OBSERVATORY FOR DIGITAL HEALTH TECHNOLOGIES IN EUROPE

Exploring Europe's Digital Health Landscape: Market Dynamics and Economic Impact

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Overviews

List of abbreviations

- AI/ML – Artificial Intelligence/Machine Learning
- AI4Health – Artificial Intelligence for Health
- AIDA – Swedish Research and Innovation Arena for AI in Medical Image Analysis
- AMR – Antimicrobial Resistance
- AR/VR – Augmented Reality/Virtual Reality
- ARTEMIS – Virtual Twins for Personalised Management of Metabolic Liver Disease
- CAGR – Compound Annual Growth Rate
- CDSS – Clinical Decision Support System
- CERTAINTY – Virtual Twins for Personalised Cellular Immunotherapy in Cancer
- CHAIMELEON – Cancer Imaging Repository for AI Tools
- CRA – Cyber Resilience Act
- dAIbetes – Federated Virtual Twins for Privacy-Preserving, Personalised Treatment Outcome Prediction in Type 2 Diabetes
- DHT – Digital health technology
- DiGA – German Digital Health Applications
- DTx – Digital Therapeutics
- EDITH – European Digital Health Initiative
- EHDS – European Health Data Space
- EHR – Electronic Health Record
- ELSAH – Electronic Smart Patch System for Wireless Monitoring of Molecular Biomarkers for Healthcare and Well-being
- ENRICHMENT – Virtual Heart Models for In Silico Clinical Trials
- ESG – Environmental, Social, and Governance
- EU-27 – European Union - 27 Member States
- EuCanImage – Pan-European Cancer Imaging Platform
- FDA – Food and Drug Administration
- GDPR – General Data Protection Regulation
- GEMINI – Multi-Scale Virtual Twins for Ischaemic and Haemorrhagic Stroke
- HAI – Hospital-Acquired Infection
- HIPAA – Health Insurance Portability and Accountability Act
- HPC – High-Performance Computing
- ICU – Intensive Care Unit
- ICU4Covid – Intensive Care Unit Data Integration for COVID-19
- IHI – Innovative Health Initiative
- INCISIVE – Multimodal AI Toolbox for Cancer Diagnosis
- IVDR – In Vitro Diagnostic Regulation
- MDR – Medical Device Regulation
- mHealth – Mobile Health
- NGS – Next Generation Sequencing
- NPV – Net Present Value
- PACS/RIS – Picture Archiving and Communication System/Radiology Information System
- PECAN – French fast-track process for digital health solutions
- PPP – Purchasing Power Parity
- ProCAncer-I – AI-Based Platform for Prostate Cancer Diagnostics
- RWE – Real-World Evidence
- SAS – Statistical Analysis System
- SepTec – Sepsis Detection and Monitoring Project
- SMASH-HCM – Stratification and Guidance of Hypertrophic Cardiomyopathy Patients Using Hybrid Digital Twin Solutions

- SMEs – Small and Medium-sized Enterprises
- TARGET – Multi-Scale Virtual Twins for Stroke Management
- TREWS – Targeted Real-Time Early Warning System
- TRL – Technology Readiness Level
- VHT – Virtual Human Twins
- VINNOVA – Swedish Governmental Agency for Innovation Systems
- VITAL – Virtual Twins for Personalised Cardiovascular Care
- VNA – Vendor-Neutral Archive
- VPH-Institute – Virtual Physiological Human Institute
- WELMO – Wearable Electronics for Effective Lung Monitoring

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Abstract

This report offers a comprehensive analysis of the EU27 digital health landscape, combining market intelligence, stakeholder insights and economic modelling to inform future policy and investment.

The first part of the report provides a detailed overview of the EU digital health technology market. It identifies the key drivers, barriers, and structural characteristics of the European digital health ecosystem, including vendor distribution, market fragmentation, maturity levels of different technology domains, and the roles of providers, regulators, and investors. The analysis highlights strong growth perspectives for the EU digital health market, where Artificial Intelligence stands out as a key technology. However, there are still significant regional disparities and growing dependencies on non-EU suppliers, in strategic domains such as AI, cybersecurity, and genomics.

The second part of the report presents an economic impact assessment of five digital health technologies, estimating projected cost-savings for EU healthcare systems over a ten-year horizon. It highlights particularly strong cost-avoidance potential for the three use cases: clinical decision support systems, automated medical image analysis, and mental health platforms.

The report concludes with nine policy recommendations aimed at strengthening market integration, advancing interoperability, supporting SMEs, accelerating frontier technologies, and fostering equitable and sustainable adoption of digital health solutions.

Executive summary

Digital health technologies are reshaping the European healthcare landscape, offering new pathways for improving clinical outcomes, operational efficiency, and patient engagement. This report, commissioned by DG CNECT and authored by Capgemini Invent and IDC, provides a comprehensive analysis of the EU27 digital health ecosystem. It combines market intelligence, stakeholder insights, and economic modelling to inform future policy and investment decisions. The report is structured around two core components: the development of the Observatory for Digital Health Technologies in Europe (Part A), and an Economic impact analysis of five selected digital health technologies (Part B). The report ends with conclusions and policy recommendations (Part C).

Part A. Observatory for Digital Health Technologies in Europe

The first part of the report lays the foundation for the European Commission's Observatory for Digital Health Technologies, offering a comprehensive analysis of the digital health landscape across the EU27 Member States. The Observatory is designed to support strategic decision-making, policy development, and long-term monitoring of digital health adoption, innovation, and investment.

The analysis draws on a robust methodological framework, combining quantitative and qualitative data sources. These include two EU-wide surveys, one targeting 70 digital health vendors and the other 300 healthcare providers, alongside 13 expert interviews, a market mapping exercise covering 690 vendors and 45 technologies, and a financial trend analysis based on over 46,000 investment records. Secondary sources such as EC policy documents, WHO reports, OECD studies, and proprietary IDC databases complement the evidence base.

Part A begins with a structured PESTLE analysis, identifying the political, economic, social, technological, legal, and environmental factors shaping digital health adoption. Politically, the European Health Data Space (EHDS) provides strong momentum, but national fragmentation and procurement barriers continue to hinder scalability. Economically, digital health is recognised for its efficiency gains, yet financial constraints and limited access to growth capita, particularly among SMEs, remain significant obstacles. Socially, digital health improves patient engagement and staff satisfaction, but digital skill gaps and equity concerns persist. Technologically, interoperability deficits and outdated infrastructure are widely reported, while legal complexity poses compliance challenges. Environmental considerations are emerging, with 45% of providers recognising sustainability benefits, although vendors have yet to fully integrate eco-design principles.

The vendor landscape is highly fragmented and regionally concentrated. Of the 690 vendors identified, only 196 are headquartered in the EU27, with the United States accounting for 354. Germany and France lead in vendor count, while 15 Member States report five or fewer vendors. EU vendors predominantly focus on core health IT systems and administrative solutions, with limited activity in emerging technologies like for example AI powered diagnostic tools and novel biological sensors, and genomics. Most solutions target diagnosis and treatment stages, and are designed for tertiary hospitals and specialist care settings. Strategic dependencies on non-EU vendors, particularly in cybersecurity, AI-powered clinical tools, and genomics, raise concerns about digital sovereignty.

EU vendors operate primarily within national markets, with only 11% reporting customers outside Europe. Their growth outlook is cautious: 46% anticipate moderate expansion, while 31% remain uncertain. Strategic priorities include niche specialisation, AI/ML investment, and clinical partnerships, though alignment with population health goals and patient-centred design remains limited. R&D investment is relatively strong, with 32% of vendors allocating over 20% of their budget, focusing on patient outcomes, operational efficiency, and regulatory compliance.

Revenue models are evolving, with tiered pricing and licensing still dominant, but outcomes-based and subscription models gaining traction. Patient engagement strategies increasingly emphasise user-centred design and accessibility, though active co-creation with patients is rare. Partnerships are concentrated among providers, tech firms, and life sciences companies, while engagement with academia, regulators, and patient groups remains low. Vendors face significant regulatory burdens and cybersecurity threats, and while many invest in internal resilience and talent development, adoption of open standards and data sovereignty measures is limited.

The report also assesses the maturity and adoption trajectories of five emerging digital health technologies using a Technology Readiness Level (TRL) framework. AI-powered diagnostic tools are the most mature, with widespread clinical deployment and projected adoption nearing 80% by 2029. Next-generation virtual care platforms and AI-based hospital infection warning systems are advancing toward large-scale deployment, while virtual human twins and novel biosensors remain in earlier stages of development. The healthcare providers survey results however point to a remarkably positive outlook for virtual human twins. While adoption today is still limited (around one in ten providers), more than half of healthcare organisations plan to introduce them by 2029. This strong forward-looking investment intention highlights both the transformative potential of digital patient models in clinical practice and the readiness of providers to integrate them once technological and regulatory enablers are in place. Similarly adjacent technologies such as AR/VR, hospital digital twins, and robotics show promising growth but require further validation and integration.

Artificial Intelligence emerges as a cross-cutting enabler of digital transformation. Ninety-four percent of healthcare providers are engaged in AI adoption or planning, with top use cases including clinical decision support, early diagnosis, patient engagement, and remote monitoring. However, operational applications such as supply chain optimisation and workflow automation remain underutilised.

The EU digital health market is projected to grow from €11 billion in 2023 to €61.2 billion by 2035, reflecting a compound annual growth rate of 15.1%. While hospitals currently dominate investment, other healthcare providers, such as outpatient clinics and laboratories, are rapidly catching up. Regional disparities persist, with DACH and Southern Europe accounting for nearly 75% of total spending by 2035. The market remains fragmented, with significant opportunities for new entrants, particularly in AI, genomics, and cybersecurity. However, regulatory complexity, interoperability gaps, and external dependencies continue to constrain scalability and innovation.

Beyond the EU, comparative analysis highlights different models of progress. The United States is scaling critical technologies such as AI and advanced cybersecurity more rapidly, supported by stronger venture capital flows. Between 2019 and 2024, U.S. digital health investment volumes were more than triple those of the EU27, with U.S. vendors representing 63% of the global market compared to 28% for Europe. Market growth rates reinforce this divergence: the U.S. digital health market is forecast to expand at 17–18% CAGR through 2030, compared with 15% for the EU27, meaning a larger market is also accelerating at a faster pace. In Asia-Pacific, Japan and China are advancing quickly in robotics and large-scale virtual care, while the EU's strengths lie in robust data protection and patient rights frameworks. Building on this foundation, Europe's opportunity and challenge is to scale investment, enhance agility, and harmonise markets, alongside targeted support for SMEs, to reduce dependencies and accelerate innovation.

Part B. Economic impact analysis of selected Digital Health Technologies

The second part of the report presents a cost-benefit analysis of five promising digital health technologies, quantifying their projected costs and benefits (cost savings) at EU27 level over a ten-year horizon. The analysis is designed to inform strategic investment decisions and policy prioritisation, offering an assessment of net cost avoidance, implementation costs, and impact on healthcare systems.

The methodology follows a stepped approach: step 1 is selecting and defining five use cases (listed below) within five broader technology types, step 2 is identifying the benefits (value drivers) of each use case for each scenario, step 3 is quantifying and monetising these benefits as well as the costs for a reference country, step 4 is extrapolating results to each Member State, step 5 is forecasting the results to a five and ten year time horizon and discounting the results to get the net cost avoidance, and step 6 is testing the uncertainty of the model and the underlying assumptions in a sensitivity analysis. This study employs multiple data collection methods, including desk research and consultation with experts.

Clinical Decision Support Systems (CDSS) demonstrate the highest economic impact, with projected net cost avoidance of €252 billion in the full implementation scenario and €71 billion in the partial scenario cumulatively over ten years in the EU27. These systems help reduce administrative workload, enhance the effectiveness of care, and help avoid the unnecessary use of medical services. Full implementation of CDSS could yield net cost avoidance of approximately 1% of total EU healthcare expenditure over a ten-year period.

Automated Medical Image Analysis also shows strong economic impact, with net cost avoidance of €192 billion (full scenario) and €126 billion (partial scenario) cumulatively over ten years in the EU27. These technologies improve diagnostic speed and accuracy, particularly in radiology. Implementation and operating costs per hospital are relatively modest. Full implementation could yield net cost avoidance of approximately 0.8% of total EU healthcare expenditure over a ten-year period.

Virtual human twins, while conceptually promising to improve quality of care, is not fully modelled due to a lack of data on cost quantification and uncertainties related to this emerging technology, specifically regarding limited real-world case studies from hospital settings. The value drivers have been quantified, indicating cumulative projections of gross cost savings of €60 billion (full scenario) and €30 billion (partial scenario) over ten years in the EU27. To determine net cost avoidance, associated costs would need to be subtracted from these figures

Mental health platforms also offer significant economic impact, with net cost avoidance projected at €164 billion (full scenario) and €136 billion (partial scenario) cumulatively over ten years in the EU27. These platforms support early intervention, remote therapy, and patient self-management, contributing to improved outcomes and reduced service utilisation. Full implementation could yield net cost avoidance of approximately 0.7% of total EU healthcare expenditure over a ten-year period.

Advanced genetic sequencing (genomics) is not modelled due to data unavailability and indirect value drivers. However, literature[1] shows that the costs of operating the use case are declining. Furthermore, several logics that could lead to cost savings were identified including earlier intervention, better prevention, and avoiding ineffective treatments.

Part C. Conclusions and policy recommendations

The Observatory provides a systematic EU-wide classification of digital health technologies, encompassing 45 subcategories across five domains. It offers a solid foundation for monitoring the market and supports comparability across Member States. The economic analysis of use cases provided a structured and transparent approach to assessing the cost savings enabled by digital health technologies. The analysis incorporates key factors influencing the implementation and adoption of the use cases across the EU, and provides both quantitative and qualitative insights into how technologies affect healthcare processes and can lead to cost savings.

To unlock the full potential of digital health, the authors of the report propose the following recommendations based on the findings of the study:

1. **Strengthen EU digital health market integration** and procurement alignment to reduce fragmentation and enable cross-border scaling. Joint procurement mechanisms, mutual recognition of certifications and streamlined conformity pathways can reduce duplication, accelerate time-to-market and enhance Europe's strategic autonomy in digital health.
2. **Support the adoption of internationally recognised interoperability standards** (e.g. FHIR, opener), and upgrading national IT systems to enable secure data exchange and advanced analytics. This can address fragmented data standards, uneven implementation of frameworks and outdated infrastructures that hinder continuity of care and cross-border data use.
3. **Support investment and reimbursement stability** by facilitating coordination and best practice exchange among Member States to promote predictable reimbursement and financing approaches. This can reduce fragmentation, encourage the adoption of proven solutions and strengthen Europe's long-term competitiveness in digital-health innovation.
4. **Enhance SME and scale-up support** by providing targeted instruments to reduce compliance costs and enable cross-border expansion. This can strengthen Europe's capacity to retain and scale high-potential digital-health ventures and promote the development of a European digital health ecosystem.
5. **Boost frontier technology innovation** by prioritising funding and procurement initiatives in underrepresented but strategically vital domains such as AI diagnostics, genomics, and cybersecurity. Establish targeted funding and coordinated actions to strengthen Europe's technological sovereignty. This contributes to reducing reliance on non-EU vendors, enhance

[1] The findings from the literature on genomics are described in Chapter 8 of Part B

healthcare-system resilience and ensure the Europe captures the full economic and clinical value of next generation digital-health solutions.

6. **Diversify the adoption of digital health technologies beyond hospitals** by incentivising research & innovation and deployment in preventive care, community care, and public health applications, ensuring that digital health extends benefits to underserved areas while supporting EU health policy objectives. Coordination across the healthcare value can unlock system-wide impact, improve care integration, improve equity and fully realise the value of digital health technologies.
7. **Strengthen organisational readiness and workforce** by supporting digital training, change management, and organisational readiness initiatives across healthcare systems. By investing in this, healthcare providers will be better equipped to adopt and integrate new technologies into daily practice, ensuring that digital health solutions deliver their full financial benefits across the EU.
8. **Promote sustainability and green Digital Health** by integrating eco-design, energy efficiency, and green procurement requirements into funding and procurement processes. Embedding sustainability into the digital-health agenda contributes to reducing the sector's environmental footprint, drive eco-innovation, and ensure that Europe's digital transformation of health contributes directly to EU climate-neutrality goals.
9. **Ensure digital health initiatives address disparities** by embedding equity and accessibility requirements into the design, procurement, and funding frameworks of programmes. Embedding inclusivity and accessibility across digital-health policies can ensure that the digital transformation of healthcare promotes equity, strengthens social cohesion, and upholds the principle of universal access to quality care.

1 Introduction

This report presents the findings of the European Commission study titled "Observatory for Digital Health Technologies in Europe". It provides an analysis of the digital health landscape across the 27 Member States of the EU, focusing on market dynamics, emerging technologies, and their economic impact in terms of cost savings for the healthcare system. In this section, the purpose, objectives, and structure of the study are outlined.

1.1 Purpose of the study

This study addresses the need for a comprehensive, EU-wide understanding and evidence regarding the digital health technology market and its economic impact. The study responds to strategic priorities outlined in the Commission's 2024–2029 Political Guidelines, including the digital transformation of healthcare, the strengthening of the EU Single Market, and the development of resilient, secure, and innovative health systems.

