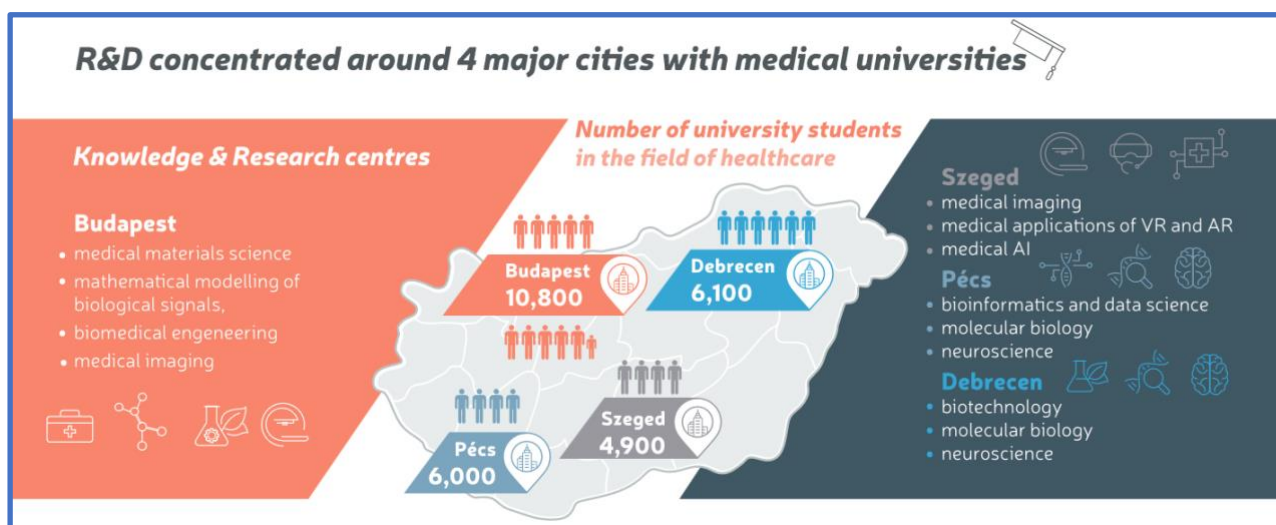


Figure n.6 - Main Medical Universities in Hungary (Source: [Hungarian Investment Promotion Agency, 2024](#))

University of Pécs - Pécs

The University of Pécs, one of Hungary's largest higher education institutions, traces its origins to the Middle Ages, making it the country's first university and the fourth in Central Europe. Established in Pécs in 1951, it currently accommodates approximately 22,000 students, including 4,900 international students enrolled in English or German-language programs. With 10 faculties, numerous clinics, and research centers, the university offers robust academic support to its diverse student body.

The Faculty of Engineering and Information Technology provides 12 English-language courses, including a Master's in Biomedical Engineering. The Faculty of Health Sciences operates in four training centers across Kaposvár, Pécs, Szombathely, and Zalaegerszeg, fostering effective collaboration with local teaching hospitals and social institutions. As the largest faculty of its kind in Hungary, it excels in student enrollment, elective courses, teaching staff, and training opportunities.

For further details: <https://international.pte.hu/>

University of Szeged – Szeged

The University of Szeged, a renowned public research institution in Szeged, has a rich history dating back to 1581 with the establishment of the Jesuit Academy of Kolozsvár. Re-established as a university in 1872, it relocated to Szeged in 1921, becoming one of Hungary's oldest research universities. In 2000, it was

restructured to comprise twelve faculties and nineteen doctoral schools, overseeing the Health Centre of the University of Szeged, a comprehensive teaching hospital serving the regional public healthcare needs, and three laboratory schools. Unlike traditional single-campus universities, its faculties and buildings are spread throughout downtown Szeged.

For further details: <https://u-szeged.hu/>

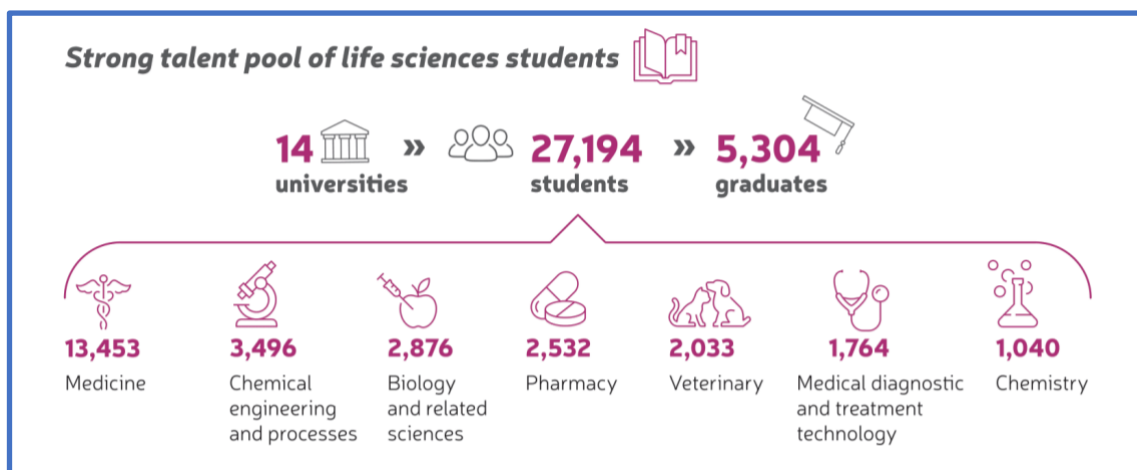


Figure n.7 - Life Sciences Students Infographics (Source: Hungarian Investment Promotion Agency, 2024)

Research centres

Biological Research Centre (Hungarian Academy of Sciences)

The Hungarian Academy of Sciences' Biological Research Centre (BRC), is situated in Szeged. Established in 1971 and employing approximately 260 scientists across its four institutes, the BRC's research endeavors contribute to international scientific literature and patents, with notable former staff members like Katalin Karikó. Research areas span various aspects of molecular and cell biology, ranging from industrial applications of bacteria to the enhancement of cultivated plants and the exploration of human health and environmental protection. While primarily dedicated to scientific research, the BRC also plays an active role in fostering biotechnological companies and education initiatives.

For further details: https://www.brc.hu/hu/?change_lang=en

HUN-REN Research Centre for Natural Sciences

The HUN-REN Research Centre for Natural Sciences engages in interdisciplinary investigations within the realm of natural sciences, placing particular emphasis on organic chemistry, materials and environmental chemistry, protein analysis, enzymology, cancer research, pharmaceutical studies, and cognitive neuroscience and psychology. A pivotal aspect of the research agenda involves developing strategies aimed at mitigating environmental harm. Given the growing stringency of both domestic and European regulations, this aspect assumes heightened significance in fostering the emergence of sustainable economic practices. Among its institutes it is possible to mention the Institute of Molecular Life Sciences, the Institute of Cognitive Neuroscience and Psychology, the Institute of Organic Chemistry and the Brain Imaging Centre.

For further details: <https://ttk.hun-ren.hu/en>

Other relevant research infrastructures

Hungarian universities are hosting a series of relevant research infrastructures, worth to be mentioned.

- Bioanalytical instrumentation for analyte examination at molecular and cellular levels @University of Debrecen
- BioImaging Hungary – Node of EuroBioImaging Network @ University of Debrecen
- Biosafety Level-4 Laboratory @ University of Pécs (BSL-4)
- European Life-sciences Infrastructure for Biological Information (ELIXIR HUNGARY)
- Hungarian European Clinical Research Infrastructura Network (HECRIN) @ University of Pécs
- Integrated Infrastructure for Molecular Science and Molecular Medicine (I2M2) @ University of Debrecen
- Biobank Network @ Semmelweis University Budapest

Hungarian National Health Research Agency (HNHRA)

Health research and development are conducted worldwide through professional organizations and agencies that collaborate closely with governmental entities. In alignment with this global practice, the HNHRA has been established in 2021 to coordinate scientific endeavours within the healthcare sector, facilitate the translation of research into practice, and uphold governmental priorities.

The mission and objective of the HNHRA are to cultivate an exceptional innovation environment, supported by medicinal research, that fosters the advancement of new technologies and procedures within Hungary. This initiative aims to enhance value addition and broaden access to innovative therapies for patients.

In addition to aiding research centers, institutes, and healthcare facilities in adhering to Hungarian research standards during their scientific pursuits, the HNHRA will also share best practices in specialized fields through international collaboration. Furthermore, it will transfer developed frameworks to bilateral and multilateral partners via knowledge exchange initiatives.

For further details: <https://neku.org.hu/>



2 – Existing legal framework

The primary regulations governing personal data, alongside the EU General Data Protection Regulation (GDPR), are outlined in Act CXII of 2011 on the Right of Informational Self-Determination and on Freedom of Information, commonly referred to as the "Information Act." Specifically focusing on the healthcare sector, **Act XLVII of 1997 on the Processing and Protection of Health Care Data and Related Personal Data**, known as the "**Medical Data Act**," serves as the key sector-specific legislation.

Art. 4(1) of the Medical Data Act delineates the objectives of processing medical data and associated personal data, which include:

- Advancing the protection, enhancement, and maintenance of health
- Facilitating the efficient delivery of healthcare services by healthcare providers, encompassing supervision.
- Monitoring the health status of individuals.
- Implementing necessary measures for public health and epidemiology
- Upholding patient rights.

Within Hungary's legal framework, concerning health data as delineated by GDPR, the nation adheres to the legal obligations specified in Article 6(1)(c) and the provision outlined in Article 9(2)(h), which pertains to health or social care.

According to Section 12(1) of the national Medical Data Act, individuals have the option to provide personal health data and identifying information voluntarily. Additionally, Paragraphs (2) and (3) stipulate that consent is presumed when the data subject, typically a patient, voluntarily seeks assistance from a healthcare provider or when urgency or the incapacitation of the data subject is evident.

Section 7 specifies that data controllers are exempted from medical confidentiality obligations if written consent is obtained from the data subject or their representative. However, this exemption is limited to the scope of the consent provided.

Further provisions in subsequent sections detail specific instances wherein **data sharing** is permitted, such as for public health initiatives, epidemiological studies, occupational health, storage of data in national health databases and disease registries, and administrative purposes.

More stringent regulations govern the handling of **genetic data** in Hungary, particularly under Act XXI of 2008 on the Protection of Data on Human Genetics, on the Rules of Research and Examinations of Human Genetics, and of the Functioning of Biobanks. This legislation provides comprehensive guidelines for the collection, storage, and usage of genetic information, ensuring the protection of individuals' genetic privacy and rights.

For what attains the **creation of disease registries** (or medical registries) detailed rules are included in the Medical Data Act too (Sections 16, 22 and 35) and in the Decree No 49/2018 of the Minister of Human Capacities on diseases with a high public health significance or high-cost burden, the nomination of disease (medical) registries, and the rules of reporting and registration of such diseases.

As per the legislation, the following parties may lawfully receive access to information stored in the disease registry:



- Healthcare professionals are eligible to access the data they have contributed to the registry.
- Healthcare providers have the authority to access data related to patients within their geographical area or jurisdiction.
- Patients have the right to access any data pertaining to themselves.
- Healthcare system payers, such as governmental bodies and statutory health insurers, may access data regarding patients within their coverage or jurisdiction.
- Other national governmental agencies are permitted access.
- Public sector researchers are authorized to access the data.
- Private researchers are also granted access.

Regarding **cross-border data exchange**, the absence of specific legislation poses certain barriers. However, health professionals may engage in cross-border data exchange when it is deemed medically necessary. Challenges to such exchanges may arise due to various factors:

- Different legal bases in member states may cause legal concerns when sending data across borders, such as differences in patient consent requirements or legal obligations.
- Varying administrative rules and procedures across countries can slow down the exchange of data and complicate coordination efforts.
- There may be an unclear understanding and interpretation of GDPR requirements concerning health data, leading to uncertainties and potential legal risks for data exchange activities.

To address these challenges, Hungary has introduced and operates a national-level eHealth system known as EESZT. This system aims to promote interoperability on a national scale and facilitate centralized electronic cross-border data exchange. The presumption of patient consent for individual health services simplifies administrative processes for data exchange required for diagnosis or treatment purposes. The EESZT provides an opt-out mechanism, allowing patients to specify that their data should not be accessed by particular healthcare professionals or to opt out of data usage for research purposes.

Full details about the regulation of EESZT can be found at this link: <https://e-egeszsegugy.gov.hu/web/eeszt-information-portal/regulation>

The National Data Asset Management Agency

The National Data Asset Management Agency (NAVÜ) is a governmental body in Hungary established by law in 2021, authorized to access national databases as per Act No. XCI of 2021 on the National Data Asset and Government Decree No. 607/2021 (XI. 5) detailing the use of national data assets. To facilitate these tasks, the National Data Assets Agency Limited Liability Company was established, mandated to compile a list of databases containing reusable public data (in accordance with Act No. LXIII of 2012 on the reuse of public data), known as the public data cadastre, as well as the national data asset inventory, which includes registers containing personal data, public data, and data of public interest usable for data analysis. The Agency's key responsibilities include operating the National Open Data Portal and offering information services to aid decision-making for central government administrations and businesses.

NAVÜ's responsibilities will encompass operating a national public data portal, establishing and overseeing a national public data registry, analyzing anonymized databases, and providing data analysis services to the government, markets, and citizens.

NAVÜ is supposed to generate new data sets in collaboration with relevant organizations handling such data. To safeguard personal data, collaborating data managers will be required to appropriately anonymize the data they handle. The proposal concentrates on the professional processing of extensive databases and does not affect regulations pertaining to access to data in the public interest.

Secondary use of data

Despite the advancements described above, legislation concerning the secondary use of health data remains less clearly defined, posing ongoing challenges for data governance and privacy protection in the healthcare sector.

The access to personal health data for scientific research and personalized healthcare purposes falls under the 'Privacy Act (2018)', which aligns with the General Data Protection Regulation (GDPR). While there have been suggestions for sector-specific legislation to address scientific applications in healthcare, no formal proposals have been submitted thus far. It's essential to obtain individual consent for utilizing data for scientific research purposes.

The **general rules of medical research involving human subjects** are laid down by Act CLIV on Health (Health Act), Sections 157-164/D. Special rules are included in Decree No. 23/2002 of the Minister of Health on biomedical research involving human subjects. In order to carry out medical research, the approval of the national and local ethics committees, as well as the given healthcare institution is always needed. The research plan is approved by the Medical Research Council. The research plan shall be approved for implementation by the executive of the healthcare institution, or in the case of another health service provider. The decree referred to above lays down special rules on the protection of persons taking part in the research, providing information about and giving consent to the research, the institutional research ethical committee and the Regional Research Ethical Committee, reporting obligation, provisions on examinations without intervention.

In Hungary, the legislation treats not-for-profit researchers and for-profit researchers equally. Scientific research is enumerated as one of the objectives of data processing in Section 4 of the Medical Data Act. Specific regulations for research are outlined in Section 21 of the Medical Data Act. According to paragraph (1), individuals can access medical data for scientific research purposes with the consent of the head (director) or the Data Protection Officer (DPO) of the relevant healthcare provider. However, any scientific publication based on this data must not include health or personal data that could identify the patient. Additionally, personal identifying information stored in research data cannot be duplicated. Records must be maintained detailing which individuals (researchers) accessed the data, along with the purpose and date of access, for a period of 10 years. If a research application is denied, the head or the DPO must provide justification. The applicant has the option to appeal the decision in court in accordance with the general provisions of the Privacy Act.

Data access infrastructure entities through which researchers can share, and access EHR data for research purposes are represented by national eHealth Space and the database of the National Health Insurance Fund. Among these, the National Health Insurance Fund's database, primarily containing healthcare financing information, is accessible for research upon request. The dataset within the national eHealth Space offers a

more comprehensive source of data. However, the legislative framework governing its use for research purposes is not yet fully established.

Researchers can also obtain access to individual healthcare providers' databases with the authorization of the director or the Data Protection Officer (DPO). The National Healthcare Service Centre, responsible for operating all public hospitals in the country, maintains its own database. Notably, university clinics, of which there are four medical faculties in Hungary, possess substantial databases.

At a recent health conference (2023)¹², Zoltán Lantos, associate professor at Semmelweis University, addressed the **current state and future trajectory of healthcare data management**. Despite having stored health data in the cloud for five years, most of it remains in PDF format, limiting its utility for researchers. Lantos highlighted the impending arrival of unified data space regulations in 2025, which will standardize e-health data across member states and necessitate Hungary's readiness for compliance.

Emphasizing the significance of data in the digital age, Lantos underscored the necessity for patient data within the Electronic Health Services Area (EESZT) to transition from PDF to structured, searchable formats. He noted ongoing efforts toward data standardization within the European Union (EU) and anticipated the enactment of health data space regulations by 2025. These regulations will harmonize e-health data and dissolve member state markets.

However, Lantos cautioned that Hungary currently lacks preparedness for this transition, potentially facing significant challenges akin to a 'tsunami' when attempting to integrate the EESZT data into the EU data space.

At present, registry datasets exhibit inadequate coordination and lack standardization, resulting in diminished data quality. In addition, essential datasets concerning social health insurance, sickness/employment benefits, and certain health registries remain uncollected and unpublished, leading to knowledge gaps in managing efficiency and resource optimization within the local healthcare system.

In light of these weaknesses, Electronic Health Records (EHR) are currently at the forefront of healthcare reform efforts, also because market players and research centers are increasingly seeking access to data for secondary data processing purposes. Therefore, a primary objective in the ongoing development of the EESZT is to facilitate the utilization of data resources by establishing the necessary technical infrastructure. For example hospitals are now mandated to collect all records at the patient level, which are subsequently integrated into a centralized data collection system. Mandatory data collection is essential for securing financing for interventions, thus fostering incentives for digital reform among stakeholders.

Patients' Rights to access medical records

The national eHealth Space, also known as the Electronic Health Cooperation Service Space, was established through Chapter III/A of the Medical Data Act. Detailed guidelines for the eHealth Space are outlined in Decree No. 39/2016 issued by the Minister of Human Capacities. This platform encompasses the medical data and associated personal information of all individuals covered by social insurance in Hungary, essentially encompassing the entire population.

Patients have the capability to access their own medical records electronically through the eHealth Space. Additionally, patients are empowered to request their medical data or records from healthcare providers

¹² Source: <https://hirlevel.egov.hu/2023/05/22/a-magyar-egeszsegugy-nincs-felkeszulve-az-erkezo-europai-egyseges-egeszsegugyi-adatterre/>



where diagnosis or treatment was conducted, as per Section 24 of Act CLIV on Health (Health Act). Healthcare providers are mandated to furnish a copy of the medical record, report, medical image, and similar documents upon request. In accordance with the **right to access medical records**, patients are entitled to:

- Receive information regarding the management of their medical data.
- Be informed about their test results and medical data.
- Obtain a hospital discharge document upon discharge.
- Receive an outpatient medical record after outpatient care.
- Request modifications to their medical record if any data is missing or incorrect.

Furthermore, patients have the right to:

- Review their medical records, request an excerpt, or obtain a copy of them.
- Receive the first copy free of charge

In the event of the patient's death:

- Legal representatives, close relatives, or heirs can request information about the cause of death, medical treatment received, and access the patient's medical records.
- Spouses, children, siblings, or life partners can access the patient's medical records if the information is crucial for their health and cannot be obtained otherwise.
- Psychiatric patients' access to their medical records can be restricted if it might harm their recovery or violate someone else's privacy rights, with patient representatives and legal representatives being notified of any restrictions.

Access to medical records is also available through the EESZT (National eHealth Infrastructure) in electronic format.

3 – Innovation agenda in the field

Future plans about innovation in healthcare, with specific focus on health data, are described across three main official national documents, namely the **Health Sector Strategy (2021)**, the **AI Strategy (2020)** and the **Recovery and Resilience Facility (2022)**, while a dedicated Digital Health Strategy is under development.