In particular, the study aims to:

- Provide a robust evidence base to guide future EU research, innovation, investment, and policy decisions in the area of digital health.
- Support the design of a long-term monitoring framework for the EU Digital Health Observatory.
- Demonstrate the value of digital health technologies to stakeholders, including policymakers, healthcare providers, and investors.

1.2 Objective of the study

The study is guided by two primary objectives that together aim to provide a comprehensive understanding of the digital health landscape in the EU and its economic implications.

1. **European digital health market observatory**

The first objective is to deliver a detailed market overview of digital health technologies across the EU. This involves mapping the current state of the market, identifying key technology categories, and analysing the structure, size, and growth potential of the sector. The study explores the uptake of digital health products and services used in healthcare delivery, including administrative tools, and examines how these technologies are distributed across different clinical settings, user groups, and Member States. It also investigates the origins of technology providers, highlighting potential strategic dependencies, and compares the EU market with those of other global regions such as North America and Asia. Through this analysis, the study identifies the main drivers and barriers to market development, assesses the competitive landscape, and proposes a framework for continuous monitoring and evaluation of the EU digital health market.

2. **Economic impact analysis**

The second objective is to assess the economic impact of digital health technologies in terms of financial cost savings for the healthcare system. This part of the study quantifies the cost savings that these technologies can generate for EU healthcare systems. It evaluates both the current and projected net cost avoidance offered by specific applications (use cases) of five technologies: electronic health records, medical imaging, digital twins, telemedicine, and genomics, over a five- to ten-year horizon. By doing so, the study seeks to provide robust evidence of the value these innovations can deliver, particularly in terms of costs savings for healthcare delivery across the EU.

1.3 Structure of the report

The report is structured into three main parts, aligned with the study's objectives:

- Part A: European digital health market observatory (objective 1)
- Part B: Economic analysis of five promising digital health technologies in Europe (objective 2)

- Part C: Conclusions and recommendations
- Annexes

Part A: European digital health market observatory

Part A presents an integrated analysis of the digital health technology market in the European Union. It provides a strategic foundation for understanding the key trends, market dynamics, and adoption patterns that are shaping the evolution of digital health across Member States. The chapters in this part of the report include the (1) introduction, (2) methodology, (3) analysis of market drivers and barriers, (4) market supply analysis, (5) market demand analysis, and a (6) comparative analysis of EU and non-EU markets.

Part B: Economic Impact Analysis

Part B presents the economic impact analysis of five use cases of digital health technologies. The chapters in this part of the report include the (1) introduction, (2) methodology, (3) analysis of the use case 'clinical decision support systems', (4) analysis of the use case automated 'medical image analysis', (5) analysis of the use case 'digital twins for disease management', (6) analysis of the use case 'mental health platforms', and (5) analysis of the use case 'advanced genetic sequencing'.

Part C: Conclusions and Recommendations

Part C synthesises the key findings of the study and presents a set of policy recommendations from the view of the study authors aimed at supporting evidence-based decision-making. It also outlines the study's limitations and identifies areas where further research is needed to strengthen the evidence base and address remaining knowledge gaps.

Annexes:

- Annex A: Methodology for the European digital health market observatory
- Annex B: Methodology for the European digital health market observatory: expert interviews
- Annex C: Methodology for the selection of digital health technologies and definition of use cases and scenarios
- Annex D: Methodology for the economic impact analysis of five promising digital health technologies in Europe
- Annex E: Supporting information – Use Case 1: Clinical decision support system
- Annex F: Supporting information – Use Case 2: Automated medical image analysis
- Annex G: Supporting information – Use Case 3: Digital twins for disease management
- Annex H: Supporting information – Use Case 4: Mental health platforms
- Annex I: Supporting information – Use Case 5: Advanced genetic sequencing

Part A: European digital health market observatory

1 Introduction

This section introduces the European Digital Health Market Observatory, which delivers the first integrated analysis of the digital health technology landscape across the European Union. It establishes a strategic foundation for understanding the trends, market dynamics, and adoption patterns that are shaping digital health transformation in the Member States.

The Observatory's analysis unfolds across several interrelated dimensions. It begins with a **PESTLE review** of the political, economic, social, technological, legal, and environmental factors that influence the diffusion of digital health solutions across Europe, identifying both the enablers of progress and the barriers that constrain adoption.

The second dimension examines the **supply side**, combining vendor mapping, technology segmentation, and competitive landscape analysis. This provides insight into the maturity and structure of the vendor ecosystem, ranging from multinational suppliers to European scale-ups and specialised SMEs, and highlights their strategies, investment priorities, and responses to shifting market conditions. Particular attention is given to frontier innovations such as AI-powered diagnostics, virtual care platforms, digital patient twins, novel biosensors, and early-warning systems for clinical risk.

The third dimension explores the **demand side**, using primary data from healthcare providers to analyse technology uptake, investment intentions, and procurement practices. This perspective captures the operational realities of hospitals, clinics, and community care providers, highlighting their unmet needs and priorities. It is complemented by a quantitative market sizing and forecasting exercise, offering five- and ten-year projections that clarify adoption trajectories and investment momentum at both national and EU levels.

Finally, the Observatory situates the European market in the global context through comparative analysis with selected global regions. This benchmarking underscores Europe's strengths, such as strong public mandates for digital transformation, while also revealing structural gaps, requiring greater policy and investment focus, including fragmented markets and limited access to scale-up funding.

2 Methodology

Methodological Foundations and Data Sources

The analysis underpinning the European Digital Health Market Observatory is built on a robust evidence base that combines both primary and secondary research. It draws on:

- Survey responses from **70 digital health vendors**, capturing supply-side trends;
- Survey data from **300 healthcare providers** across the EU27, offering demand-side insights;
- Findings from **13 expert interviews** with stakeholders across government, industry, and academia;
- A detailed **market mapping and segmentation exercise**, covering over 600 vendors and 45 technologies;
- A **financial trend analysis** based on over 46,000 investment records;
- **Secondary research** using IDC proprietary databases and external sources, such as EC policy documents, WHO reports, and OECD studies.

Together, these components provide a **multidimensional view** of the European digital health market, supporting strategic planning, evidence-based policymaking, and the development of a long-term monitoring framework under the Observatory.

Primary Data Collection: Surveys and Expert Consultation

Two **EU-wide surveys,** one of **healthcare providers** and one of **digital health vendors,** provide harmonised insights into adoption trends, investment behaviours, market challenges, and strategic perspectives across the EU27.

The **European Healthcare Providers Survey** collects answers from **300 respondents** belonging to **healthcare organisations across the EU27**, including hospitals, outpatient services, physicians' offices medical testing, laboratory, and diagnostic services, outpatient facilities, and home and community care services. Conducted via Computer-Assisted Telephone Interviewing (CATI) methodology, the survey gathered data on **technology uptake, investment plans, operational and clinical benefits, procurement dynamics, and adoption barriers**. Respondents included IT and clinical leaders. The survey distinguished between two planning horizons: 1–2 years for short-term investments and upgrades, and 3–4 years for medium-term transformation initiatives (Figure 1: Healthcare Providers Survey Demographics).

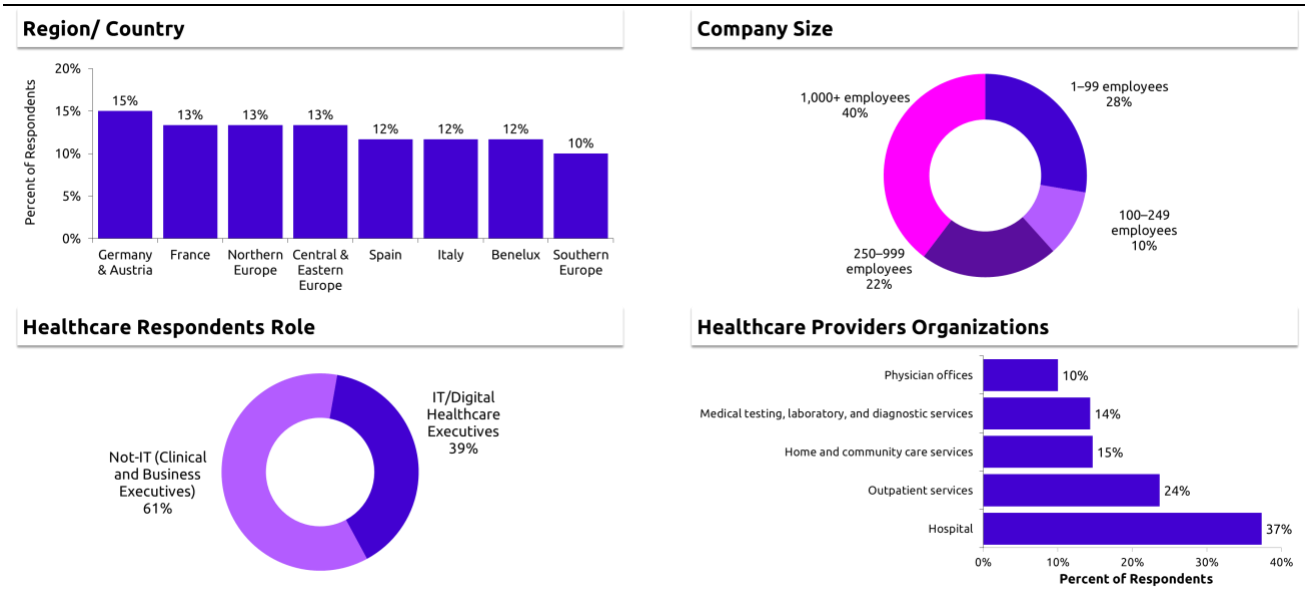

Figure 1: Healthcare Providers Survey Demographics

Source: Digital Technologies in Healthcare: Providers 2025 survey. Total Sample Size: N = 300

The **Digital Health Technology Vendors Survey** captured insights from **70 senior decision-makers** representing **established vendors, SMEs, scale-ups, and startups** with an **active presence in the EU27**. These companies supply technologies and services across clinical information systems, cybersecurity, genomics platforms, patient engagement tools, and AI-driven diagnostics. (**Figure 2, Figure 3**) The survey examined **innovation strategies, regulatory and market access challenges, pricing models, investment priorities, and growth constraints**. A 4-year timeframe was adopted to reflect typical product development, funding, and commercialisation cycles. While vendors may operate with extended R&D roadmaps, their market strategies rarely extend beyond this horizon. A ten-year outlook was deemed too speculative, particularly for start-ups, many of which may be acquired or exit the market within a shorter period.

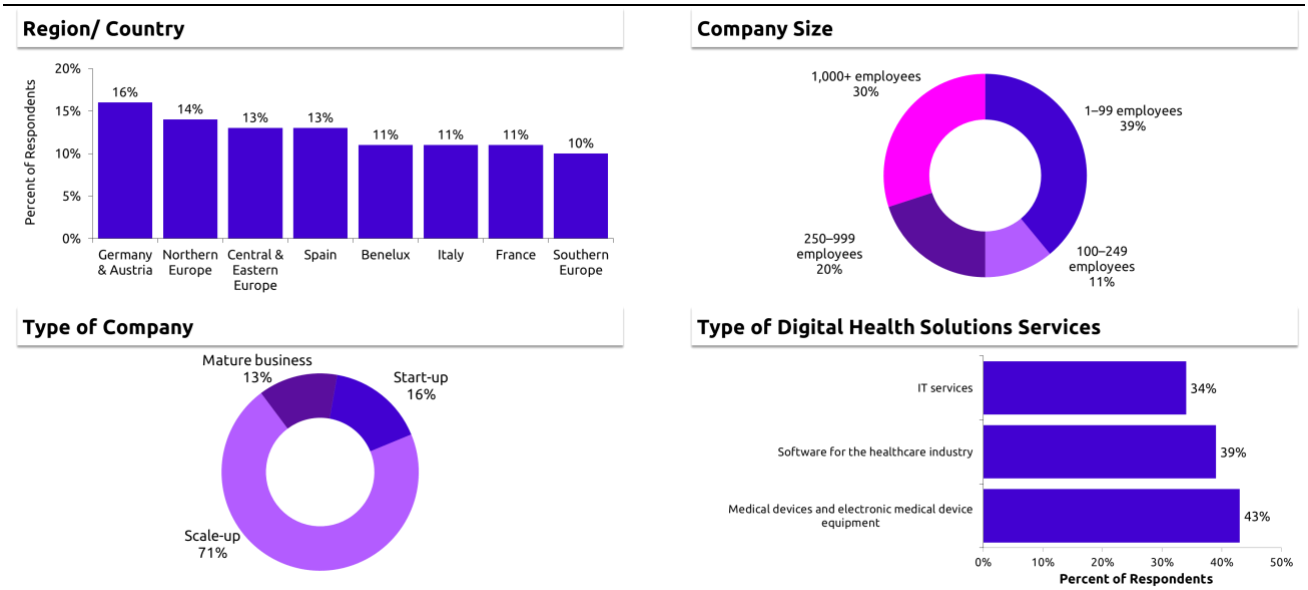

Figure 2: Digital Health Vendors Survey Demographics

Source: Digital Technologies in Healthcare: Vendors 2025 survey. Total Sample Size: N = 70

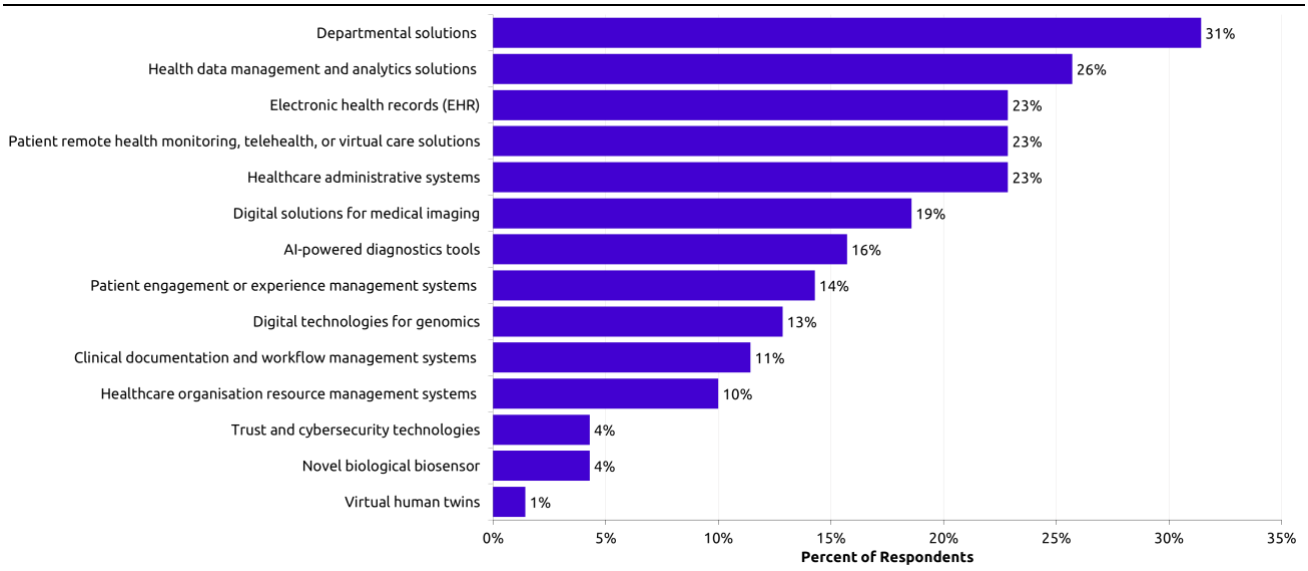

Figure 3: Key Product Areas and Value Propositions of Interviewed Digital Health Vendors

Source: Digital Technologies in Healthcare: Vendors 2025 survey. Total Sample Size: N = 70 Question: Which of the following best describes your company's key products and value proposition? If your company is active in multiple areas, please choose the areas that generate the highest revenue.

Both surveys were conducted over a nine-week fieldwork period, starting in mid-February 2025 and with results delivered in April 2025.

To complement the survey-based and desk research activities of the Observatory, the study team conducted a targeted series of **in-depth expert interviews** with key stakeholders across the European digital health ecosystem. These interviews provided qualitative insights into adoption trends, market dynamics, regulatory barriers, and innovation strategies, offering a nuanced understanding of the factors that enable or constrain the development of digital health technologies in Europe.

In total, **13 interviews** were completed between February and April 2025, covering seven stakeholder groups: healthcare providers, national and regional health authorities, digital health technology vendors, start-ups and accelerators, academia and research institutions, industry associations, and patient organisations.

The interviews were used to **contextualise survey findings** and validate early conclusions from the market mapping and literature review. Recurring themes included interoperability, procurement models, regulatory complexity, collaboration practices, data governance, and skills gaps. Responses were anonymised and analysed using a structured thematic framework. A detailed account of the methodology and findings is provided in **Annex B – Market Overview: Expert Interviews**, which includes participation records, thematic structuring of responses, and cross-cutting insights.

3 Analysis of European Digital Health Market Drivers and Barriers

European Digital Health Market Drivers and Barriers: Key Takeaways

- **Political Momentum, Local Fragmentation:** Strong EU-level policy momentum (e.g. EHDS) drives digital health adoption. Healthcare providers recognise alignment of digital health investments with strategic priorities such as clinical and operational outcomes. Nevertheless, complex national regulatory frameworks and fragmented procurement processes continue to pose political and governance-related challenges for healthcare providers. Misalignment of regulatory and procurement models between Member States further limits market access for new entrants and hampers scalability. For instance, 36% of digital health vendors point to limited market access due to dominant incumbents and fragmented national health systems, which drive up local adaptation costs (27%) and reinforce vendor specialisation in specific domestic markets.
- **Economic Value vs. Financial Realities:** Digital health is seen as delivering clear value: 64% of providers report improved operational efficiency, 52% cite cost savings, and 60% note productivity gains. However, 48% identify financial constraints as a key barrier. Among vendors, 39% struggle with margin pressures and 24% cite reimbursement misalignment; 26% of firms, especially SMEs, report challenges accessing growth capital. These insights underscore the need for aligned investment and reimbursement models to support innovation and financial sustainability for both providers and vendors.
- **Skills Gap and Equity Risks:** 57% of providers report enhanced patient engagement, and 58% increased staff satisfaction. Yet, 34% cite digital skill shortages, and 20% resistance to change. Vendors echo challenges in overcoming entrenched workflows and limited digital maturity in client organisations. Equity concerns are mounting, as digital tools often favour younger, urban, and more educated users, potentially creating new barriers for disadvantaged groups. A lack of inclusive design further hinders widespread adoption.
- **Interoperability and IT Infrastructure Deficits:** Interoperability and outdated infrastructure remain key barriers: 45% of providers highlight interoperability gaps and 30% point to outdated infrastructure. From the vendor side, 43% cite interoperability issues and 27% mention fragmented infrastructure and local adaptation costs. EU initiatives like EEHRxF and QUANTUM aim to improve data quality, security, and system integration, critical to scaling digital health, but require adoption at the national level.
- **Legal Complexity and Uncertainty:** Over 60% of providers report digital health helps with compliance, but they also continue to face legal uncertainties, with 38% citing data privacy concerns and 13% pointing to broader compliance challenges. Half of vendors cite regulatory burden, navigating GDPR, MDR, IVDR, AI Act, and EHDS, as a top barrier. Divergent national implementations add compliance cost and complexity, underscoring the need for harmonisation and clearer guidance.
- **Sustainability – an Emerging Consideration:** 45% of providers recognise environmental benefits from digital health, particularly through telemedicine and paperless workflows. While vendors do not yet prioritise sustainability, ESG pressures are growing, especially around device lifecycle management and energy efficiency, as governments led initiatives begin to influence healthcare providers' procurement decisions. Overall, these insights indicate that the broader environmental impact of digital health still requires more structured and strategic attention.

This section presents a structured PESTLE analysis that provides a comprehensive assessment of the political, economic, social, technological, legal, and environmental factors shaping digital health adoption across EU Member States. The analysis integrates both **demand-side** (healthcare providers) and **supply-side** (digital health vendors) perspectives on digital health adoption across the EU. Drawing on survey data,

literature review, and expert interviews, it highlights key drivers, barriers, and areas of convergence and divergence among stakeholders within each dimension.

Figure 4 to **Figure 7** provide a comprehensive overview of the survey results from both healthcare providers and digital health vendors. They illustrate the benefits and positive impacts of digital health adoption across Europe's healthcare sector, while also highlighting key barriers to adoption from the perspective of healthcare providers, as well as the operational challenges reported by digital health vendors.

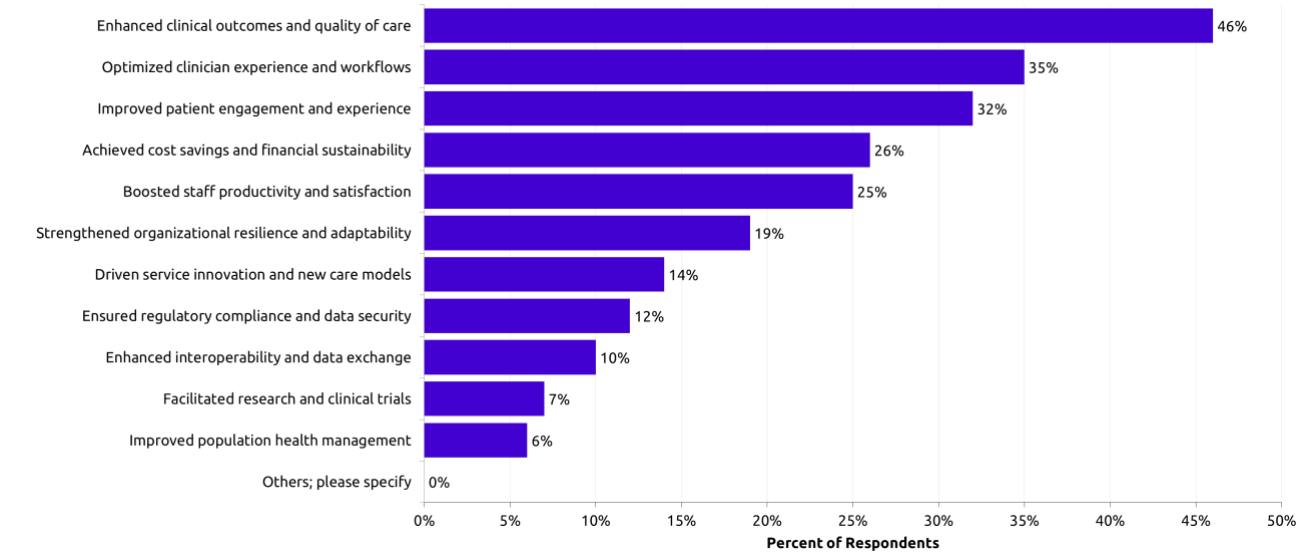

Figure 4: Benefits of Digital Health Adoption

Source: Digital Technologies in Healthcare: Providers 2025 survey. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Question: How have investments in digital health technologies benefited your organisation?

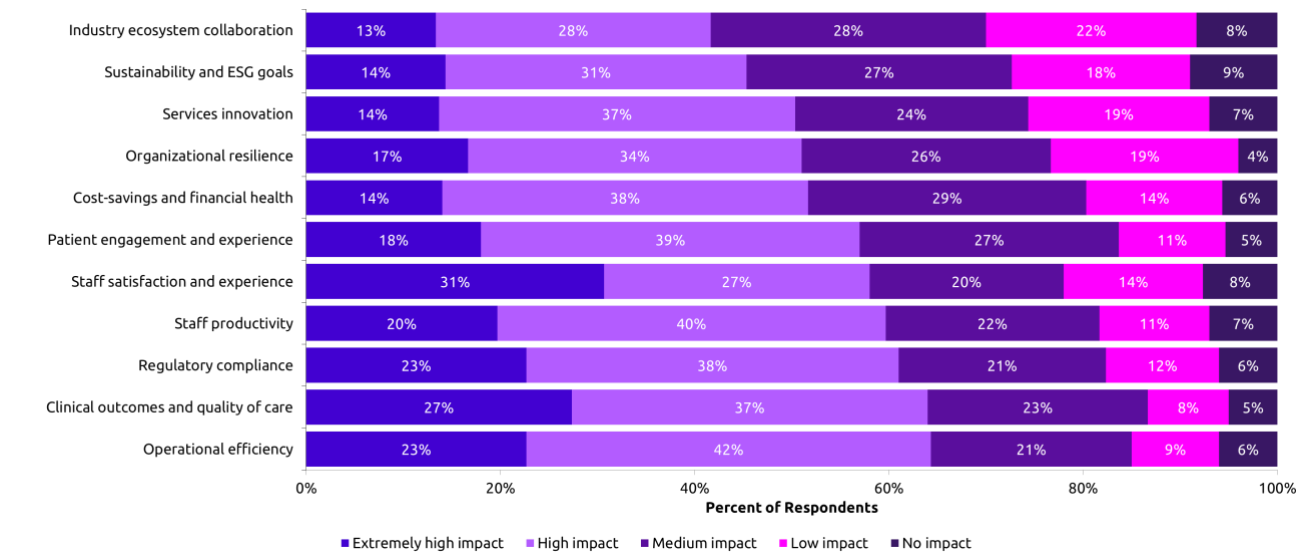

Figure 5: Positive Impact of Digital Health Investments by Area

Study: Digital Technologies in Healthcare: Providers 2025. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Q. To what extent have the investments in digital health technologies positively impacted the following areas within your organisation?

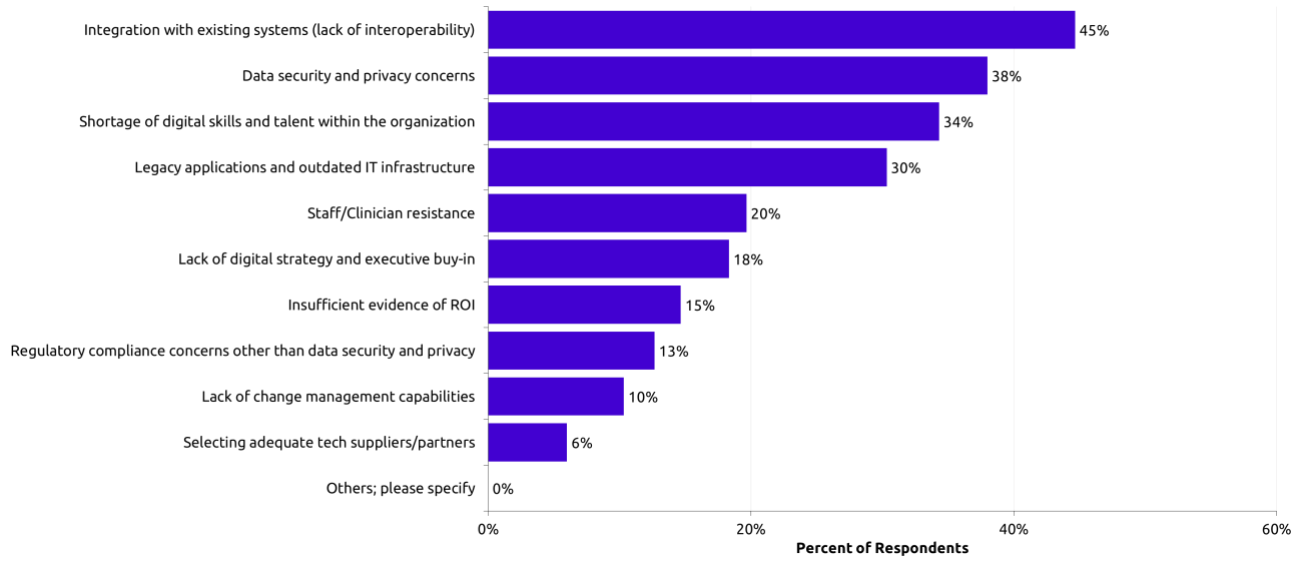

Figure 6: Key Barriers to Digital Health Adoption Among Healthcare Providers

Study: Digital Technologies in Healthcare: Providers 2025. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Q. What are the top challenges your organisation faces in adopting new digital health technologies?

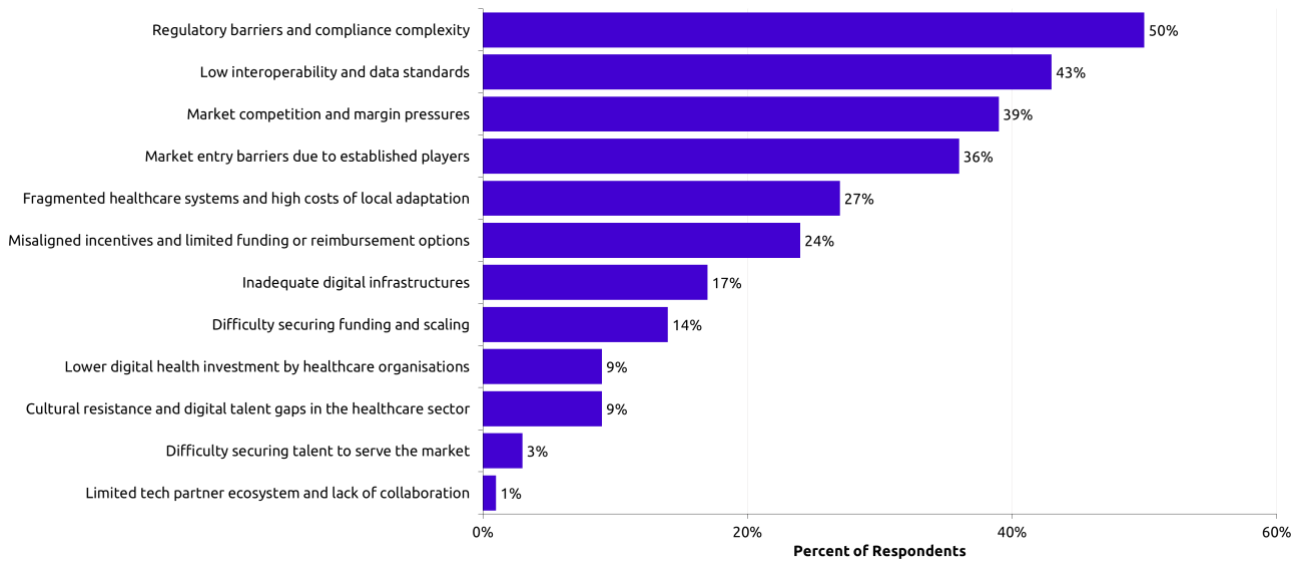

Figure 7: Key Challenges for Digital Health Companies in the EU

Study: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. What are your organisation's most significant challenges when operating in the EU healthcare market?

3.1 Political

The development of the digital health market in the EU is underpinned by strong political momentum, driven by regulations such as the European Health Data Space (EHDS), and other initiatives like structured investments in innovation, and efforts to strengthen digital infrastructures both at national and EU level. These measures aim to enhance the quality of healthcare services, the resilience of healthcare systems as well as the competitiveness of the healthcare sector.

From the demand side, survey results show that healthcare providers recognise that digital health contributes to clinical outcomes and operational efficiency, benefits that align closely with broader strategic and business priorities (**Figure 4**)[2]. However, they also face political and governance-related challenges. In certain cases, as also noted in expert interviews, the specificity and variability of national healthcare systems can drive misalignment or delays in synchronising and adapting national policies with EU-level strategies, hindering the consistent implementation of digital health initiatives at scale.

From the supply side, in the digital tech vendors survey, vendors – particularly SMEs – point to political barriers such as limited market access due to dominant incumbents (36% of vendors surveyed) and fragmented national health systems, which drive up local adaptation costs (27% of vendors surveyed) and reinforce vendor specialisation in specific domestic markets (**Figure 7**)[3].

The vendor specialisation in local markets emerge also when analysing survey results for the cross regional customer base of digital health vendors, showing that European digital health vendors serve mostly customers in their country or in neighbouring countries (see **Figure 20** from European Digital health Vendors Market Presence section). This trend is further confirmed by insights from interviews with national and local healthcare authorities, who emphasised the prevalence of locally tailored solutions and procurement dynamics. These challenges restrict vendors' ability to scale across the EU, reinforcing the need for more harmonised and innovation-friendly policy environments.

3.2 Economic

Healthcare providers recognise clear economic value in their digital health initiatives, with 64% reporting high-impact improvements in operational efficiency and 52% citing cost savings. Additionally, 60% acknowledge gains in staff productivity, underscoring the role of digital tools in optimising resource use (**Figure 5**). However, financial constraints remain a significant barrier for nearly half of providers (48%), reflecting a persistent gap between the long-term return on investment and short-term budget limitations (**Figure 6**). While survey data[4] indicate a positive trend in digital health budget allocations, with 27% of healthcare providers expecting a moderate increase (under 10%) and 18% anticipating a larger increase (over 10%), this projected growth may still fall short of fully meeting the needs of comprehensive digital transformation. During the expert interviews, experts from healthcare providers highlighted challenges due to healthcare systems operating within relatively fixed budgets, with inflation and rising operational costs further straining financial resources.

From the supply perspective, vendors, particularly smaller companies, face economic pressures stemming from market saturation and constrained margins (39% of vendors interviewed), as well as misaligned reimbursement frameworks and incentive models that limit the viability of innovative solutions (24% of vendors interviewed) (**Figure 7**). Although only 14% of all companies surveyed identified access to growth capital as a challenge, this figure rises to 26% among smaller firms. This suggests that limited access to financing may pose a significant barrier to scalability for early-stage and smaller digital health technology providers. Notably, only 9% of vendors view providers' investment levels as a barrier, suggesting that the core economic issue lies not in demand, but rather in systemic factors such market structure, high entry costs, and misaligned reimbursement mechanisms and funding flows.