3.1 Health Sector Strategy “Healthy Hungary 2021–2027”

The main national document tackling the topic of ehealth and health data in Hungary is represented by the 7 years strategic document entitled "**Healthy Hungary 2021–2027 – Health Sector Strategy**" prepared by the State Secretariat responsible for healthcare, published in January 2021, and mentioned earlier in this report.

The 113 pages document builds upon previous efforts such as the adoption of five National Health Programs in 2018 and the Semmelweis Plan of 2011 and aims to promote healthier and longer lives for Hungarians.

Through a comprehensive approach, utilizing both EU and domestic resources, it plans to include infrastructural investments, leveraging funds from the Recovery and Resilience Plan (RRF) to strengthen basic care, medical wages, and digital transition. It also mentions the Human Development Operational Program

(HOP) which aims to finance public health, prevention, screening programs, and long-term nursing care, as well as the Competitive Hungary Operative Program (VMOP) intended to support care accessibility and targeted health improvements. Through the Digital Renewal Operative Program (DIMOP) it plans to modernize digital services, while other operational programs like the Green Infrastructure and Climate Protection Operational Program (ZIKOP) are planned to contribute to energy modernization of institutions within the health sector.

Among the six main goals of the plan, what is relevant here is the one entitled “Strengthening the public health system”, where digital health is comprised.

In relation to this topic, the document acknowledges that the digital transition represents a significant societal shift offering widespread opportunities across various domains, including healthcare. This transformation greatly benefits public health by making targeted treatments more accessible, promoting healthier lifestyles, and optimizing resource utilization. Moreover, addressing health at a societal level necessitates new tools beyond traditional health systems. This is underscored by initiatives like the WHO's "Health in all policies" program, which emphasizes the importance of a holistic health ecosystem approach. Integrating digital health models with such initiatives can effectively serve as a cross-sectoral social program.

The document states that in Europe, efforts towards unified healthcare are evident through cross-border collaborations among healthcare stakeholders and directed programs aimed at standardizing data exchange and establishing a unified European healthcare data space. The creation of the Hungarian Electronic Health Services Space (EESZT) at the national level exemplifies such efforts, providing an integrated platform for e-health solutions and facilitating collaboration among healthcare providers.

Then, a series of planned and coordinated actions related to the e-health action plan are described and detailed as follows.

1. Human-centered E-Health

Within the framework of a comprehensive central program, the development group that implements human-centered E-Health solutions can be formed. One of the foundations for the implementation of human-centered EHealth is "Patient 360 degrees", which is nothing more than a set of structured data and information collected "around" the citizen and dynamically built. The patient's health profile is formed from the continuous evaluation of its connections. As a central element of public health communication, a user-friendly central portal can provide a solution that provides the two groups of users (patients and care staff) with a quick and organized way to access information.

2. Regulated processes, data-driven decisions

The goal of implementing regulated processes and data-driven decisions is:

- *supporting decision-making based on authentic and real-time data*
- *implementation of efficient resource allocation*
- *improving the quality of care*
- *creating sectoral transparency*

3. Unification of supply system IT

The main goal of the unification of supply system IT:

- *achieving the highest possible level of interoperability*

- *homogenization of heterogeneous endpoint systems*
- *improving the quality of care*
- *supporting health awareness and prevention*
- *support for effective screening activities*
- *supporting efficient patient care*
- *promoting cost effective institutional operation*
- *creating sectoral transparency*

4. Digitization of supply processes

The aim of the digitization of the care processes is to:

- *put the patient at the center of the care and integrate the service points into a unified process (integrated care)*
- *increasing the efficiency of use of resources*
- *promoting the sustainability of the supply system*
- *achieving greater health gains through more efficient care and the involvement of patients*
- *proper utilization of the capacities of healthcare workers and their workload reduction, increasing their satisfaction*
- *on the basis of the standardized data collected on supply processes, capacities and training needs can be accurately predicted and thus well planned*
- *quality assurance and development broken down to the level of individual service providers and employees is available*
- *the added value of all elements of the service is standardized, so its technological evaluation can be implemented.*

5. Support of official and administrative activities, e-public administration

The purpose of supporting official and administrative activities is to:

- *extend e-public administration to the health field*
- *maximizing user satisfaction*
- *minimizing social costs, reducing customer burden*
- *creating the conditions for life situation-based administration*
- *increasing customer experience and satisfaction*
- *increasing trust in e-public administration services*

6. Creation of an E-Health institutional system

The purpose of managing the E-Health institutional system is to:

- *exploiting synergies between sectors*
- *achieving uniform and coordinated operation*
- *reduction and elimination of duplications*
- *cost effectiveness*
- *achieving the highest possible level of interoperability*
- *homogenization of heterogeneous endpoint systems*
- *improving the quality of care*
- *support for effective patient care*

- promoting cost-effective institutional operation
- creating sectoral transparency



Figure n.8 - The six actions constituting the Health Sector Strategy, explained in section 3.1 (Source: official strategy document, in Hungarian)

3.2 Hungary Artificial Intelligence Strategy 2020-2030

Recognizing both the potential benefits and challenges associated with technology, the Government of Hungary decided to formulate a comprehensive Artificial Intelligence Strategy, which was unveiled in 2020. This strategy delineates goals extending until 2030 and provides an action plan until 2025 to achieve them. Given the rapid pace of technological advancement and the increasing experience with AI applications, this Strategy is considered dynamic and subject to periodic revision, with updates scheduled at least every two years. The full document is available here: <https://mik.neum.hu/wp-content/uploads/2024/03/Magyarország-Mesterseges-Intelligencia-Strategiaja.pdf>

Hungary's AI strategy is geared towards bolstering and enhancing various segments of the AI value chain, encompassing data generation and management, fundamental and applied research, technology utilization, and increasing awareness of the practical applications of AI. Through a multifaceted array of objectives, the strategy aims to:

- Reinforce the **foundational pillars** of the Hungarian AI ecosystem, including the data economy, R&D&I, AI adoption, education and skills development, infrastructure implementation, and regulatory and ethical framework.
- Concentrate on specific focus areas, represented by sectors and technological domains with the greatest potential for acceleration in Hungary, such as manufacturing, agriculture, public administration, transportation, logistics, energy and of course healthcare.
- Launch transformative initiatives with ambitious long-term objectives that directly benefit citizens, including the promotion of health awareness in the digital realm.

As stated above, **healthcare represents one of the 7 focus areas.**

The objective is to ensure responsible utilization of the expanding healthcare data assets in Hungary, emphasizing the enhancement of diagnostic and therapeutic applications of AI, and the development and implementation of AI-supported medical decision-making and technologies. This aims to actively contribute to a more efficient healthcare industry in accordance with the e-Health strategy. Key initiatives include:

- Facilitating access to healthcare data and promoting AI research and innovation while adhering to GDPR requirements. This involves leveraging modern infrastructure to harness large, continually generated health data assets for preventive, screening, and decision-support applications.
- Developing an infrastructure and organizational framework that facilitates the effective utilization of health data assets.
- Advancing the deployment, testing, and piloting of AI applications in healthcare settings to improve everyday care processes. This entails introducing proven AI applications supported by data on a pilot basis.
- Enhancing health administration and management efficiency through AI tools within the National Health Laboratory. This includes supporting AI-focused research, incubating health startups, and promoting the use of AI for capacity planning and administration tasks such as human resources, emergency response, and asset utilization.



Healthcare	
Measure	Target
Making healthcare data available, supporting AI research and innovation based on it	Creation of an infrastructure and organization supporting the exploitation of healthcare data assets, the development of the related legal environment
Development of AI applications in the field of prevention, screening and diagnostics	I. image diagnostics II. focused, preventive screenings based on the analysis of central records III. therapy and diagnostic decision support ARC. increasing the efficiency of drug research, supporting in silico experiments V. development of medical technology devices
Medical introduction	Introduction of existing applications into medicine (distribution of some own developments on a pilot basis)
Introduction to the supply process	Distribution of MI applications that can be integrated into the everyday supply process
AI support for capacity planning	Capacity planning and administration support with MI support (e.g. HR, backup, asset utilization)

Figure n.9 - Specific measures for healthcare (Source: "AI Strategy 2020-2030")

In terms of **transformative initiatives**, directly benefiting the citizens, the Strategy states that citizens are being prepared for the advantages of maintaining health in the digital era and utilizing AI-supported suggestions, while also being guided through potential risks. The integration of digitization and artificial intelligence presents numerous opportunities in digital health awareness and medicine. Hungary's proficiency in integrating and analysing patient data is expected to be further enhanced through industry-focused developments.

It clearly emerges that these transformative measures don't encompass traditional programs but rather intricate goal-oriented systems, presented in a manner accessible to the broader society. They outline Hungary's ambitious directions for both domestic and international participants within the AI ecosystem. For what attains healthcare **the goal** is formulated as follows: "to integrate AI in the healthcare system, so at least 3 million citizens will receive modern services based on AI through the integrated digital health system".

Health awareness in the digital world	
Measure	Target
Campaign promoting the use of health data	A campaign promoting knowledge of possible health data and its own collection and responsible use using applications connected to the data wallet
Resolutions on the use of health data	Developing a legal position on how to use your own health data or the health data collected by us in a secondary way
	Assessing the activities of companies dealing with illegal data management, examining the means of action against these activities and applying the available tools, reducing the number of information security incidents, and increasing data protection and integrity
Healthcare data analyst development of a rating system for applications	Mapping of digital healthcare applications, establishing qualification criteria and control processes, communicating with qualified service providers

Figure n.10 - Measures related to "Health Awareness in the digital world" (Source: "AI Strategy 2020-2030")

This progress creates additional avenues to support healthcare professionals and the sector as a whole, as well as to develop and deploy AI applications. However, it's crucial for citizens to be aware of these potential benefits and actively engage in preserving or restoring their health. Consequently, as digitization and AI become increasingly prevalent, prudent and informed use of available services and tools is in the best interests of both the country and individuals.**3.3 Hungary Recovery and Resilience Plan**

Funding from the Recovery and Resilience Facility offers Hungary significant resources for the modernization of its healthcare system.