These insights highlight the need for more coordinated investment and reimbursement models that facilitate innovation uptake while ensuring financial sustainability for both providers and solution developers. As confirmed by executive interviews with industry associations and MedTech networks, processes for approving, certifying, and reimbursing digital health technologies, such as medical device certification, health technology assessment (HTA), pricing mechanisms, and innovative funding models, are critical in shaping the digital health market. Notably, insights from tech start-up interviews revealed that

[2] Digital Technologies in Healthcare: Providers 2025 survey. Total Sample Size: N = 300 results referring to question: *How have investments in digital health technologies benefited your organisation?*

[3] Digital Technologies in Healthcare, Vendors, 2025. Total sample: 70. Results referring to question: *What are your organisation's most significant challenges when operating in the EU healthcare market?*

[4] Digital Technologies in Healthcare: Providers 2025 survey. Total Sample Size: N = 300

diverging regulatory and reimbursement environments between the EU and other regions significantly influence commercialisation strategies. These discrepancies often result in a prioritised launch of innovative digital health products in larger markets such as the United States, where regulatory pathways and investor incentives are perceived as more conducive to early market entry. Conversely, market deployment in Europe tends to occur later, typically once companies have achieved stronger financial positions and greater evidence maturity. At the national level, innovative policy and reimbursement frameworks, such as Belgium's mHealth validation [5], DiGA in Germany[6], Article 51 experimentation and the PECAN fast-track process in France [7], demonstrate how tailored mechanisms can effectively streamline market access and accelerate the adoption of digital health solutions. However, while these initiatives offer valuable models of best practice, they also underscore the increasing need for a more harmonised and interoperable approach across the EU. The lack of alignment between Member States continues to pose significant challenges for vendors seeking to scale solutions beyond national borders, reinforcing the importance of coordinated EU-level frameworks to support market integration and innovation diffusion.

3.3 Social

Healthcare providers widely acknowledge the social value of digital health technologies, with 64% of survey respondents reporting improved clinical outcomes, 57% highlighting enhanced patient engagement, and 58% noting increased staff satisfaction. These outcomes reinforce the societal benefits of digital transformation in health, particularly in advancing patient-centred care and improving working conditions for clinical staff (**Figure 4**). However, persistent barriers remain. Among healthcare providers, a shortage of digital skills within organisations (34% of healthcare organisation interviewed) and moderate but still considerable levels of staff resistance (20% of healthcare organisation interviewed) point to cultural and educational frictions that hinder widespread adoption (**Figure 6**)[8].

These challenges were also highlighted in executive interviews with healthcare providers, who noted that workforce shortages significantly hinder the adoption of digital health technologies. Overburdened staff often lack the capacity to engage with new solutions, while existing habits and workflows further complicate integration. Some healthcare professionals resist change due to personal preferences and limited time to explore new tools, making effective change management crucial for digital transformation. Supported also by international studies[9], this insight confirms that workforce and organisational readiness are key enablers of digital health adoption, emphasising the need for coordinated investments in training, change management, and strategic communication to ensure successful and sustainable implementation.

From the supply side, vendors perceive social challenges as less prominent but nonetheless relevant (**Figure 7**). The vendors survey results shows that smaller companies, in particular, report encountering greater resistance within healthcare organisations. This often stems from entrenched clinical workflows, limited digital maturity among healthcare professionals, and the operational reality of overburdened staff who lack the time and capacity to adopt and adapt to new technologies. This can slow the uptake of novel solutions, especially where frontline engagement is lacking.

Another important aspect to consider is the variation in digital health adoption among patient populations. Studies have shown that digital health tools are more commonly used by younger, urban, and more educated groups. This raises equity concerns, particularly in ageing or rural populations, where digital literacy and access are lower[10]. European healthcare organisations and authorities should uphold the principle of universal coverage by ensuring that digital health services are inclusive, reliable, and free from unnecessary technical barriers for all citizens. Without targeted inclusion strategies, digital health may inadvertently

[5] Mhealth Belgium (2024)
[6] DiGA (Germany)
[7] PECAN (France)
[8] Digital Technologies in Healthcare: Providers 2025. Total Sample Size: N = 300. Results related to question: *What are the top challenges your organisation faces in adopting new digital health technologies?*
[9] Ferreira, J.C.; Elvas, L.B.; Correia, R.; Mascarenhas, M. Empowering Health Professionals with Digital Skills to Improve Patient Care and Daily Workflows. Healthcare 2025, 13, 329
[10] Equity within digital health technology within the WHO European Region: a scoping review. Copenhagen: WHO Regional Office for Europe; 2022. WHO/EURO:2022-6810-46576-67595

widen the healthcare gap through a digital divide, undermining efforts to ensure equitable access to care[11]. Expert interviews with patient associations highlighted that the early involvement of patients in the design of digital health solutions, particularly those that are patient-facing, as a key area for improvement in the current digital health landscape. Stakeholders stressed that vendors of digital health technologies should consider, from the outset, critical aspects such as accessibility, inclusiveness, and ergonomics. Doing so would not only promote equitable access to these solutions and services but also support improved user experience, thereby enhancing patient engagement, uptake, and reducing the need for substantial redesigns post-deployment.

3.4 Technological

Technological enablers are fundamental to the positive outcomes associated with digital health, underpinning improvements across nearly all benefit areas. This reinforces the perception of digital solutions as essential infrastructure for delivering modern, data-driven, and patient-centred care.

However, both healthcare providers and vendors identify persistent technological barriers. According to the survey results, among providers, lack of interoperability and data standardisation (45% of healthcare providers interviewed) and outdated IT infrastructure (30% of healthcare providers interviewed) are seen as major impediments to data fluidity and innovation (**Figure 6**). Vendors echo these concerns, with 43% citing interoperability issues and 27% pointing to fragmented infrastructures and high local adaptation costs (**Figure 7**).

This dimension shows a clear convergence between supply and demand perspectives: both stakeholders emphasise the urgent need for interoperable systems, shared standards, and modern IT foundations. Addressing these shared pain points is critical to enabling innovation at scale and reducing the friction slowing digital transformation across the EU health landscape.

In this dimension, the implementation of the European Health Data Space (EHDS) serves as a key enabler for a unified, interoperable digital health market, shaping both national and EU-level strategies. For example, MyHealth[12], the digital infrastructure enabling cross-border exchange of health data for primary healthcare, includes the adoption of the secure and interoperable European Electronic Health Record Exchange Format (EEHRxF). The European Commission is actively supporting the EEHRxF through funding of key projects. One such initiative is the Xt-EHR[13] project, which is developing implementation guides, technical specifications, and a conformity assessment framework to ensure the security and compliance of the EEHRxF. This initiative is expected to drive greater standardisation at both local and cross-border levels.

The Commission is also funding the QUANTUM project[14], which defines criteria for a data quality and utility label to improve the standardisation and reliability of health data across the EU. Data quality is a critical enabler for healthcare organisations to fully harness data-driven insights and AI innovation. Notably, 46% of surveyed healthcare providers identified the lack of high-quality data as a top challenge in leveraging AI and advanced analytics.

3.5 Legal

The legal landscape plays a pivotal role in shaping the adoption and scalability of digital health technologies across the EU. Healthcare providers report tangible benefits from digital tools in supporting their regulatory compliance, with over 60% of respondents indicating a high or extremely high positive impact, with an

[11] European Commission: Capgemini Invent, Directorate-General for Communications Networks, Content and Technology, Page, M., Winkel, R., Behrooz, A. et al., 2024 digital decade ehealth indicator study – Final report, Publications Office of the European Union, 2024
[12] European Commission (2025)
[13] Xt-EHR project
[14] QUANTUM project

average impact rating of 3.60[15] (**Figure 5**). However, providers also face persistent legal uncertainties: 38% cited concerns related to data privacy, while 13% identified broader compliance challenges (**Figure 6**).

On the supply side, in the survey vendors express even greater concern: 50% identified regulatory complexity as a key obstacle, driven by the need to navigate frameworks such as the General Data Protection Regulation (GDPR), Medical Device Regulation (MDR), In Vitro Diagnostic Regulation (IVDR), the European Health Data Space Regulation (EHDS), and the AI Act.

As confirmed by executive interviews with digital health technologies vendors, health tech networks and industry associations, these layers of regulation contribute to increased operational burden, liability risk, and compliance costs, particularly when national implementation diverges from EU directives. This convergence of concerns underscores the urgent need for regulatory streamlining, clear guidance on compliance pathways, and harmonised enforcement across Member States.

Legal frameworks directly impact data governance, processing, and cross-border sharing, especially for sensitive data categories such as genomic, molecular, and biobank information, which may be subject to additional ethical or national restrictions potentially limiting the EHDS Regulation's effectiveness as a unified EU-wide health data governance framework[16]. Inconsistent data access rules and variable certification requirements, including CE marking and health-specific legal provisions, further complicate the environment for innovators. Nonetheless, ongoing EU initiatives are working to address these barriers. Projects such as TEHDAS 2 Joint Action[17] are actively developing harmonised workflows for data access, interoperability, privacy, and security, which are critical components for enabling the EHDS to serve as a truly unified health data governance framework. These efforts are essential to build trust, ensure legal clarity, and unlock the full potential of digital health innovation across Europe.

3.6 Environmental

Sustainability is beginning to emerge as a relevant consideration in digital health, increasingly aligned with the EU's Green Deal and climate-neutral objectives. On the demand side, 45% of healthcare providers recognise digital health's contribution to environmental goals, mainly by reducing travel through telemedicine, virtual consultations, and paperless workflows (**Figure 5**). These solutions help reduce the carbon footprint of care delivery by minimising transportation needs and shifting services to lower-impact, less resource-intensive settings.

On the supply side, environmental considerations are not cited as primary challenges (**Figure 7**). However, vendors, especially manufacturers of connected medical devices[18], are facing growing pressure to adopt sustainable manufacturing, energy-efficient technologies, and responsible e-waste management practices, especially as ESG criteria increasingly influence procurement decisions by healthcare organisations. While digital health is generally less resource-intensive than traditional care models, its environmental footprint, including energy consumption from data centres and device lifecycle waste, warrants closer attention.

The EU's broader evolving regulatory environment reinforces this trajectory. Initiatives such as the *EU Circular Economy Action Plan* [19]and *Ecodesign for Sustainable Products Regulation*[20] are pushing for more eco-friendly product design and carbon-conscious supply chains. Additionally, international strategies, such as the UK's Greener NHS Strategy[21], which mandates that all suppliers meet net zero commitments by 2030,

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[15] Digital Technologies in Healthcare: Providers 2025. Total Sample Size: N = 300 Results related to question: *To what extent have the investments in digital health technologies positively impacted the following areas within your organisation?* Healthcare providers respondents were asked to rate the positive impact of digital health investments on their organisations using a scale from 1 to 5, where 1 indicates no impact and 5 represents an extremely high impact

[16] Regina Becker, Davit Chokoshvili, Edward S Dove, Legal bases for effective secondary use of health and genetic data in the EU: time for new legislative solutions to better harmonize data for cross-border sharing?, *International Data Privacy Law*, Volume 14, Issue 3, August 2024, Pages 223–246

[17] Tehdas (2025)

[18] Tamara Hoveling, Anne Svindland Nijdam, Marlou Monincx, Jeremy Faludi, Conny Bakker, Circular economy for medical devices: Barriers, opportunities and best practices from a design perspective

[19] European Commission (2020)

[20] European Commission (2024)

[21] NHS (2025)

signal a broader global movement toward sustainability in healthcare procurement and technology deployment. National-level efforts, such as France's *Éco-conception des services numériques en santé* initiative, further illustrate the growing emphasis on sustainable digital health infrastructure. This programme provides a structured approach to evaluating and reducing the carbon impact of health information systems through eco-design principles, supporting environmentally responsible innovation at both technical and organisational levels[22]. Although not yet a dominant driver or barrier, the environmental dimension presents a forward-looking opportunity. Embedding green principles into digital health strategies through sustainable infrastructure, ESG-aligned procurement, and carbon reporting will be essential for aligning digital innovation with the EU's climate targets and supporting long-term healthcare resilience.

[22] L'Agence du numérique en santé (2025)

4 Digital Health Market Supply Analysis

To provide a comprehensive overview of the digital health technology market in the EU, this section focuses on understanding the competitive structure and dynamics of the sector, an essential foundation for evidence-based policymaking and strategic investment planning. The analysis is based on four key components:

- **Market mapping and segmentation**, which classifies digital health technologies into five overarching categories and examines them across six key dimensions: technology type, care delivery setting, medical domain, end-user type, and the geographical distribution of vendors.
- **Strategic and market dynamics of digital health vendors**, drawing on insights from the digital health vendors survey to assess investment patterns, operational challenges, innovation strategies, and growth trajectories, offering a detailed picture of how market actors are responding to an increasingly dynamic environment.
- **Financial trends analysis**, evaluating the scale, direction, and evolution of capital flows into digital health, and their influence on market development. This includes coverage of both EU27 Member States and selected non-EU regions across major global markets.
- **Market readiness assessment of emerging technologies**, offering insights into innovation pathways, levels of market maturity, and priority areas for future growth, focusing on cutting-edge solutions such as AI, virtual care platforms, and digital twins.

These components will be synthesised in a **Comprehensive Market Structure and Competitive Landscape Analysis**, integrating insights from the strategic and market dynamics of digital health vendors, financial trends analysis, emerging technologies market readiness assessment, and market mapping and segmentation. Leveraging Porter's Five Forces framework, the analysis consolidates diverse supply-side data to evaluate key factors (such as market composition, entry barriers, strategic dependencies, and competitive positioning) with the aim of informing EU policy decisions and identifying strategic opportunities for digital health market development.

4.1 Digital Health market mapping and segmentation

Market Mapping and Segmentation Key Takeaways

Global and European vendor distribution

- The **digital health technology market remains globally concentrated**. The United States accounts for 63% of all identified vendors, with the EU27 collectively underrepresented. Within the EU, Germany and France lead in vendor count, but 15 Member States report five or fewer vendors, reflecting **substantial intra-EU disparities in digital health maturity and ecosystem development**.

Technology focus and innovation profile

- EU27 vendor portfolios are predominantly oriented towards core health IT systems. Health data management, diagnostic, and clinical workflow solutions represent 67% of all technologies, while administrative tools account for a further 18%. Conversely, emerging technologies (7%), trust-enabling solutions (6%), and digital technologies for genomics (2%) remain limited, pointing to a **stronger focus on operational modernisation than frontier innovation**.

Patient value chain and organisational alignment

- Vendor offerings are concentrated around the **diagnosis** (230 solutions), and **treatment** (131) stages of the patient value chain. Most solutions are designed for **tertiary and secondary hospitals** (362), as well as **clinics and ambulatories** (321), suggesting a strong **orientation toward hospital-based, specialist care**. Public health, home care, and preventive services are less frequently targeted.

End users and clinical domains

- Most technologies are aimed at **healthcare professionals** (289) and **administrators** (150), with only a small proportion explicitly targeting patients. While this may reflect vendor focus, it may also stem from dataset limitations in capturing multi-user or patient-facing functionality. Among clinical domains, oncology, radiology, and cardiology are the most represented, consistent with the diagnostic emphasis of the broader vendor landscape.

External actors play a strategic role in key enabling technologies

- A qualitative review of non-EU27 vendors commercially active in the EU27 market reveals potential **dependencies** in several foundational domains. Vendors headquartered outside the EU, primarily in the United States and the United Kingdom, are strongly represented in **trust-enabling technologies** (e.g. cybersecurity, governance, compliance), as well as in **AI-powered clinical assistants**, **data analytics platforms**, and **genomics-related technologies**. These findings highlight a reliance on non-EU suppliers for cross-sectoral digital infrastructure and emerging technologies that are critical to the EU's future digital health readiness and sovereignty.

4.1.1 Methodology and definitions for market mapping and segmentation

To support a structured understanding of the digital health market in Europe, the study developed a comprehensive vendor mapping covering the EU27 and international countries. The objective was to produce a scalable dataset capturing the distribution, scope, and technology focus of digital health suppliers, forming the empirical basis for market mapping and segmentation analysis.

Definition of Technologies

The mapping was built on standardised technology market definitions, detailed in **Annex A1**, comprising 45 distinct technologies across 25 subcategories, grouped into 5 main technology categories, as shown in **Table 1**.

Table 1: Technology Categories, Technology Subcategories and Example of Technologies Mapped

Technology Category	Definition	Technology Subcategories	Examples of Technologies Included
Health administrative and operational information management systems	Digital solutions that support the administrative, financial, and logistical operations of healthcare providers, including systems for patient management, resource scheduling, workforce coordination, assets and supply chain management—enabling streamlined, efficient, and resilient care delivery.	• Clinical and non-clinical resource management, • Patient services - back-end operations, • Patient services - front end operations	• Pharmacy Management Systems, • Patient appointment scheduling/eBooking systems, • Patient access and front-end services (e.g. patient apps, patient portals)
Health data management, diagnostic and therapeutic workflow management systems	Digital solutions that enable the collection, management, analysis, and exchange of health data, while supporting diagnostic, treatment, and care coordination workflows across healthcare settings.	• Clinical documentation and workflow management, • Clinical documentation and workflow management - Departmental solutions, • Digital solutions for medical imaging, • Electronic Health Record (EHR), • Virtual care, remote health delivery and monitoring, and patient health engagement	• Electronic Health Record (EHR), Clinical Decision Support Systems (CDSS), • Emergency care / Emergency Department Information Systems, • Laboratory Information Management Systems (LIMS), • Medical imaging analytics and AI, • Remote monitoring and connected devices platforms/ solutions
Digital technologies for genomics	Digital solutions that enable the analysis, interpretation, and clinical use of genomic and biomolecular data to support precision diagnosis, risk prediction, and personalised care delivery.	Advanced analytical, solutions for genomic research, Computing platforms and software for genome sequencing, Genomic data ecosystem and collaborative platforms, Genomic insights and clinical translation platforms	Advanced analytical solutions for genomic research, Genomic data ecosystem and collaborative platforms
Emerging Digital Health Technologies	Innovative, early-stage digital technologies—including AI diagnostics, digital patient twins,	AI-Based Hospital Early Infection Warning Systems, AI-Powered Diagnostic Tools, Next-	Biological Sensors, Virtual Human Twins/Digital Patient Twins

Technology Category	Definition	Technology Subcategories	Examples of Technologies Included
	immersive virtual care, and biosensors—that are expanding the boundaries of personalised, predictive, and proactive healthcare delivery.	Generation Virtual Care and Patient Monitoring, Novel Biological Sensors, Virtual Human Twins/Digital Patient Twins	
Trust: privacy and cybersecurity technologies	Digital solutions that protect health data, ensure system integrity, and maintain trust in digital healthcare through robust cybersecurity, privacy, and compliance mechanisms.	Business continuity and disaster recovery, Data security technologies, Endpoint security, Governance, risk and compliance management, Identity and access management, Security analytics software and SOC solutions	Business continuity and disaster recovery, Data security technologies, Endpoint security,

Source: Consortium's Study Team Definitions and Market Segmentation Developed for the Observatory Study

"In-house" or internally developed systems were excluded from the database due to data constraints, though their relevance is discussed based on qualitative inputs from stakeholder interviews. The full methodology used to map and classify digital health technology vendors is explained in detail in **Annex A2**.

The final dataset and the definitions developed for the market mapping and segmentation are also applied in the following sections, supporting comparative analysis and granular estimates by selected technology type, geography, and provider segment.

Vendor and Product Identification Methodology

The identification of vendors and products was conducted using a hybrid methodology that combined proprietary IDC datasets[23] with reputable external databases, including S&P Capital IQ[24] and Dealroom[25]. The process applied industry-standard NACE[26] codes and sector-specific keyword tagging to identify companies active in the digital health space.

During the analysis phase, the Consortium identified several limitations associated with the classification systems employed by these data sources. These systems, designed for broad industry categorisation, often lack the granularity required to accurately represent digital health technologies. Consequently, classification inconsistencies and incomplete data posed challenges to achieving comprehensive coverage and precision.

To address these limitations, the Consortium introduced a multi-layered validation framework to enhance the quality and robustness of the dataset. This included:

- AI-assisted classification of vendors and their solutions;
- Web scraping of official vendor websites for product verification;
- Manual validation and enrichment by domain experts to ensure accuracy in vendor profiles and product categorisation.

As detailed in **Annex A2** – Methodology for Market Mapping and Segmentation, the mapping process involved extensive manual classification and validation of vendor data to ensure consistency and completeness across multiple dimensions. This included harmonising sources, addressing data gaps, and reconciling inconsistent classifications. While certain limitations persist, particularly regarding coverage depth and granularity, the result is a curated, structured database that serves as a reliable foundation for

[23] Refer to Annex A2 for the complete methodology.
[24] S&P Global Market Intelligence, S&P CAPITAL IQ
[25] Dealroom
[26] The Statistical Classification of Economic Activities in the European Community

further market analysis. Although there is a recognised need for more granular and continuously updated data, the current version represents a robust initial benchmark. Datasets of this breadth and organisation are not typically available in the marketplace, making this a valuable contribution to the digital health evidence base.

4.1.2 Digital Health market mapping - analysis

The market mapping exercise identified **690 companies worldwide**, spanning both EU27 and non-EU regions, and classified **1,375 digital health solutions** through the framework described above in **Table 1**, illustrating the diversity and distribution of vendors and product portfolios.

The pie chart in **Figure 8** illustrates the global distribution of digital health vendors in 2025, highlighting a highly geographically concentrated market. The United States dominates the global landscape accounting for 63% of all vendors captured in the dataset. The United Kingdom (8%) and Germany (8%) follow as the next most represented countries, reflecting their established digital health ecosystems. France (4%) and Canada (4%) also show notable presence, alongside Japan (3%), the Netherlands (3%), and Sweden (3%). Rounding out the top ten are Australia, Switzerland and China, each with 2% of the identified vendors. The chart provides a snapshot of where vendors are geographically concentrated by country, signalling a marked transatlantic imbalance, with the EU27 collectively underrepresented.

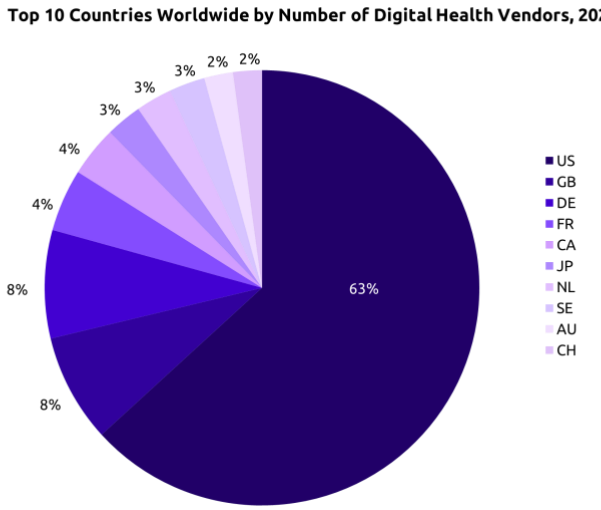


Figure 8: Leading Countries Worldwide by Number of Digital Health Vendors (2025)

Source: Consortium's data elaboration and analysis, March 2025

Figure 9 shows the number of digital health vendors in 2025 across the five EU27 regions, as defined in **Annex A2**. The DACH region records the highest number of vendors (47), followed by Central and Eastern Europe (44), Northern Europe (42), and South and Western Europe (40). The Benelux region registers the lowest number, with 23 vendors captured in the dataset. This regional lens highlights a distribution that is both diverse across the EU27 and concentrated in specific areas, particularly in the DACH region and, to a lesser extent, Benelux. The breakdown is consistent with the segmentation used throughout the report, including in the market sizing and growth forecast analysis (see section 5.5), and provides a structured basis for comparing vendors presence across the EU27.

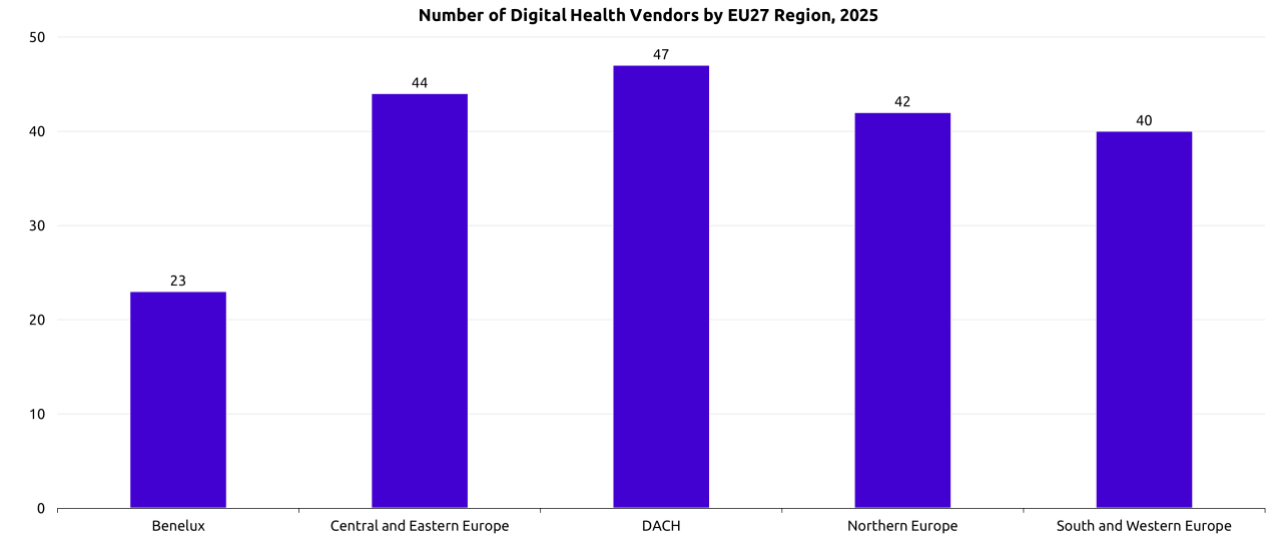


Figure 9: Distribution of EU27 Vendor Across the EU27 Regions (2025)

Source: Consortium's data elaboration and analysis, March 2025

Figure 10 presents the number of digital health vendors in 2025 by individual EU27 Member State. Germany reports the highest number, with 45 vendors, followed by France (26), the Netherlands and Sweden (15 each), and Italy and Finland (11 each). Other countries with more than five vendors include Denmark (10), Poland and Spain (8 each), and Ireland (6). The remaining Member States are characterised by lower levels of representation, with 15 countries registering five or fewer vendors. This distribution provides a country-level view of vendor presence across the EU27 and complements the regional analysis presented **Figure 9**. It also offers a reference point for understanding national-level ecosystems and their role within the broader European digital health landscape.

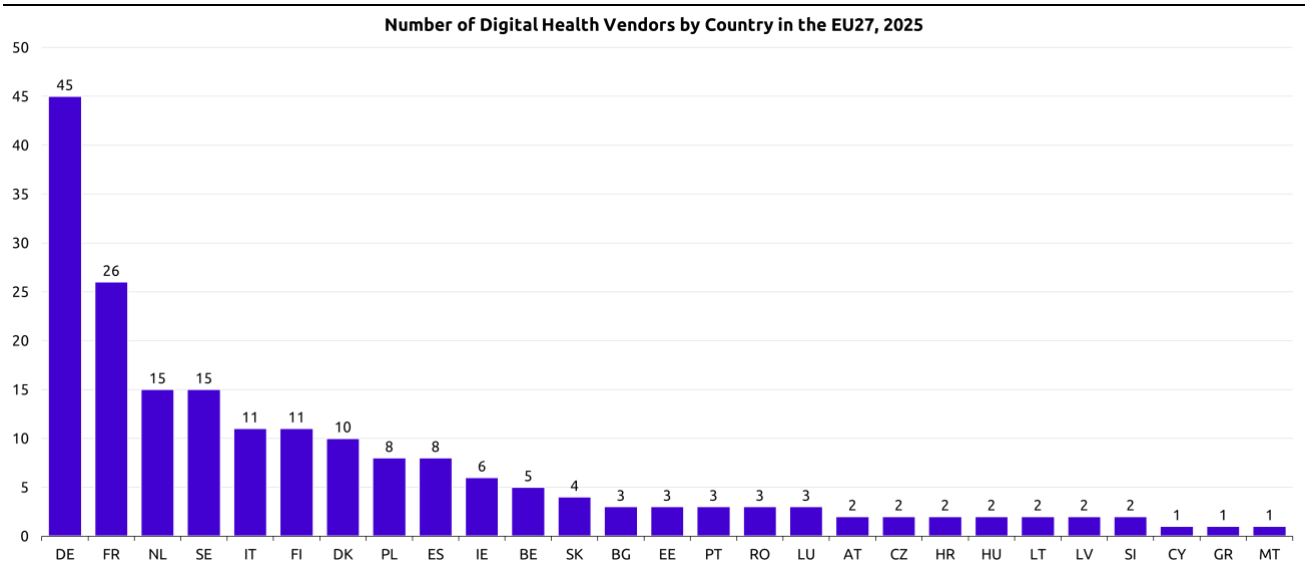


Figure 10: Number of Digital Health Vendors by EU27 Country (2025)

Source: Consortium's data elaboration and analysis, March 2025[27]

Building on the previous graph's insight into country-level distribution, **Figure 11** sheds light on the technological focus of EU27 vendors - based on the technology categories defined in **Annex A1** revealing a

[27] All 27 EU Member States are represented with at least one identified vendor. However, due to limitations in the granularity and classification accuracy of the source databases (see Market Mapping and Segmentation– Methodology and Definitions Overview section above), certain countries may be underrepresented in the final dataset.

concentration in traditional health IT systems. Most EU27 vendors (67%) are active in health data management, diagnostic, and therapeutic workflow management systems. A further 18% focus on health administrative and operational information management systems. Portfolios that include emerging digital health technologies account for 7%, while trust-enabling technologies (such as privacy and cybersecurity) represent 6%. Digital technologies for genomics are present in 2% of vendor portfolios. This classification offers a structured view of vendor portfolio orientation and serves as a basis for analysing the distribution of technology capabilities across the EU27 and it highlights a broader trend: Europe's digital health sector seems more focused on operational and core systems modernisation than frontier innovation.

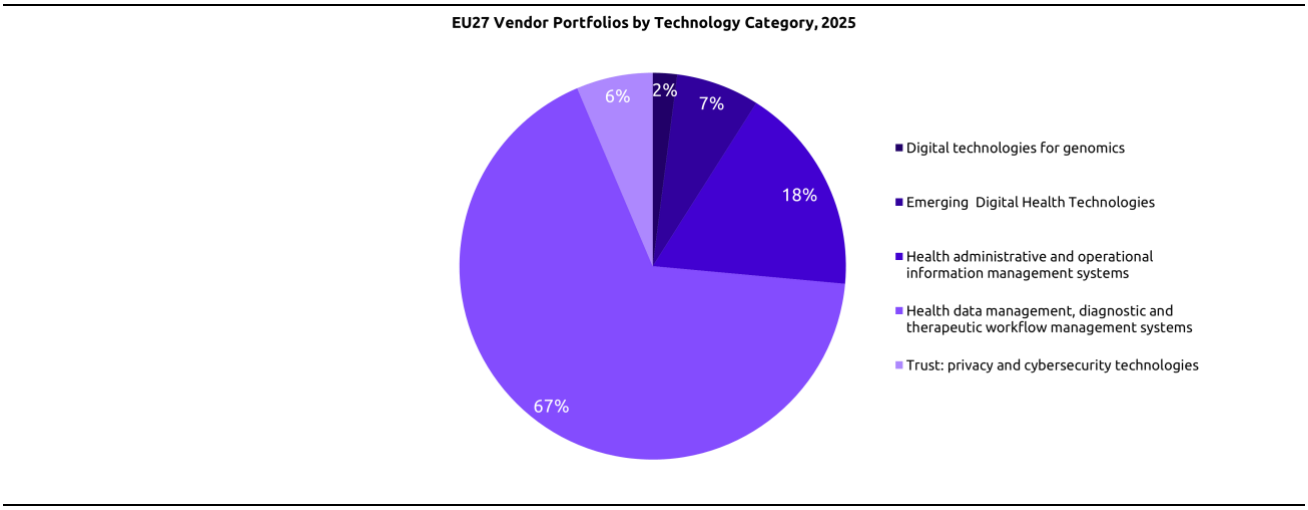


Figure 11: Distribution of EU27 Vendor Portfolios by Technology Category (2025)

Source: Consortium's data elaboration and analysis, March 2025

Figure 12 shifts the focus from portfolio categories to the specific technologies (as defined in **Annex A1**) most frequently found in EU27 vendor offerings in 2025. This view disaggregates vendor portfolios by specific technologies, bypassing the intermediate subcategory layer defined in the methodological taxonomy. The most frequently represented technologies include medical imaging analytics and AI (30 vendors), EHRs (26), and health data platforms or analytics tools (26). Clinical workflow optimisation tools and AI-/GenAI-enabled clinical assistants are present in 23 vendor portfolios. Other commonly identified technologies include radiology information systems (PACS/RIS) and telehealth platforms (17 each), patient portals and front-end services (14), interoperability and health information exchange systems (13), clinical decision support systems (12) and patient appointment scheduling systems (11). This breakdown offers a more granular view of the functional capabilities prioritised within the EU27 vendor landscape.