As outlined in its Recovery and Resilience Plan¹³, Hungary is set to receive EUR 5.8 billion, equivalent to just under 4% of its GDP. A portion of these funds, specifically 22%, totalling EUR 1.3 billion, is earmarked for healthcare investments. A primary focus of this allocation is the digitization of the healthcare sector. This involves enhancing information technology infrastructure in healthcare facilities, developing telemedicine solutions, launching mobile health applications, and establishing a remote health monitoring system for the elderly. Additionally, investments will target the modernization of healthcare infrastructure and equipment, strengthening hospital networks, and promoting the integration of primary and preventive care through the establishment of group practices for general practitioners.

The release of funds is conditional upon the achievement of 27 key "super milestones," which encompass measures aimed at combating corruption, ensuring transparency in public procurement, safeguarding judicial independence, and upholding the rule of law.

Moreover, these investments will be complemented by the EU Cohesion Policy 2021-27 programming, with Hungary expected to invest EUR 154 million in its healthcare system. The EU will co-finance a significant portion, 85%, of this amount through the European Regional Development Fund (ERDF). The objective is to enhance service quality by modernizing infrastructure, thereby improving accessibility to healthcare services in targeted regions.

The overarching goal of health measures included in the RRP is to operate a modern and efficient care system capable of responding to the challenges of the 21st century, with developments affecting different levels of care to maximize the health benefits available. 5 areas of reform or investment are envisaged:

1. Development of primary health care (reform)
2. Creating the conditions for the health care of the 21st century (investment)
3. Supporting the digital transformation of healthcare (reform)
4. Digitalisation programme for the safety and protection of people with limited self-sufficiency (reform)
5. Eradication of gratuity payments in the healthcare sector (reform)

Here we focus on n.3.

The document states that embracing digital technologies is now integral to healthcare, mirroring trends in other industries; digitization can replace traditional healthcare practices, enhancing patient safety, quality, flexibility, availability, and efficiency. The European Commission emphasizes transforming health systems for high-quality services through digitization. Digital technologies enable health data organization, disease prevention, personalized services, efficient data exchange, and informed decision-making. The deliberate

¹³ Full document is available here: <https://archive.palyazat.gov.hu/download.php?objectId=1096565>

application of modern digital technologies is crucial for significantly improving the health status and quality of life of the Hungarian population.

Considering the above, the document identifies as the primary aim of the healthcare digitization reform to utilize information and communication technologies (ICT) to enhance prevention, diagnosis, treatment, and monitoring, thereby improving the efficiency of the health sector, increasing access to services, and enhancing the quality of care. For the healthcare system, goals include ensuring sustainability, reinforcing cost-effectiveness, securing health data management, and providing higher-quality services while improving population health. Healthcare workers anticipate increased efficiency, reduced paperwork, improved resource management tools, and streamlined appointments. Successful implementation requires coordinated cooperation, program implementation, and attention to developing digital skills. Under the RRF, the reform aims to enhance institutional operation, introduce modern communication solutions, expand telemedicine services, and incorporate smart devices to reduce administrative burdens and optimize resource utilization in primary care.

Some scholar articles state that the use of digital health solutions is already an integral part of care and that there is a strong demand for further digital options.¹⁴

So, as per implementation, developments planned under the RRF's digital health reform cover the following topics of interest for our report:

- Residential e-Health features, increasing the n. of users using a central healthcare mobile application
- Development of the ambulance service with new industry services using solutions of AI
- Improving the security of the supply system - infrastructure, technology and security developments
- Digitisation of supply processes, namely:
 - Establishment of a Central Telemedicine, Remote Monitoring and Care Centre, Telemedicine and Remote Monitoring
 - Establishment of a central remote diagnostic centre
 - Data connections in healthcare
 - Establishment of central patient management services
 - Establishment of an outpatient and inpatient care qualification system, Central management of waiting lists
 - Establishment of a Central Telemedicine, Telemonitoring and Telecare Centre
- Introduction of a central health IT management system and development of a central health mobile application
- Implementation of the National Biobank Framework
- Implementation of digital, structured formats and system of medical findings, the unification of diagnostic findings
- Establishment of an Electronic Health Services Area (EESZT) data centre, data analysis centre for health research

Implementation is planned from 2021 to 2026, with the following milestones / indicators:

- Number of hospitals with an upgraded IT security system – 65 (2024/Q4)
- Number of new healthcare databases and disease registers available digitally – 17 (2026/Q1)

¹⁴ <https://akjournals.com/view/journals/650/163/29/article-p1159.xml>

- Increase of the proportion of types of health authority procedures that can be initiated electronically – 60 % (2025/Q4)
- Number of telemedicine services provided via digital tools in a single year – 690,000 (2025/Q4)
- Number of new EESZT modules launched to support supply management and digitised care processes – 4 (2025/Q4)
- Launch of a central healthcare mobile application (myEESZT) – (2024/Q2)
- Number of unique users of the central healthcare mobile application (2025/Q4)

3.4 Digital Health Strategy

Hungary Digital health Strategy has not been included in the reference documents because it is planned but it has not been published yet. However, a series of basic elements, representing the basic pillars for the future document, have already been officially published in the framework of the Digital Welfare Program 2.0¹⁵ and can be summarised as follows:

1. System-level integration of data from smart digital healthcare devices, data processing and utilization, with the aim of reducing the number of unnecessary doctor-patient meetings, monitoring lifestyle-related diseases and patient satisfaction indicators.
2. Development and implementation of digital health education applications and modules in education, in order to raise the awareness of the population towards health (as a key value) and promote healthy lifestyles.
3. Creation of a Healthcare Innovation and Incubation Startup Center, Healthcare Capital and Mentor program.
4. Unified institutional web interfaces and a unified information system improving the quality of patient information, reducing long-term IT costs and the number of avoidable lawsuits related to patient rights or cases of medical malpractice.
5. Broadening elderly care and care with the help of smart devices.

¹⁵ Official documents can be retrieved here: <https://digitalisjoletprogram.hu/hu/tartalom/defs-digitalis-egeszsegipar-fejlesztési-strategia>

4 – SWOT Analysis on digital health innovation

The Digital Health working group of the Hungarian Health Economic Society has some recommendations to overcome the gaps and needs of Hungary in the matter. Some of them are included in this SWOT analysis. Hungary has a strong government support for e-health initiatives, with dedicated funding and policies aimed at improving healthcare through digitalization.



Strengths

Most health information managed by general practitioners (GPs) and hospitals has been digitized. All data is centrally collected in the EESZT and this is mandatory, both for public and private healthcare providers.

After COVID-19 pandemic the adoption of telemedicine in Hungary was accelerated, this is one of the main strengths: the increased acceptance and utilization of remote healthcare services. The National Health insurance fund provides universal coverage through a single payer. This means that virtually all citizens have access to healthcare, resulting in comprehensive coverage of structured health insurance data across the population. There is thus a high level of trust of the citizens in the system managing their data, due to visibility and transparency about access rights.

Regarding the secondary use of data, in Hungary scientific research is listed among the purposes of data processing (Section 4 of Act XLVII of 1997 on the Processing and Protection of Health Care Data and Related Personal Data, or “Medical Data Act”). Anyone can have access to medical data with the permission of the head (director) or the DPO of the given healthcare provider with the aim of scientific research.



Weaknesses

Although we see that the system is highly digitised and telemedicine use is well extended, the information (data) systems of the hospitals are not unified, being this a barrier for interoperability. There is not a unified metadata catalogue. The healthcare system is quite hospital-centric.

There is a need for proficient human resources, especially in the field of data science.

Regarding Digital Health, there is not a health technology assessment framework. In lack of that, Hungary is recommended to develop a framework jointly with the National Institute of Pharmacy and Nutrition and the State Department of Health. The recommendation of the Digital Health working group of the Hungarian Health Economic Society is to adopt a country's classification, assessment framework and methodological guidelines with adjustments to the Hungarian socio-economic, geographical conditions. Not always the projects and goodwill are supported by the required financial resources.

Only OGYEI as Hungarian Competent Authority for medical devices and in vitro medical devices. There are two notified bodies: OGYEI-EMKI (NB 1011) and CE Certiso Kft. (NB 2409). The NB assess whether the manufacturer's documentation meets the legal requirement.

Opportunities:

Even if a considerable portion of health data remains unstructured, the percentage of structured data is on the rise in Hungary. Health and personal data from different sources can be connected, albeit only to the extent and for the period as it is necessary for the interests of prevention, treatment and public health or epidemiology purpose (under the Medical Data Act, section 10). It would be an opportunity to extend the period to stimulate related activities.

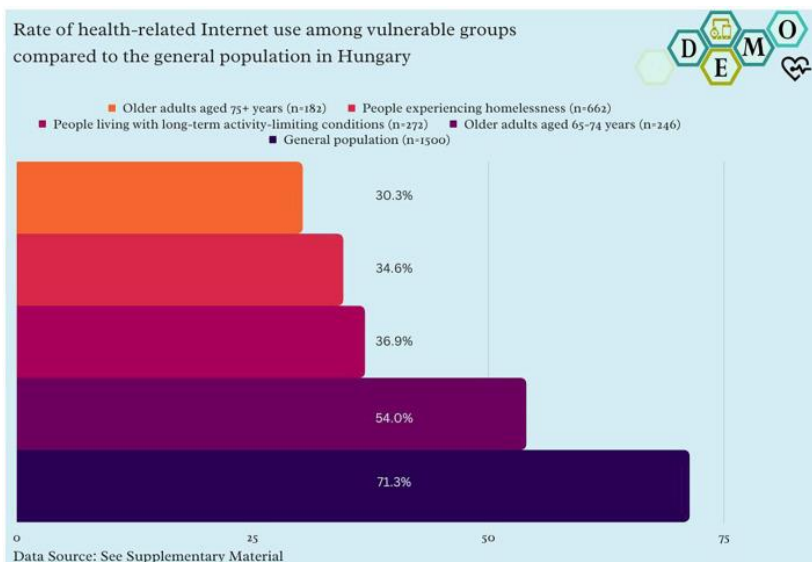
This is an opportunity: the newly established National Data Asset Agency (NAVU)¹⁶ has been assigned the responsibility of creating a public data inventory, including health data. Founded in 2020, this Agency aims to enhance public data accessibility, including the creation of an open data portal, compiling a public data inventory, and providing assistance in analyzing data sourced from public institutions.

It could also be an opportunity if the National Authorities implement some of the recommendations of the Digital Health working group of the Hungarian Health Economic Society, like: map and understand the healthcare decision-makers' information needs about DHTs and the barriers to utilizing them.

¹⁶ <https://kif.gov.hu/adatszolgaltatasok/adatszolgaltatoknak>

Threats:

The mindset among healthcare professionals and researchers/data users still diverge in many cases. While the majority of European countries have already moved toward the pre-requirement of CE certification of DHTs prior to HTA, as a demonstration of overall safety and performance of the medical device, Hungary has not (as of date of publication of these recommendations in 2023 17) before assessing and potentially



reimbursing DHTs. Related to that, there is a discrepancy in the willingness to try and the ability to harness healthtech in Hungary. This is what is also called “techquity”. There are 3 underserved segments of society: older adults, people with long-term activity-limiting conditions, and people experiencing homelessness who could greatly benefit from digital technologies and yet use them less than the general population.

Figure 11: Summary of the rate of health-related Internet use among older adults, homeless and people with long-term limiting conditions¹⁸

5 – Transferable Good practices

Good practice n.1 – Health Data EDIH

In the framework of the European call for the creation of a network of European Digital Innovation Hubs launched in 2022, a specific Hungarian EDIH focused on health data has been funded, called DATA-EDIH.

This EDIH aims at actively facilitating the digital transformation of SMEs, small mid-caps, and public sector organizations in Hungary, with a primary focus on data-related services and a specific emphasis on the healthcare industry. The DATA EDIH consortium, led by Neumann Np. Ltd. / National Data Economy Knowledge Centre (NATUK), currently comprises eight additional members, which include five universities: Budapest University of Technology and Economics (BME), University of Debrecen (DE), ELTE-SOFT Np Ltd (ELTE-Soft), a spinoff of Eötvös Loránd University (ELTE-Soft), University of Pécs (UP), and Semmelweis

¹⁷ <https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2023.1197949/full>

¹⁸ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10357289/#>

University (SE). Additionally, there are two central public organizations: Hungarian Central Statistical Office (HCSO) and National Data Asset Management Agency (NAVÜ), along with HTEnet Innovation Np Ltd (HTEnet).

The consortium represents extensive academic and practical technical/business development expertise, a broad domestic and international network, and substantial EU grant and project management experience. The most pressing DESI dimensions for Hungary remain the integration of digital technology and digital public services, where obstacles related to attitudes, mindset, and competence are prevalent alongside financial challenges. DATA EDIH offers training, technical support, and financial services at both basic and advanced levels to address these challenges. The activity of DATA EDIH is founded upon existing elements of the domestic innovation ecosystem. The implementation plan includes:

- WP1 – Operational management
- WP2 – Reaching out/customer journey
- WP3, WP4, WP5 – Providing services
- WP 6 – Networking as the base and framework of the project



The DATA EDIH project anticipates several ambitious outcomes, including reaching over 15.000 SMEs and / or public sector entities, pre-screening 6.000 SMEs / public sector entities, and servicing 490 entities. It aims to trigger an additional investment of EUR 2 million and establish a series of collaborations with other EDIHs on national/EU levels. The targeted impact is to increase the digital maturity of the target group by at least 5% within 3-5 years.

For additional details: <https://european-digital-innovation-hubs.ec.europa.eu/edih-catalogue/data-edih>

Good practice n.2 – Data warehouse at the University of Debrecen

The University of Debrecen, renowned for its excellence in research and development within Hungarian higher education, has outlined its focus on the health industry and its potential for innovation in its mission statement.

With this specific project, entitled "Development and operation of the UDBD-Health data warehouse supported by BigData technology" and carried out from December 1st, 2021 to November 30th, 2025, the researchers aim to optimize the storage and processing of the substantial volume of data generated at the

University, in order to offer the most advanced support for the university's research, development, and innovation endeavors. At the end of the project, access to structured databases will be included in the university's service portfolio.

A significant portion of the data assets at the University of Debrecen comprises medical and image data generated during patient care at the Clinical Center. However, access to this data for research purposes has been highly restricted. A pivotal outcome of the research and development activities undertaken since 2018 within the Big Data domain is the development of appropriate data transformation procedures. These procedures have enabled the University to make this wealth of data accessible to researchers. The UDBD Health data warehouse, hosted on the Microsoft Azure platform, along with its scalable computing system, facilitates the continuous collection of pseudo-anonymous data. Furthermore, it enables researchers to utilize modern analytical methods from data science, such as machine learning-based procedures. The structured and anonymized data warehouse encompasses textual data, images, and genetic diagnostic information spanning 20 years from the hospital's IT system. This comprehensive repository enables the discovery and analysis of hidden correlations, offering insights into not only common ailments like diabetes and hypertension but also rare diseases.

The project involves four different research groups:

- Clinical BigData (KBD) – focusing on curating clinical medical data and key aspects for their analysis.
- GEN - specializing in genomic processing.
- MI - concentrating on developing optimal applications for artificial intelligence
- HPC – operating the university supercomputer, optimizing hardware conditions for high-computational analyses.

During the first two years, the IT infrastructure for data collection, cleaning, and integration was established, while the KBD team made strides in processing medical data and integrating information derived from CT, MRI, and PET images stored in the PACS system. The HPC group devised a communication application to bolster the computational capacity required for handling vast data volumes, along with a suite of parallel processing algorithms. The MI team focused on automated detection and segmentation of respiratory and lung tumors, pathological accumulations on PET/CT scans, cytological sample evaluation, and skin pigmentation classification using machine learning and image processing techniques. Meanwhile, the GEN group formulated critical procedures for analyzing extensive genomic data.

A model data warehouse is expected to be established by 2024, while the development priorities are outlined as follows:

- Regulation of data asset management, with special emphasis on data security concerns associated with the integration of human genetic data into the warehouse.
- Finalization of data warehouse applications supporting university research, alongside the formulation of operational guidelines.
- Establishment of a secure environment adhering to data security, confidentiality, and GDPR standards to address external inquiries related to warehouse research.
- Establishment of operational and service protocols, coupled with pilot projects to accommodate external inquiries (e.g., pharmaceutical manufacturing, health industry development, EU research collaborations).

The plan is for university researchers to utilize the data warehouse under established guidelines and subsequently to offer this data asset to market participants as a novel university service.

For additional details: <https://palyazatok.unideb.hu/node/390> (in Hungarian)

Good practice n.3 – Hungarian National eHealth Infrastructure (EESZT)

The Hungarian central IT system known as the National eHealth Infrastructure (EESZT) was established to facilitate communication among healthcare service providers. Launched in 2017, it has since become an indispensable tool for over 26.000 health professionals, including 6.000 general medical practitioners, and 13.000 pharmacy staff.



On a daily basis, an average of 800.000 new electronic prescriptions (ePrescriptions) are generated through the system, alongside the recording of around 75 million medical documents (such as medical records, outpatient data sheets, and discharge summaries) and approximately 180 million doctor-patient appointments annually. This accessible system operates 24/7, transferring patient health data to a centralized database accessible to authorized health professionals via corresponding hospital, general practitioner, or pharmacy systems, regardless of whether the patient received care from a publicly funded or private provider.

This integration significantly enhances the quality and efficiency of healthcare delivery by minimizing redundant examinations and providing health professionals with a more comprehensive understanding of their patients, leading to faster and more accurate diagnoses and recoveries. Concurrently, citizens benefit from increased access to their medical treatment data through a unified central interface.

Personal medical data can be accessed through the citizen portal of EESZT (National eHealth Infrastructure) at eeszt.gov.hu, following Client Gate authorization, encompassing all medical data uploaded after November 1st, 2017, by participating institutions.

Since its inception, EESZT has continually expanded its capabilities, gaining heightened recognition, especially during the pandemic. Notably, its functionalities, notably the **eRecipe module**, have garnered widespread acclaim for simplifying prescription processes, as evidenced by the daily processing of around 800,000 electronic prescriptions through EESZT. Additionally, there's extensive utilization of electronic access to and retrieval of medical documents, including laboratory findings, outpatient records, and final reports. As of 2022, the EESZT's public portal registered over 40,000 daily logins, as reported by Bálint Szabó, Executive Director of ESZFK.