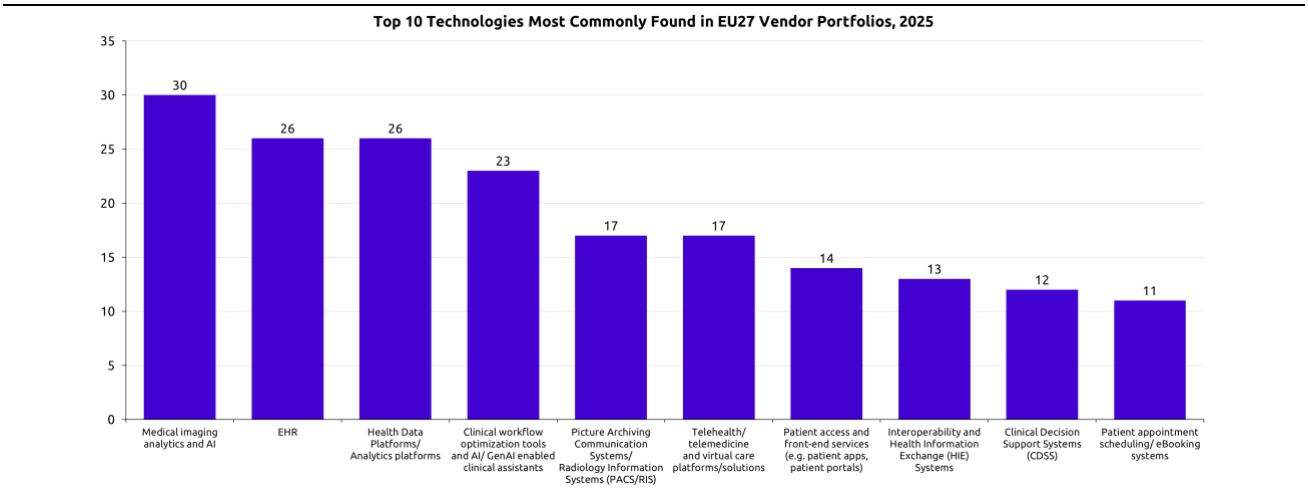


Figure 12: Top 10 Technologies Most Commonly Found in Vendor Portfolios in the EU27 (2025)

Note: Figures refer to number of vendors. Source: Consortium's data elaboration and analysis, March 2025

The next four figures present the distribution of vendor records across additional **healthcare-specific mapping dimensions**: "*Patient Care Value Chain*", "*Healthcare Providers Targeted*", "*End User*", and "*Medical Conditions Addressed*". These dimensions were refined and aggregated as part of the data cleaning process to improve consistency and enable meaningful analysis and visualization, as described in the Mapping methodology (see **Annex A2**). Solutions may be mapped to more than one category within each of the four dimensions, depending on their scope and functionality. For example, a diagnostic tool may also contribute to prevention or treatment, and a solution may target multiple user groups or provider types. As a result, the total number of records shown across the figures exceeds the number of unique vendor solutions.

While the first three dimensions provide relevant insights into how vendor solutions align with stages of the patient care pathway, provider types, and end-user groups, the "*Medical Conditions*" dimension should be interpreted with caution. The dataset contains only a limited number of entries with explicit condition targeting, and verification required manual review of product descriptions. Where this link could not be clearly established, the field was left blank – either because it was not applicable (as in the case of "*Trust: privacy and cybersecurity technologies*") or because the solution addressed multiple conditions or broad medical domains (e.g. EHRs).

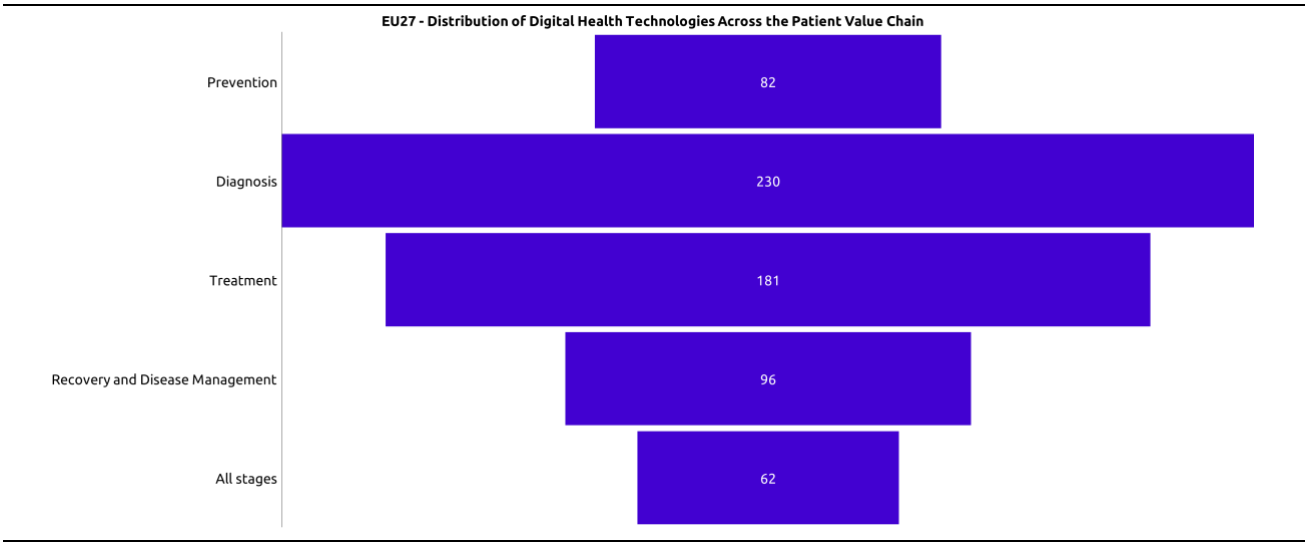


Figure 13: Number of Digital Health Technologies Offered in the EU27 by Stage of the Patient Care Value Chain (2025)

Source: Consortium's data elaboration and analysis, March 2025. Technologies may be counted in multiple categories if they serve more than one stage of the patient value chain. Therefore, the total number of technologies exceeds the number of unique solutions.

Figure 13 presents the distribution of digital health technologies developed by EU27 vendors across the patient value chain. The largest concentration of solutions is found in the diagnosis stage (230), indicating a strong emphasis on supporting clinical evaluation and decision-making processes. This is followed by treatment (181), reflecting the development of tools that aid in therapeutic interventions and care delivery. Technologies supporting recovery and disease management (96) and prevention (82) are less prevalent but still represent important areas of activity. A smaller number of solutions (62) are designed to address all stages of the care pathway. The data highlights the **dominant role of diagnostic and treatment-focused technologies** within the EU27 vendor landscape.

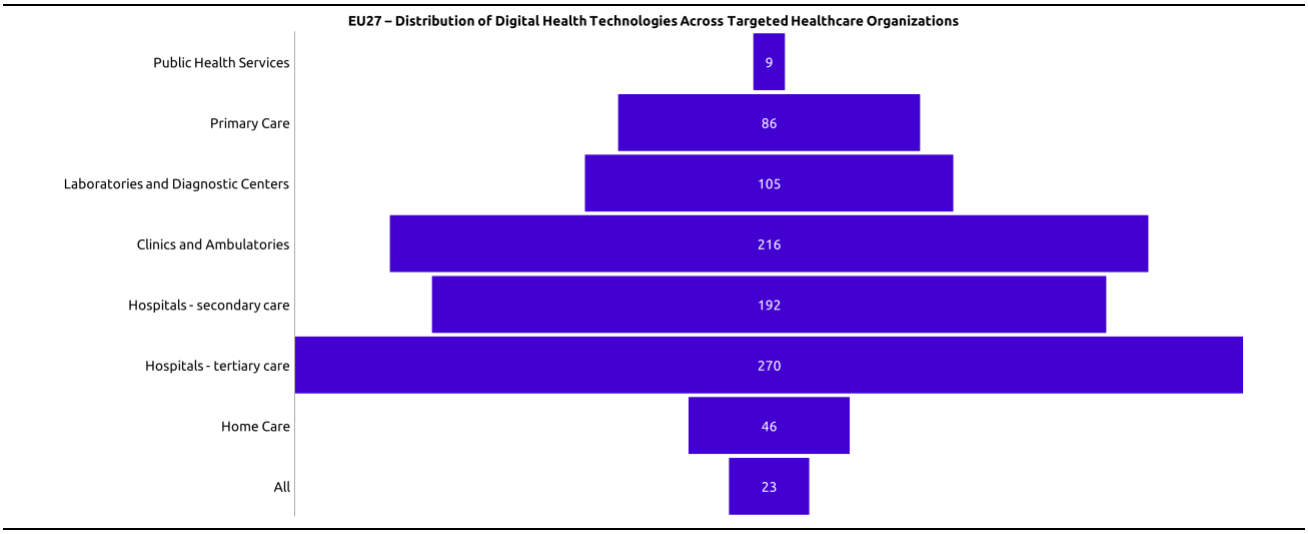


Figure 14: Number of Digital Health Technologies Offered in the EU27 by Targeted Healthcare Organisations

Source: Consortium's data elaboration and analysis, March 2025. Technologies may be counted in multiple categories, as many solutions are designed to support various types of healthcare organizations and settings. Therefore, the total number of technologies exceeds the number of unique solutions.

Figure 14 presents the distribution of digital health technologies developed by EU27 vendors based on the type of healthcare organisation they are designed to support. Most solutions target tertiary care hospitals (270) and clinics and ambulatories (216), indicating a **strong focus on specialist (hospital-tertiary care) and outpatient care environments**. A significant number also address secondary care hospitals (192) and laboratories and diagnostic centres (105), reflecting the **high share of solutions geared toward clinical workflows and diagnostic infrastructure**. Fewer technologies are directed at primary care settings (86) and home care (46), while public health services (9) are the least represented. A small group of solutions (23) are designed for use across all healthcare settings. Taken together **Figure 13** and **Figure 14** offer complementary perspectives on the focus of EU27 vendor solutions, indicate that **vendor activity is concentrated in hospital-based care, aligned with core clinical functions**.

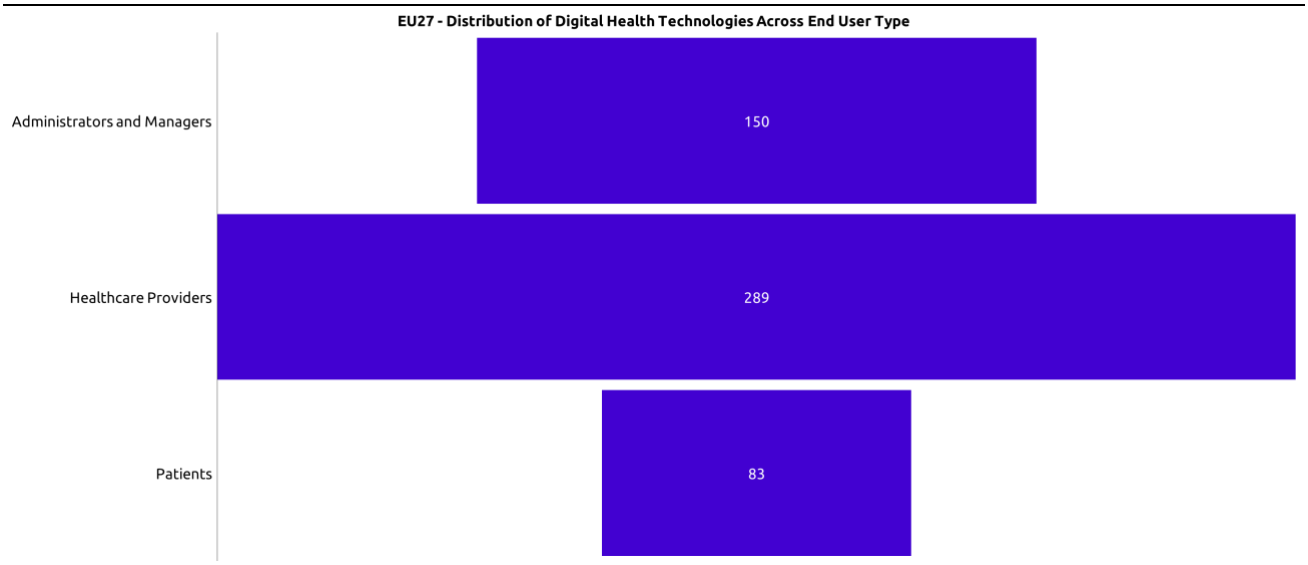


Figure 15: Number of Digital Health Technologies Offered in the EU27 by End User Group

Source: Consortium's data elaboration and analysis, March 2025. Technologies may be counted in multiple categories if they serve more than one type of end user simultaneously — for example, a remote patient monitoring device used by both patients and healthcare providers at the same time. Therefore, the total number of technologies exceeds the number of unique solutions.

Figure 15 presents the distribution of digital health technologies based on the primary end users they are designed to serve. The largest share of solutions **targets healthcare providers** (289), underscoring the **predominance of technologies that support clinical workflows, diagnostics, and care delivery**. A substantial number of solutions also address the needs of administrators and managers (150), particularly in relation to system operations, planning, and data governance. By comparison, only 83 solutions are recorded as targeting patients directly. However, this figure should be interpreted with caution, as the dataset may not fully capture all patient-facing functionalities, particularly in cases where the end user is not explicitly stated or where solutions are designed for multi-user contexts. The distribution nonetheless reflects a continued emphasis on institutional users within the EU27 digital health landscape.

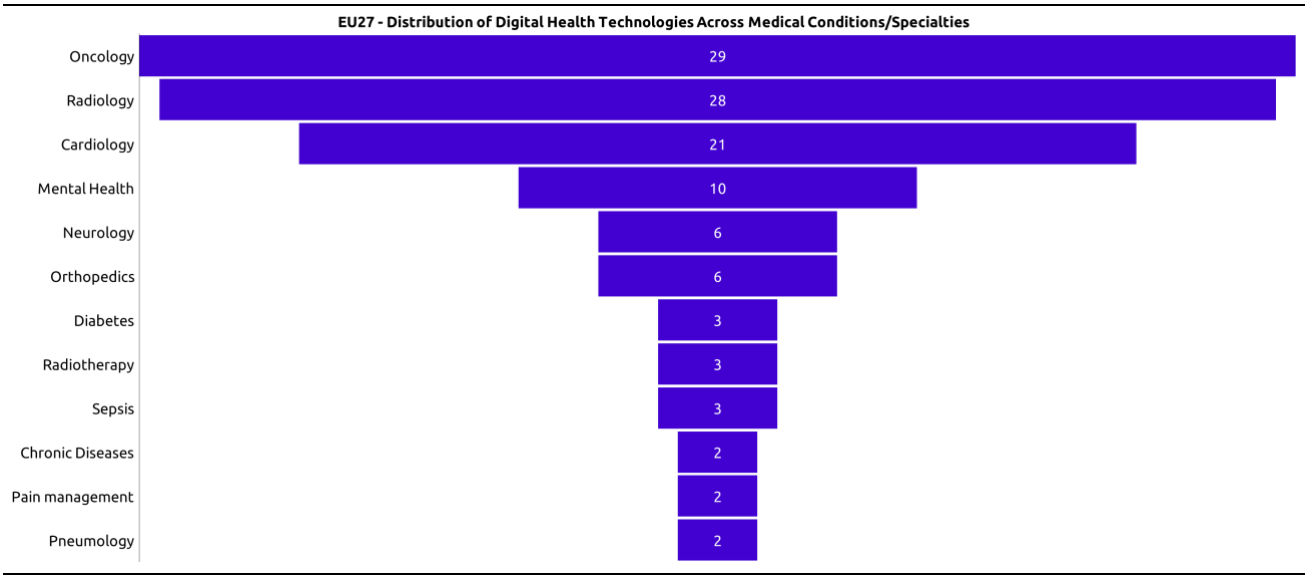


Figure 16: Number of Digital Health Technologies Offered in the EU27 by Medical Condition or Specialty

Source: Consortium's data elaboration and analysis, March 2025. Technologies may be counted in multiple categories if they serve more than one type of end user simultaneously — for example, a remote patient monitoring device used by both patients and healthcare providers at the same time. Therefore, the total number of technologies exceeds the number of unique solutions.

Figure 16 shows the distribution of digital health technologies developed by EU27 vendors that are explicitly associated with a specific medical condition or clinical specialty. The highest number of solutions target oncology (29), radiology (28), and cardiology (21), followed by smaller numbers addressing mental health (10), neurology (6), orthopaedics (6), and other conditions such as diabetes, radiotherapy, and chronic diseases. This figure complements the analysis in **Figure 13** by illustrating not only which **stages of the care pathway digital health technologies support, but also the specific clinical domains** where they are more frequently developed. For instance, the **prominence of oncology and cardiovascular-related technologies aligns with the strong concentration of solutions in the diagnosis stage**, where imaging, monitoring, and early detection tools are often prioritised. However, this data should be interpreted with caution. The field was populated only when a clear association between a solution and a medical condition could be established, resulting in a more limited subset of entries for this dimension.

4.1.3 Digital Health market mapping – insights on strategic dependencies

The market mapping enables a qualitative and illustrative analysis of non-EU27[28] vendors commercially active in the EU27 digital health market, revealing potential strategic dependencies that warrant closer monitoring. Based on the Consortium team's market knowledge and best-effort verification of publicly available sources (primarily vendor websites), 91 companies headquartered outside the EU27 were identified as offering digital health technologies in the 27 Member States. This identification relied on observable indicators of commercial activity (e.g. website language, maps showing geographic presence, or references to EU clients), which may not fully reflect the actual scope of a vendor's operations, as many companies do not clearly disclose the geographies in which their solutions are actively marketed, sold, or deployed.