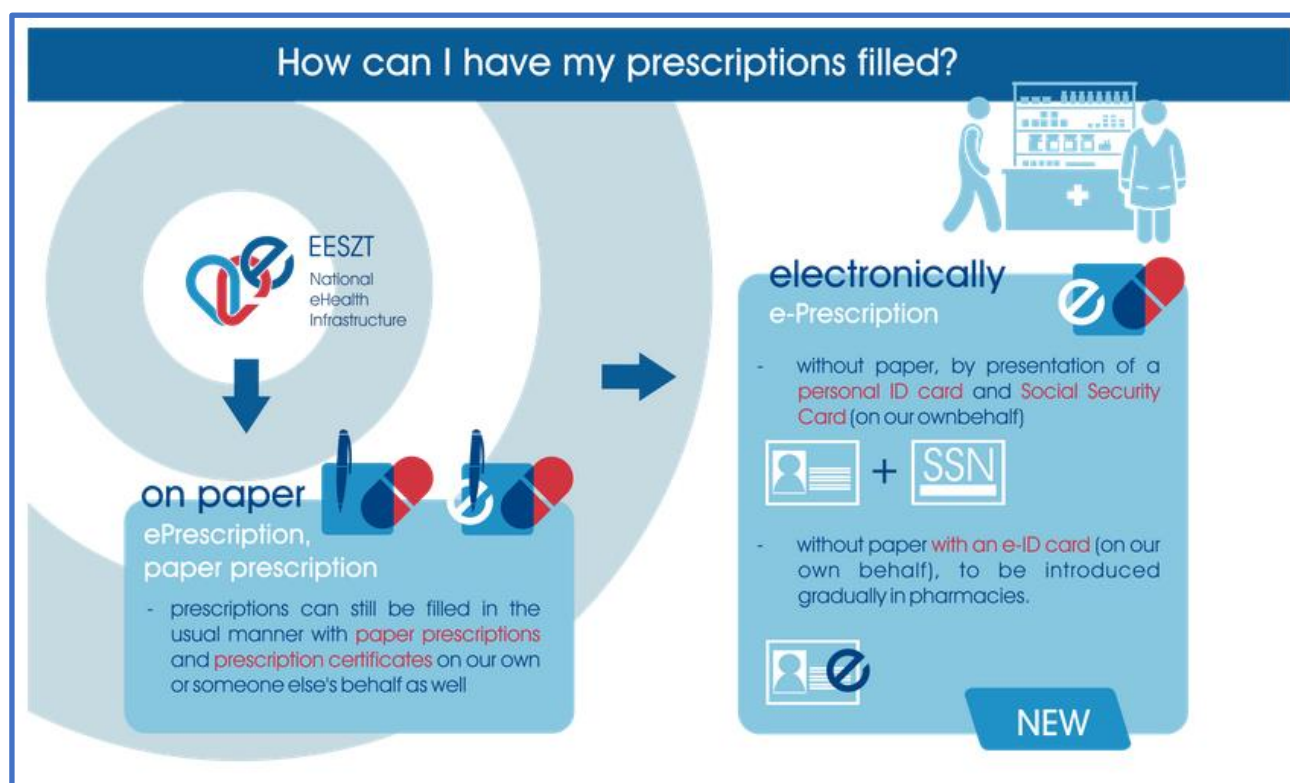


Figure n.13 - Scheme of e-prescription functioning

Other functionalities are available or expanding: for example in the **Event Catalog**, care events occurring during treatment (such as outpatient specialist care, inpatient care, general practitioner visits, etc.) are documented. The **eHealth History**, also known as EHR patient documents, manages the health documentation of all patients. This includes test results, outpatient records, X-rays, final reports, and more, accessible to authorized attending physicians. To ensure data security, every access attempt, even unsuccessful ones, is logged by the EESZT. An essential aspect of introducing the e-health system is the continuity of existing processes, allowing for the possibility of ordering paper-based prescriptions if needed, and handwritten prescriptions will remain valid. The **eProfile** stores essential, infrequently changing patient data vital for potential life-saving or emergency care, such as allergies, drug sensitivities, known diseases (e.g., high blood pressure, diabetes, severe immunodeficiency disease), and other pertinent characteristics (e.g., blood group). This data is uploaded by the attending physician or family physician. Under the framework

of digital self-determination, individuals can choose not to allow the uploading of their eProfile, thereby restricting access to these data in the future, even with enabling settings.

Digital Self-Determination (DÖR) empowers all social security beneficiaries to regulate the visibility and access to their health data within the healthcare system. Beneficiaries can manage this themselves by logging into the Customer Portal on the Citizens' Portal interface, or they can seek assistance at any government window clerk's office.

The development of EESZT occurred in several phases, with initial efforts focused on establishing a communication framework among stakeholders in the healthcare sector. Subsequently, the emphasis shifted towards creating solutions that facilitate connectivity across various providers and non-health state entities.

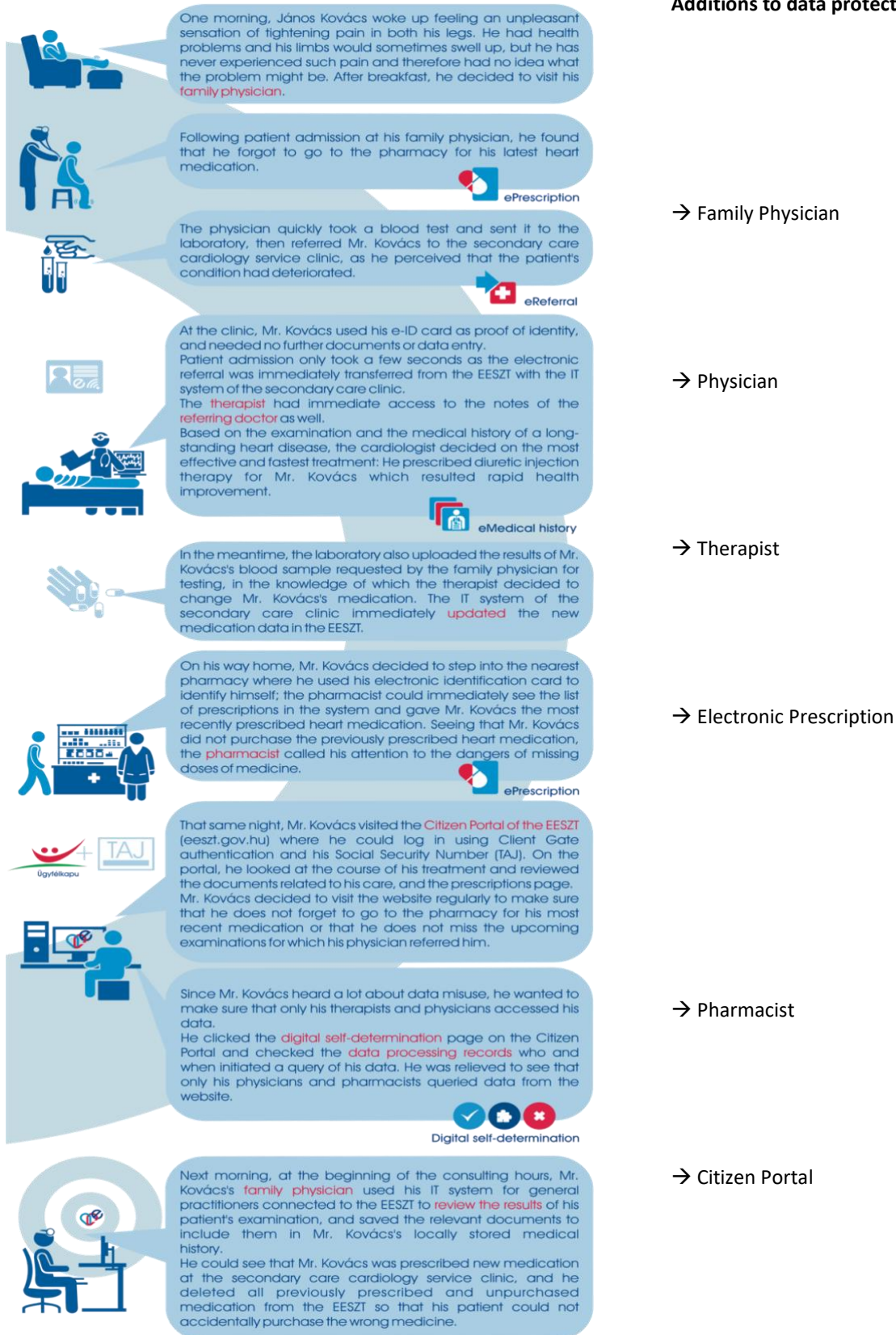
For instance, when a pregnant woman's gynecologist uploads her pregnancy confirmation document to EESZT, the tax authority automatically applies the SZJA discount she qualifies for, eliminating the need for her to wait in queues or handle personal administrative tasks. Similarly, the medical certificate required for obtaining a driver's license seamlessly integrates into the public administration system, eliminating the necessity for physical printouts or visits to government offices.

Furthermore, EESZT promotes contemporary patient care by enabling secure access and exchange of patient data, medical histories, and treatment records among healthcare stakeholders through a protected channel from an authenticated database. This transparency enhances the outcomes of therapy and improves patient experiences. Moreover, EESZT serves as the groundwork for implementing eHealth solutions, allowing health-related information obtained from smart devices to be securely input into the platform after validation, thereby enhancing the effectiveness of preventive measures. Another significant initiative involves the introduction of an online appointment booking system for both primary and specialized medical consultations, as well as for laboratory and diagnostic tests.

For additional details: <https://e-egeszsegugy.gov.hu/web/eeszt-information-portal>

Full example of the patient journey in Hungary in the next page.

PATIENT JOURNEY AND THE ROLE OF EESZT



Additions to data protection

→ Family Physician

→ Physician

→ Therapist

→ Electronic Prescription

→ Pharmacist

→ Citizen Portal

Figure n.14 – The patient Journey within the EESZT(source EESZT website)

6 - Good practices related to gender diversity and inclusiveness

Hungary has made significant strides in promoting gender diversity and inclusiveness within its health sciences and innovation sector. Several key practices have been observed:

- **Gender-Inclusive Policies:** The Hungarian government has implemented policies and regulations that promote gender equality and inclusiveness in the workplace. These include anti-discrimination laws, maternity and paternity leave provisions, and measures to address gender pay gaps.
- **Support for Women in Leadership Roles:** Efforts have been made to increase the representation of women in leadership positions within the health sciences and innovation sector. This includes initiatives to support women entrepreneurs, researchers, and decision-makers through funding schemes, networking opportunities, and leadership development programs.
- **Research and Data Collection:** Hungary has prioritized research and data collection efforts to better understand gender disparities and barriers within the health sciences and innovation sector. This data-driven approach enables evidence-based policy-making and targeted interventions to address gender-related challenges.

Government Initiatives: In Hungary, the promotion of gender equality in the health sciences and innovation sector is overseen by the Ministry of Human Capacities. Specific departments or units within the ministry may be responsible for gender equality policies and implementation.

Legislation and Policies: Hungary may lack specific legislation targeting gender equality in research and innovation. However, existing laws and regulations, such as those related to labor rights and equal opportunities, may indirectly impact gender diversity within the sector. The presence of a National Gender Equality Council or similar body, established by the government, could indicate efforts to address gender disparities.

Representation in Research: Statistics or reports may provide insights into the representation of women in Hungary's health sciences and innovation sector. This could include data on the percentage of female researchers, their distribution across different fields, and any gender imbalances in leadership positions.

Challenges and Progress: Similar to Bulgaria, Hungary may face challenges such as gender pay gaps, unequal distribution of household responsibilities, and limited representation of women in decision-making roles. However, progress may be evident through initiatives aimed at increasing women's participation and addressing systemic barriers.

Good Practices in Hungary's Health Sciences and Innovation Sector:

Women in Technology Initiatives: Hungary may have organizations or programs dedicated to supporting women in technology and innovation fields. These initiatives could include mentorship programs, networking events, and training opportunities aimed at increasing the representation of women in STEM-related professions.



Entrepreneurship and Leadership Programs: Similar to Bulgaria's Entrepregirl and Women Founders Forum, Hungary may have initiatives focused on empowering women entrepreneurs and leaders in the health sciences and innovation sector. These programs could provide funding, mentorship, and networking opportunities to support women-led startups and businesses.

Healthcare Access and Awareness Campaigns: Hungary may have implemented campaigns or programs to improve healthcare access and awareness among marginalized communities, including women. These initiatives could address specific health issues, promote preventive care, and empower women to take control of their health.

Research and Data Collection: Efforts to collect data on gender disparities in Hungary's health sciences and innovation sector may indicate a commitment to evidence-based policy-making. Research studies or reports may highlight areas of improvement and inform targeted interventions to promote gender diversity and inclusiveness.

The telehealth digitisation programme will specifically strengthen the social inclusion of elderly groups

Institutional Mechanisms: Similar to Bulgaria, Hungary may have established institutional mechanisms at both national and local levels to address gender equality issues. These mechanisms could include governmental bodies, commissions, or councils responsible for developing and implementing gender equality policies.

References:

- Ministry of Human Capacities of Hungary: [Official website](#)
- National Gender Equality Council: [Official webpage](#)
- Statistical Office of Hungary: [Gender statistics](#)
- Research studies on gender diversity in the health sciences and innovation sector: [Research repository](#)
- Women in Technology initiatives in Hungary: [Organization website](#)
- Healthcare access and awareness campaigns in Hungary: [Governmental health agency website](#)

By structuring the report in this manner and referencing official pages and relevant resources, a comprehensive overview of gender diversity and good practices in Hungary's health sciences and innovation sector can be provided, drawing parallels with the Bulgarian case study while highlighting Hungary's unique initiatives and challenges.

Hungary has demonstrated a commitment to promoting gender diversity and inclusiveness within its health sciences and innovation sector through various initiatives and policies. By continuing to prioritize these efforts and leveraging data-driven insights, Hungary can further advance gender equality and foster a more inclusive and diverse ecosystem for innovation in healthcare.

This report provides a snapshot of the good practices observed in Hungary's case study within the EDAH project, highlighting opportunities for collaboration and knowledge sharing across European ecosystems.

7 - Potential synergies with other EU regions

7.1 - Cross-border cooperation in healthcare

Eight out of nine regions in Hungary are adjacent to neighboring countries, making them border regions. Hungary actively participates in Interreg's European cross-border cooperation programs. Bilateral programs for cross-border cooperation have been established with Austria, Romania, Slovakia, Slovenia, and Croatia; these countries play a significant role in Hungary's open economy, representing nearly 18% of exports and 15% of imports. At the same time, Hungarian institutions are not so often involved in networks and partnerships at broad EU level: no Hungarian partners are involved in Vanguard Initiative, in the EIT health, in ERRIN, in CEBR, in EuropaBio and so on, while there is at least one in MedTech Europe. Cooperation in general is more active at the level of Danube macro-region and closer countries; here following we collected some examples of cross-border cooperation in healthcare.

INTERREG Hungary – Slovakia – Romania - Ukraine

The Hungary-Slovakia-Romania-Ukraine (HSRU) European Neighborhood Instrument Cross Border Cooperation Programme focuses on supporting an area with eight million inhabitants across ten border regions spanning four countries. These regions face challenges such as rural settings, declining and aging populations, higher unemployment rates, and lower economic performance compared to national averages. Health status in these areas tends to be less favorable, especially among the socioeconomically disadvantaged. Despite this, there's a lack of awareness about prevention and healthy lifestyles among a significant portion of the population. Consequently, investing in health infrastructure, services, training programs, prevention activities, and public awareness campaigns is crucial. Since the start of the 2014-2020 programming cycle, the cooperation efforts between European countries and their neighbors have prioritized improving healthcare in these border regions. Approximately 12.3 million euros have been allocated to support health projects, which represents close to 20% of the total available funds for the program.

Over the past eight years, health stakeholders in the Hungary-Slovakia-Romania-Ukraine (HSRU) region have significantly upgraded their capabilities and potential through financial support and experience exchange. Despite facing challenges like the COVID-19 pandemic and Russian aggression on Ukraine, partnerships between hospitals and NGOs have flourished. These collaborations have facilitated advancements in medical technology, screenings, diagnostics, and health services provision, particularly targeting deprived communities and internally displaced persons.

Cross-border partnership projects like "Infectious diseases have no borders" (IDHB) and "TBC has no borders" (TBCHB) have been instrumental in curbing the spread of pathogens across administrative frontiers. These initiatives, implemented in Hungary and Ukraine, address the ease with which pathogens can traverse national borders, especially evident during the COVID-19 era. By balancing healthcare capacities between the two countries through professional guidance, training, and infrastructure development, these projects have strengthened the diagnostic and treatment capabilities of partner hospitals, facilitating disease prevention and control. Upgrades in equipment, such as digital X-ray devices, bronchoscopes, and laboratory diagnostic equipment, have been crucial in enhancing diagnostic accuracy and treatment efficacy. Additionally, infrastructure modernization efforts have improved the overall healthcare environment for

both patients and staff, ensuring quality care delivery. In addition, in 2021, professionals from Ukrainian hospitals in Mukachevo and Uzhhorod received comprehensive training on infection control and microbiology practices from Hungarian counterparts.

The 4DAGMEG4 project, involving four hospitals across four countries (St. Damján Greek Catholic Hospital in Hungary being the project's lead partner) aimed to enhance secondary prevention of cancer, particularly focusing on women. By improving breast screening conditions, the project aims to reduce avoidable deaths, increase life expectancy, and decrease healthcare inequalities. Another collaboration involves St. Damjan Greek Catholic Hospital and a partner hospital in Uzhgorod, Ukraine, to provide urgent and intensive care for high-risk patients, aiming to reduce mortality rates for traumatic or intoxicated patients and those with cardiovascular or respiratory issues.

Recognizing the positive impact of a stronger and more inclusive health system, the Interreg NEXT Hungary-Slovakia-Romania-Ukraine Programme has allocated increased funding of up to 20 million euros for healthcare projects in the current programming period.



Figure n.XX - Map of the areas involved in the INTERREG Hungary-Slovakia-Romania-Ukraine 2021 - 2027

Priority 2 of Interreg NEXT 2021 - 2027 is entitled **“A healthy and attractive border region”** and **Objective 2.1 “Equal access to health care”** includes at present the following actions

- Creation of the legislative, administrative and technical framework for common epidemiological measures and the cross-border rescue services
- Investments for improving cooperation in epidemiology and in cross-border rescue services

- Enhancing the use of digital technologies in healthcare and health development
- Implementation of health screening and health promotion programmes

For additional information: <https://next.huskroua-cbc.eu/>

Babies across borders - Transforming Healthcare Infrastructure in Romania-Hungary (2019 – 2023)

The Babies Across Borders initiative aims to enhance preventive and healthcare services in the Romanian-Hungarian cross-border region, focusing primarily on obstetrics-gynecology and neonatology. It involves constructing new medical facilities, modernizing existing departments, updating medical equipment, and facilitating knowledge exchange among healthcare professionals. The project's approach encompasses:

- Construction of a new obstetrics-gynecology clinic in Timisoara and modernization of the department in Szeged, along with implementing an electronic patient records system.
- Procurement and installation of new medical equipment and furniture at both locations.
- Facilitating the exchange of medical expertise and experiences between Romanian and Hungarian healthcare professionals to improve skills and develop shared professional recommendations.
- Promoting awareness among the population about the importance of access to preventive and treatment services through dissemination of information derived from experience exchanges.

And the outcomes include:

- Enhanced healthcare infrastructure and facilities in Timisoara and Szeged, resulting in improved treatment outcomes for women and infants.
- Augmented medical proficiency and knowledge among healthcare practitioners facilitated by experience sharing.
- Expanded availability of specialized healthcare services within the cross-border region.
- Public awareness campaigns and improved accessibility to medical services.
- Overall mitigation of health disparities within the population, particularly in obstetrics-gynecology and neonatology.

For additional information: <https://interreg-rohu.eu/wp-content/uploads/2024/02/ROHU-443-EN-final.pdf>

HEAL NOW (2020 – 2022) – Hungary – Austria cooperation

The HEAL NOW project, spearheaded by Healthacross and the Hungarian National Directorate General of Hospitals (OKFŐ), has successfully forged **the first sustainable cross-border healthcare partnership between Austria and Hungary**. Under the guidance of OKFŐ, the project facilitated the establishment of a comprehensive cross-border network involving crucial stakeholders like hospitals and ambulance services. This network forms the foundation for ongoing collaboration aimed at enhancing healthcare delivery.

Addressing critical administrative and legal aspects, the project laid the groundwork for seamless cross-border patient care. It proposed a joint emergency agreement and developed "The Cooperation Agenda 2030," outlining short, medium, and long-term objectives for the partnership.

A significant achievement of the HEAL NOW project is the implementation of a pathology pilot program between Landeskrankenhaus Wiener Neustadt in Austria and the Hungarian Medical Centre Soproni Gyógyközpont - Elisabeth Teaching Hospital and Rehabilitation Institute. Overseen by OKFŐ, this initiative integrates a rapid point-to-point tele-diagnostic system, enabling real-time histological sample analysis for

patients on both sides of the border. This technological advancement notably reduces diagnostic turnaround time, especially crucial in timely tumor identification and treatment provision.