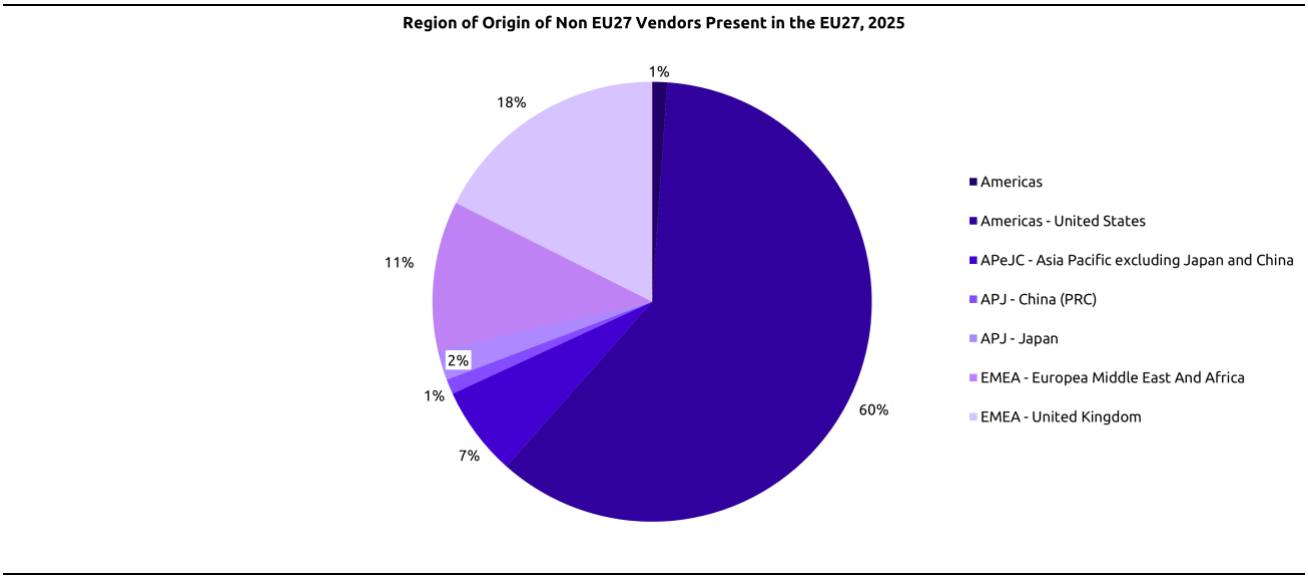


Figure 17: Geographic Origin of Non-EU27 Vendors Active in the EU27 Digital Health Market (2025)

Source: Consortium's data elaboration and analysis, March 2025.

These vendors were found to offer a total of 175 distinct technologies, spanning a broad range of categories. As shown in **Figure 17**, the majority originate from the United States (60%), followed by the United Kingdom (18%) and Japan (11%). This regional distribution reflects a strong transatlantic and Anglosphere orientation in the EU27 vendor landscape, underscoring the influence of external innovation ecosystems, particularly those in the United States, in shaping technology availability and adoption within the EU27 market.

[28] For the countries included in the non-EU27 vendor clusters refer to Annex A2

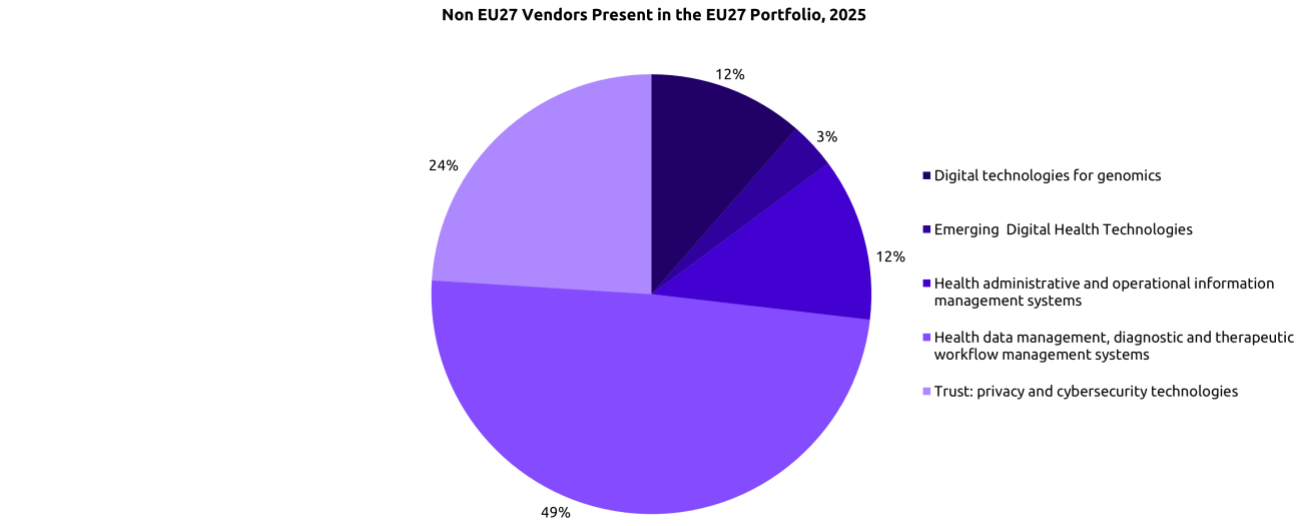


Figure 18: Technology Portfolio Distribution of Non-EU27 Vendors Operating in the EU27 (2025)

Source: Consortium's data elaboration and analysis, March 2025.

The technology portfolios of non-EU27 vendors in **Figure 18** reveal a strong focus on health data management and technologies for cybersecurity and compliance. Nearly half (49%) of all solutions relate to health data management, diagnostic and therapeutic workflow systems, but a significant portion (24%) addresses trust technologies such as privacy, cybersecurity, and digital infrastructure resilience. Additional contributions include administrative platforms (12%), emerging digital health technologies (3%), and genomics tools (12%). The data suggest that non-EU actors may play a large role in segments critical to the EU's digital health transition, particularly in enabling secure, interoperable, and data-centric healthcare systems.

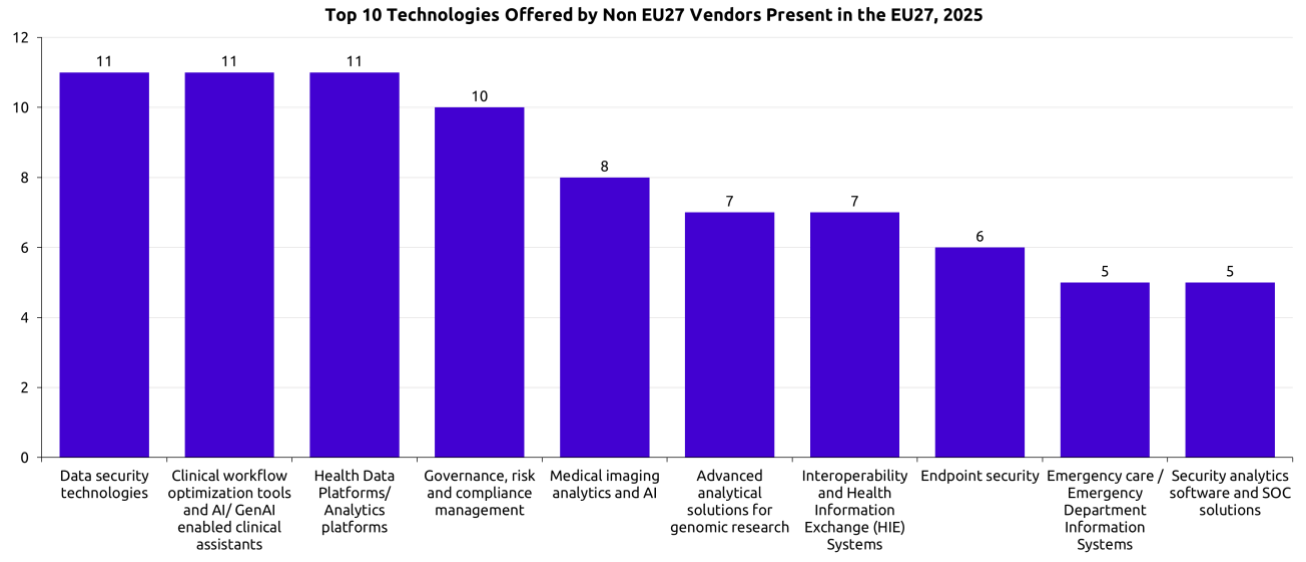


Figure 19: Top 10 Technologies Offered in the EU27 by Non-EU27 Vendors (2025), number of vendors

Source: Consortium's data elaboration and analysis, March 2025.

Figure 19 reinforces this insight. Among the ten most frequently offered technologies by non-EU27 vendors, commercially present in the European Union are **data security**, **governance and compliance platforms**, **endpoint protection**, and **software supply chain security and risk management**. These four technologies fall within the **trust category**, which encompasses cross-cutting digital infrastructure designed for general application across sectors (including finance, government, and industry) not healthcare specifically. Their

presence in the digital health domain reflects the **strength of non-EU IT and cybersecurity firms in providing essential building blocks for digital trust**. Notably, the market mapping reveals that **no EU27-headquartered vendor currently offers software supply chain security and risk management solutions**, pointing to a critical dependency in a high-risk and increasingly strategic domain. Two additional technologies, **AI-/GenAI-enabled clinical assistants** and **health data platforms and analytics tools,** also appear frequently and belong to health data management category. Their presence further illustrates the role of non-EU vendors in supporting advanced analytics and decision-support capabilities within EU healthcare environments.

While the analysis is based on limited data and anecdotal evidence, constrained by the availability and transparency of publicly disclosed information, the findings nonetheless highlight the importance of systematically monitoring geopolitical and technological dependencies in the digital health sector. The **anecdotal evidence suggests a growing reliance on non-EU vendors in several foundational areas,** including **cybersecurity**, clinical AI, and compliance infrastructure, **as well as in increasingly strategic domains** such as **digital solutions for genomics** and other emerging technologies. These trends carry **important implications for the EU's long-term capacity to ensure secure, sovereign, and resilient digital health ecosystems**. As such, they can inform ongoing discussions around strategic autonomy, regulatory alignment, industrial investment, and innovation policy at both EU and Member State levels.

4.2 Strategic and market dynamics of digital health vendors in the EU

This section provides an in-depth analysis of the strategic and market dynamics shaping the digital health vendor landscape across the European Union. It draws on findings from the study's dedicated survey of 70 European digital health technology companies, complemented by insights from expert interviews. The analysis explores how vendors are navigating a rapidly evolving ecosystem characterised by technological innovation, regulatory transformation, and systemic fragmentation. The findings span a wide range of strategic dimensions, including market presence, growth priorities, R&D investment, revenue models, regulatory compliance, cybersecurity, resilience, partnerships, and talent acquisition. Collectively, these insights offer a comprehensive view of how digital health vendors are positioning themselves to scale, compete, and respond to the shifting demands of Europe's healthcare systems.

By identifying both the emerging opportunities and the persistent structural challenges facing these innovators, this section provides actionable evidence to support EU and Member State policy efforts aimed at reinforcing the digital health ecosystem, through smarter regulation, targeted investment, enhanced interoperability, and stronger cross-sector collaboration.

European Union Strategic and Market Dynamic Analysis Key Takeaways

- **Vendor Footprint:** Most EU digital health vendors have a national or regional footprint; only 11% report customers outside Europe. A handful in France and Northern Europe have begun to branch out, but cross border expansion remains the exception, underscoring how national procurement rules and market heterogeneity keep the ecosystem highly localised. Expansion outside the EU is limited, with under 2% identifying the US, Canada, or Asia-Pacific as growth priorities.
- **Growth Outlook:** EU digital health vendors are cautiously optimistic: while 46% anticipate moderate growth within the EU, 31% remain uncertain, and only 10% foresee strong expansion. This tempered outlook reflects concerns over regulatory burdens, high compliance costs, and fragmented reimbursement pathways, which continue to hinder broader market potential despite promising opportunities.
- **Strategic Focus and Differentiation:** EU digital health vendors compete by focusing on specialised niches (50%), investing in AI/ML (46%), and forming clinical partnerships (49%). Innovation remains central, with 52% emphasising product development. However, alignment with broader health goals is limited: only 26% address population health priorities, 14% prioritise clinical validation, 17% focus on patient-centred design, and just 13% adopt value-based pricing, highlighting a gap between vendor strategies and outcomes-driven, user-focused care models.
- **Innovation and Emerging Technologies:** 32% of EU digital health vendors invest over 20% of their budget in R&D, prioritising patient outcomes (51%) and operational efficiency (46%). Key innovation drivers also include regulatory compliance (41%) and interoperability (34%). AI/ML (23%) and Generative AI (20%) lead emerging tech adoption, followed by robotics (27%) and biosensors (23%), seen as practical extensions of current solutions. Investment in frontier technologies like AR/VR, 3D printing, and digital twins remains limited and exploratory.
- **Revenue Models:** Enterprise style licences (46%) and tiered pricing (47%) continue to dominate amongst EU digital health vendors. Advisory and implementation services (41%) are a vital income stream, reflecting the need for heavy localisation and integration work in fragmented health systems. Subscription (33%) and outcomes-based models (37%) are emerging but not yet dominant.
- **Partnership and Ecosystem Dynamics:** For EU digital health vendors, collaboration with hospitals (51%), tech firms (44%), and life sciences companies (41%) is key to clinical validation and product development. However, limited engagement with academia (31%), regulators (20%), patient groups (7%), and investors (4%) highlights missed opportunities to strengthen evidence generation, system integration, and user-centred design.
- **Regulatory Strategies:** EU digital health vendors face significant regulatory pressures: 40% cite MDR/IVDR and 37% GDPR as major burdens, with EHDS and AI Act requirements rising. While most rely on in-house compliance teams (51%) and external advisors (46%), engagement with regulators is limited (13% national, 7% EU).
- **Patient Engagement and Accessibility:** User-centred design and inclusive interfaces (53%) are gaining momentum, yet genuine co-creation with patients is the exception rather than the rule. Limited feedback loops and sparse educational support risk undermining adoption, echoing patient-association concerns that solutions are often built for patients, not with them.
- **Cybersecurity and Talent Pressures:** Cybersecurity threats (51%) and legacy infrastructure (44%) add to cost burdens and constrain vendors' ability to maintain robust resilience. At the same time, competition for skilled talent remains intense, particularly in cybersecurity and data science.
- **Resilience efforts underway, but gaps remain**: 46% invest in internal R&D to reduce supplier dependency; only 20% apply data sovereignty measures and just 13% use open standards, despite EU policy emphasis on digital autonomy.

4.2.1 European Digital Heath vendors market presence

The vendor survey provides valuable insights into the current market footprint and strategic growth ambitions of EU-based digital health vendors. Results show that **most vendors have a highly localised customer base**, primarily concentrated in their country of headquarters (**Figure 20**). This suggests a predominantly regionalised ecosystem, where a "**home market first" strategy** prevails and cross-border expansion, even within the EU's internal market, remains limited. Pan-European vendors appear to be the exception rather than the rule.

Only vendors based in France and Northern Europe report serving somewhat diversified regions, while data from other regions indicates limited cross-border scalability and weak economies of scale. This fragmentation undermines the development of a truly integrated EU single market for digital health. Global presence is also minimal: aside from 11% of Spanish vendors reporting customers in the US, Canada, or Latin America, no vendor group reported active clients in Asia, Africa, or the Middle East.

Although sample size limitations should be considered, the findings reveal a very limited international commercial presence among EU digital health vendors, possibly indicating marginal global competitiveness.

Strategic growth intentions further reflect this **inward focus** (**Figure 21**). Fewer than 2% of vendors cite the US, Canada, Asia-Pacific, or the Middle East as current or future priority markets. The UK (6%) and other non-EU European countries (4%) show limited customer engagement, though 16% and 11% of vendors, respectively, identify them as growth priorities. This points to a **latent interest in expansion** beyond EU borders, particularly into the UK and neighbouring non-EU countries, **but actual market penetration remains low**.

These patterns are consistent with the operational challenges reported by vendors within the EU (see **Figure 7** in Analysis of European Digital Health Market Drivers and Barriers section). **Regulatory barriers and compliance complexity**, coupled with **market fragmentation** and **significant entry costs**, collectively **discourage cross-border expansion** and reinforce the siloed, country-specific nature of digital health vendors' market presence. **Interoperability issues** further compound these challenges, as inconsistent data standards and technical requirements make cross-country deployment costly and resource intensive. Finally, as also emerging from executive interviews, economic pressures, such as **margin constraints and misaligned reimbursement models**, may also lead many vendors to hesitate in pursuing international growth without clearer return on investment prospects and more stable, predictable funding conditions.