Additionally, the project facilitated the procurement of high-resolution medical equipment, enhancing the technical capabilities of participating hospitals to ensure state-of-the-art healthcare services.

For additional information: <https://www.interreg-athu.eu/en/healnow/>

7.2 - Selected European Projects in the field of Health data with partners from Hungary

Following a dedicated analysis on CORDIS project repository, it has been possible to identify a series of projects related to the topic of “Health Data” where one or more partners come from Hungary. Here is a selection of some of them: for each we report a short summary, the total budget and the names of the Hungarian partners involved. Data are extracted from CORDIS database, IMI and other EC official sources.

EOSC-ENTRUST: A European Network of TRUSTed research environments (2024 – 2027)

EOSC-ENTRUST unites operational Trusted Research Environments from 15 European countries with the collective objective of implementing, validating, and advocating for their capabilities through a unified European framework. This framework employs shared standards and a common language across legal, operational, and technical domains. Anchored in the EOSC Interoperability Framework, which addresses Legal, Organizational, Technical, and Semantic interoperability, EOSC-ENTRUST focuses on developing a blueprint for interoperability. The initiative has identified four driver projects in Genomics, Clinical Trials, Social Science, and Public-Private Partnerships to assess capabilities, guide blueprint development, and showcase secure data analysis using federated workflows.

Total budget: 4M euro

Hungarian partner: Tarki Foundation, as Third party

Website: <https://eosc-entrust.eu/>

Towards GEMINI: A Generation of Multi-scale Digital Twins of Ischaemic and Haemorrhagic Stroke Patients (2023 – 2029)

GEMINI aims to create validated computational models for acute strokes, including both ischemic and hemorrhagic types. These models will help doctors make better treatment decisions and improve our understanding of strokes. GEMINI will develop digital twin models for various aspects of stroke, such as blood flow in the brain and heart-brain axis, using existing and new computational models. These models will be used to understand the causes, treatment, and progression of strokes at both population and individual levels. GEMINI will then validate personalized digital twin models for specific stroke treatments and disease progression, aiding in patient care. The effectiveness of these models will be tested in a clinical trial to assess their impact on treatment decisions and patient outcomes. GEMINI will also establish processes for data management, model validation, and certification. The project outcomes will benefit clinical practice, medical

device industry, and research in medical and computer sciences, requiring a comprehensive strategy for protecting intellectual property and promoting widespread adoption of the results.

Total budget: 10M euro

Hungarian partner: Budapesti Muszaki es Gazdasagtudomanyi Egyetem (Budapest University of Economics and Business Administration)

Website: <https://dth-gemini.eu/>

Scaling Up secure Processing, Anonymization and generation of Health Data for EU cross border collaborative research and Innovation (2023 – 2025)

The SECURED project aims to enhance multiparty computation, data anonymization, and synthetic data generation to achieve greater efficiency and security. It focuses on fostering private and unbiased artificial intelligence and data analytics, particularly in health-related data and cross-border collaborations. The project targets the current limitations hindering widespread adoption of secure multiparty computation and effective anonymization. These limitations include the practical constraints of existing cryptographic schemes, the need for standardized anonymization methods for health data, the absence of dynamic synthetic data generation services, the complexity of current federation protocols for machine learning and AI-based analytics, and the lack of support for health technology providers, especially small and medium-sized enterprises (SMEs), to implement privacy-enhancing technologies.

Total budget: 7M euro

Hungarian partners: Budapest University of Economics and Business Administration and Semmelweis University

Website: <https://secured-project.eu/>

Expanding Digital Health through a pan-European EHRxF-based Ecosystem (2023 – 2024)

XpanDH is a CSA initiative with the goal of empowering individuals and organizations to develop, customize, and explore the meaningful utilization of interoperable digital health solutions throughout Europe. Centered around adopting the European Electronic Health Records Exchange format (EEHRxF), this pan-European endeavor utilizes a "network-of-networks" approach to ensure that digital health stakeholders receive tailored guidance and practical examples, motivating them to adopt EEHRxF-embedded digital health solutions. The aim is to enhance healthcare value and support the establishment of Personal and European Health Data Spaces. Building upon previous eHealth interoperability projects like X-eHealth and DigitalHealthEurope, XpanDH emphasizes digital health data activism and robust patient engagement. This initiative brings together 26 Digital Health Actors under a collaborative co-creation and co-implementation framework.

Total budget: 2M euro

Hungarian partner: Orszagos Korhazi Foigazgatosag (Regional Government of Korhazi) and Semmelweis University

Website: <https://xpandh-project.iscte-iul.pt/>

IMI BIGPICTURE (2021 – 2027)

The BIGPICTURE project, funded under IMI – Innovative medicine Initiative – aims to create a repository of digital copies of around 3 million slides covering a range of disease areas. This repository will then be used to develop artificial intelligence tools that could aid in the analysis of slides. The project will first create the infrastructure needed to store, share and process millions of image files; secondly, legal and ethical issues to ensure patient privacy and data confidentiality will be addressed. Finally, the project aims to develop functionalities to facilitate the use of the database as well as the processing of images for diagnostic and research purposes.

Total budget: 70 Meuro

Hungarian partner: Semmelweis University.

Project website: <https://bigpicture.eu/>

BY-COVID Beyond COVID (2021 – 2024)

The Beyond-COVID (BY-COVID) initiative is dedicated to furnishing comprehensive open data on SARS-CoV-2 and other infectious diseases, encompassing scientific, medical, public health, and policy domains. A key focus is on facilitating the mobilization of raw viral sequences to aid in identifying and monitoring the spread of SARS-CoV-2 variants. Moreover, BY-COVID aims to expedite access and integration of data and metadata related to SARS-CoV-2 and COVID-19, ensuring compliance with data protection regulations and enabling federated data analysis. Additionally, the project emphasizes harmonizing and managing metadata and sample identifiers, along with long-term cataloging to ensure interoperability of efforts at both national and global levels. It also adheres to relevant standards and policies for managing, sharing, and reusing research data and synergies with the European Health Data Space are actively pursued to enhance data utilization and exchange.

Total budget: 12M euro

Hungarian partner: Eotvos Lorand Tudományegyetem (Doctor Lorand University of Science) as Third party

Website: <https://by-covid.org/>

Joint Action TEHDAS – Towards the European Health Data Space (2021 – 2023)

The TEHDAS project developed joint European principles for the secondary use of health data, thanks to a consortium composed by members from 25 countries. The project's main objectives are as follows:

- Initiate a conversation with European projects and policymakers regarding the EHDS.
- Ensure the durability of health data's secondary use in Europe.
- Formulate a governance structure for cross-border co-operation among European countries for the secondary use of health data.
- Boost the consistency, compatibility, and accessibility of health data for secondary use.
- Clarify the position of individuals in the secondary use of health data and incorporate them in discussions about health data usage for policymaking and research.

The outcomes of the TEHDAS project are providing key inputs for the European Commission's legislative proposal on the European Health Data Space and contribute to the broader pan-European discussion that follows the conclusion of the project. A follow-up of the project (TEHDAS 2) is expected to start in May 2024.



Total budget: 4.16 Meuro

Hungarian partners: National Healthcare Service Center and Semmelweis University

Website: <https://tehdas.eu>

PHIRI - Population Health Information Research Infrastructure (2020-2023)

The PHIRI project aims to facilitate open and data-driven research on the broader impacts of COVID-19 on the health of populations in Europe by sharing cross-country COVID-19 population health information and best practices related to data collection and processing. It seeks to provide a Health Information portal for COVID-19 with FAIR catalogues on health and health care data, structured exchange between countries on COVID-19 best practices and expertise, and to promote interoperability and tackle health information inequalities.

Total budget: 5 Meuro

Hungarian partner: National General Directorate of Hospitals

Website: <https://www.phiri.eu/>

B1MG – Beyond 1 Million Genomes (2020 – 2023)

The B1MG project aims to establish a support and coordination structure for the European 1+ Million Genomes initiative, which involves 20 EU states and Norway committing to the sequencing of at least 1 million genomes in the EU by 2022. The project helps to create a pan-European genome-based health data infrastructure that includes data quality and exchange standards, access protocols, and legal guidance. B1MG will collaborate with international initiatives and consult with various stakeholders to provide concrete guidance on implementing personalized medicine at the local, regional, and national level.

Total budget: 4 Meuro

Hungarian partner: Hungarian National Institute of Oncology

Project website: <https://b1mg-project.eu/>

Worth to be mentioned is also the Hungarian national project entitled

Support for the digital transition of healthcare (stage II), managed by the Hungarian National Directorate General for Hospitals (2023 – 2024).

The project focuses on supporting the digital transition of healthcare through three main topics:

- Health data assets and related professional developments.
- Improving the security of the supply system, specifically through Information, Technology, Security (ITB project).

- Telemedicine, remote diagnosis, and infocommunication, including the development of a national health mobile application and telemedicine services, along with central developments for laboratory diagnostics.

The objectives of the project include:

- Preparing Feasibility Studies based on professional concepts related to the above-mentioned topics. These studies will summarize content and conceptual elements, considering the goals and deadlines set in the HET (Harmonized European Time).
- Conducting a comprehensive IT survey to establish national, regulated IT services related to improving the security of the supply system. This survey will assess various aspects such as IT needs and expectations of institutions, IT services, IT organization, monitoring systems, operational insurances, competence and decision centers, sectoral ticketing systems, and supervised border protection/internet access.
- Using the survey documentation and results as a starting point for the implementation phase of the ITB application.

For additional details on this project and other ongoing initiatives it is possible to visit the organization website: <https://okfo.gov.hu/>

NOTE ON REFERENCES AND SOURCES

This report has been elaborated with inputs from available public sources published on the Internet.

All the main sources used for information or assessment are mentioned in the text or listed as foot notes or as links to the text.

A special thanks to Sarolta Skoze, Program manager at EIT Health, Budapest for her review and contributions to this report.

April 2024