The survey results reveal a digital health vendor landscape in Europe that is strong at the national level, but cautious in both cross-EU and global expansion. This underscores the need for a dual-track strategy: **strengthening the internal market through regulatory harmonisation**, while **supporting global growth via targeted regulatory alignment, strategic partnerships, and financial incentives.**

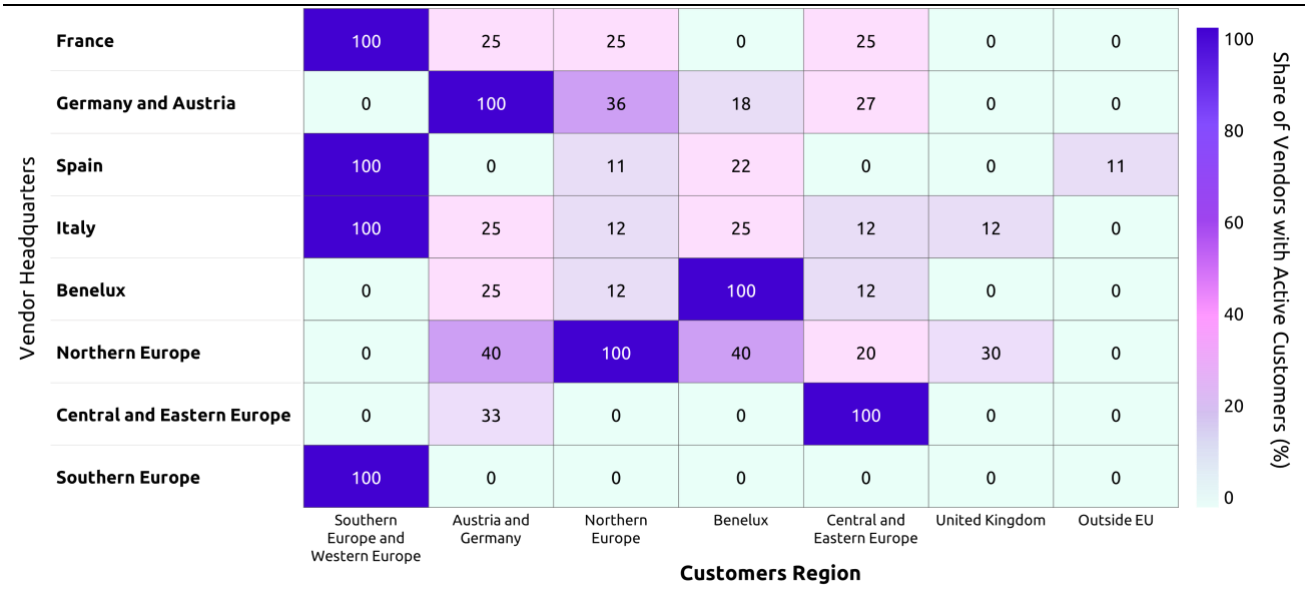


Figure 20: Cross regional customer base of EU Digital Health Vendors

Study: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. In which regions of the EU and beyond does your company currently have active customers? And Q. Where are your company's headquarters located?

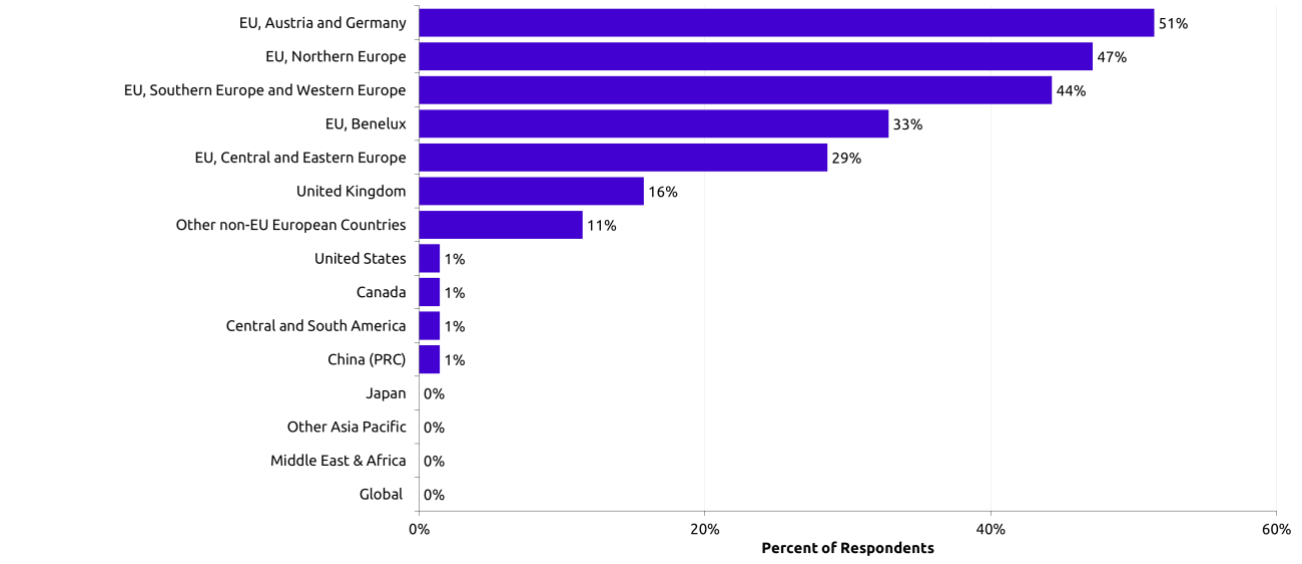


Figure 21: Digital Health Companies Strategic Regional Growth

Study: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. Which regions/countries are your top priorities for market growth?

Anecdotal Trends in Transatlantic Expansion of EU Digital Health Start-Ups

Anecdotal evidence from the vendor Mapping Exercise (see Section Digital Health market mapping and) of this report focusing on 25 EU27-headquartered companies active in three frontier and emerging digital health technologies, namely Digital Therapeutics (DTx), Virtual Human Twins, and AI-powered diagnostic tools, suggests a growing trend of strategic expansion beyond the EU27. Among these, two technologies are developed by large multinationals (10,000+ employees; revenues exceeding €1 billion), and one by a mid-sized multinational (1,000+ employees; over €100 million in revenue). The remaining 22 are small and medium-sized enterprises (SMEs), typically with fewer than 500 employees and under €50 million in revenue. They are, to be more precise a mix of start-ups and scale-ups as defined in the Annex A2 - Methodology for Market Mapping and Segmentation.

Of these 22 SMEs, eight currently show no discernible commercial or operational footprint outside the EU27. One additional company has only limited indications of extra-EU market activity. However, 13 companies have established offices in the United Kingdom or, more frequently, the United States. Many of these firms have secured regulatory certifications such as Health Insurance Portability and Accountability Act (HIPAA) compliance, FDA 510(k) clearance, or Breakthrough Device designation, while press releases frequently highlight partnerships with U.S. payers and providers. In one notable case, a company was acquired by a global pharmaceutical group, significantly expanding its international market reach.

While these findings are anecdotal, they are broadly consistent with the patterns identified in the financial trends analysis in this section (please refer to Financial trends analysis -results). The analysis highlights a pronounced disparity in digital health investment flows, with the EU27 significantly trailing the U.S. in both deal volume and aggregate capital. Furthermore, as corroborated by qualitative insights from a leading Healthtech industry association (see Annex B), the U.S. is widely seen as a more favourable environment for digital health innovation and products' first launch. Key advantages include faster regulatory clearance pathways, deeper venture capital ecosystems, and greater commercial traction with private insurers and provider networks. These observations were also corroborated during the expert interview with representatives of a MedTech association, who highlighted that greater availability of investment capital, and more uniform market access conditions make the United States a more favourable environment for launching new digital health medical devices.

Taken together, these observations underscore the structural challenges facing EU-based digital health innovators in scaling their operations within the Single Market. The observed pattern of transatlantic expansion reflects not only a search for growth capital but also a response to persistent differences in regulatory agility, investment availability, and innovation adoption readiness. While the current analysis is not statistically representative, it offers qualitative support for the broader conclusion that the EU ecosystem, while dynamic, remains constrained by systemic factors that may limit its ability to retain and scale high-potential digital health ventures.

4.2.2Market outlook and strategic sentiment

Survey responses (**Figure 22**) reveal a **carefully optimistic outlook** among digital health vendors operating within the EU. While 10% expect strong growth and potential market leadership, 46% anticipate moderate to cautious growth over the next four years. However, 31% express neutral or uncertain expectations, suggesting a market rich in opportunity but still constrained by the barriers outlined in **Figure 7**[29] as well as the volatility of global dynamics.

Outside the EU, vendor sentiment is marked by greater uncertainty, though not necessarily pessimism. Among the smaller subset of vendors active in non-EU markets, 46% report a neutral outlook, and only 8% foresee significant challenges. This indicates that global expansion is limited not due to perceived hostility,

[29] In the vendors survey rrespondents particularly highlighted key barriers such as regulatory complexity, lack of interoperability and standardisation, margin pressures, and market entry obstacles created by incumbent players

but rather unfamiliarity. **Non-EU markets are viewed as less explored, not inherently more difficult.** Vendors recognise their potential but remain cautious due to uncertainties around regulation, and market access.

Consequently, the **EU remains the primary arena for near-term growth**. However, its complexity and fragmentation continue to present challenges. Turning cautious optimism into sustainable expansion will require coordinated policy interventions, particularly in the areas of regulatory harmonisation, investment predictability, and coherent digital infrastructure development.

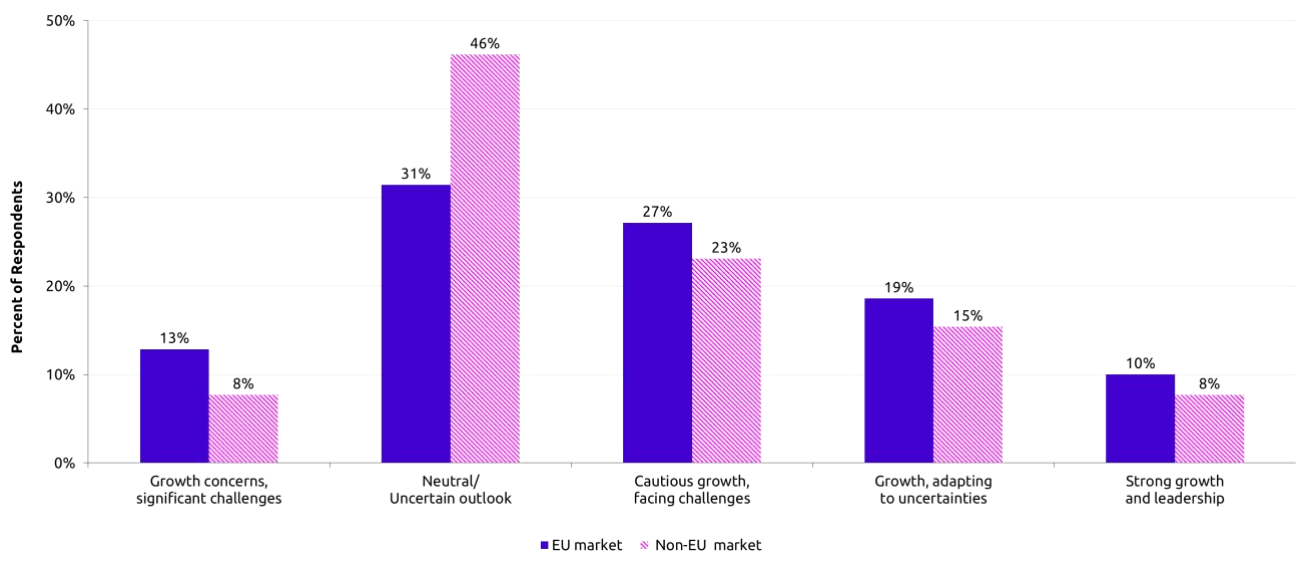


Figure 22: Market outlook and sentiment

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70. Note: Data for Non-EU market has a low base size, as this question was asked only to vendors that said they are operating outside the EU. Q. What is your organisation's overall outlook for the next four years in both the EU and the broader non-EU digital health markets, if applicable?

4.2.3Strategic focus of EU Digital Health vendors

Survey results (**Figure 23**) indicate that EU digital health vendors are adopting varied yet targeted and innovation-led strategies to drive sustainable growth over the next four years.

Half of the respondents (50%) **prioritise market leadership within a specific niche**, signalling a strategic shift toward specialised, high-value solutions. In parallel, 46% are **investing in AI/ML and other emerging technologies**, improving their positioning in the advanced digital health applications space.

While specialisation dominates, 39% of vendors continue to focus on **building comprehensive digital health portfolios** – suggesting that **platform-based models and integrated end-to-end offerings** remain important for market competitiveness. Additionally, 30% highlight geographic or segmental expansion as a growth priority, revealing latent ambition for cross-border scaling – despite such ambitions currently being constrained, as previously discussed.

Aligning growth strategies with critical healthcare needs (such as chronic disease, aging, and equitable access to services) **appears to be a lower priority compared to technology-driven ambitions**, with only 26% of vendors focusing on it. Even lower emphasis is placed on clinical validation (14%), operational efficiency (10%), and mergers and acquisitions (3%). This points to a vendor landscape where scaling and evidence generation are not yet central strategic levers.

Overall, the data suggest a clear opportunity for **EU policy to play a more active role in steering vendor innovation towards population health priorities** and promoting outcomes-based, evidence-driven digital health development.

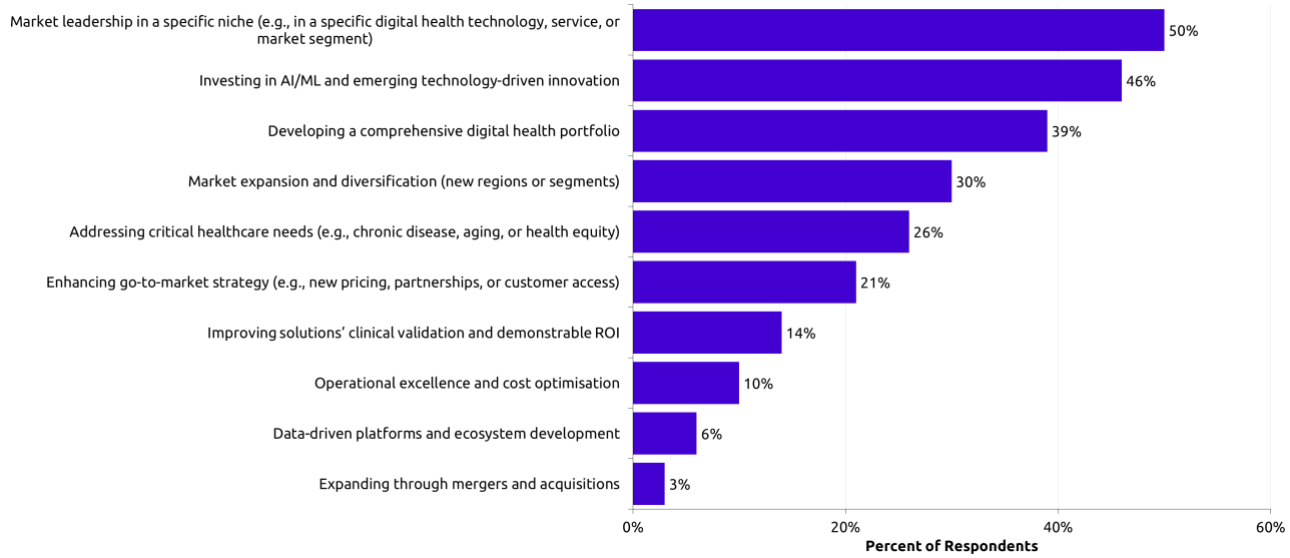


Figure 23: Vendors Priorities for Growth

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70. Q. What are your organisation's primary strategic focuses for achieving strong and sustainable growth over the next four years?

4.2.4Competitive positioning and differentiation strategies

EU digital health vendors are pursuing competitive differentiation through a mix of product innovation, strategic partnerships, and local adaptation (**Figure 24**). Over half of the respondents cite product innovation and investment as their primary competitive lever, reflecting a **focus on technological distinctiveness and first-mover advantage**. This is closely followed by strategic partnerships with healthcare organisations (49%), underscoring the importance of **co-development and clinical integration** for market penetration and trust-building within the European context.

The operational imperative to navigate diverse regulatory environments and adapt to fragmented health systems across EU Member States is once again underscored by the 41% of respondents who prioritise solution customisation to local needs.

While data-driven approaches (37%) and a focus on clinician experience (31%) are emerging as relevant strategies, patient-centred design (17%) and value-based pricing models (13%) remain significantly underutilised. The **growing emphasis on analytics and clinician-focused innovation** is a positive development that can support adoption; however, the **limited attention to patient-centred design** risks undermining long-term engagement, especially in areas such as chronic disease management and preventive care. Moreover, it is noteworthy that, despite increasing policy emphasis, outcomes-based payment models have yet to gain meaningful traction in vendor strategies[30].

These findings highlight an opportunity for public authorities to reinforce initiatives supporting real-world evidence (RWE) platforms that can underpin value-based care models. They also underscore the need to advance a European framework for human-centred design in digital health by incentivising the inclusion of

[30] Outcomes-based payment models refer to reimbursement or funding mechanisms in which payment is contingent on the achievement of specific, measurable health outcomes in real-world use, rather than being based solely on product purchase or usage volume. These models shift the focus from paying for a product (e.g., a wearable device or digital platform) to paying for the value it delivers (e.g., improved patient adherence, reduced hospital admissions, or better disease management). In these models manufacturers or technology vendors may share financial risk with payers (e.g., public insurers, hospitals) by agreeing to reduced or delayed payments unless agreed-upon health outcomes are achieved. These models rely heavily on the ability to collect, track, analyse and validate real-world evidence. They also necessitate updated frameworks to assess and certify digital solutions not only for safety and performance but also for clinical and economic outcome.

user experience (UX) testing, patient involvement, and clinician feedback in public procurement processes and innovation funding calls.

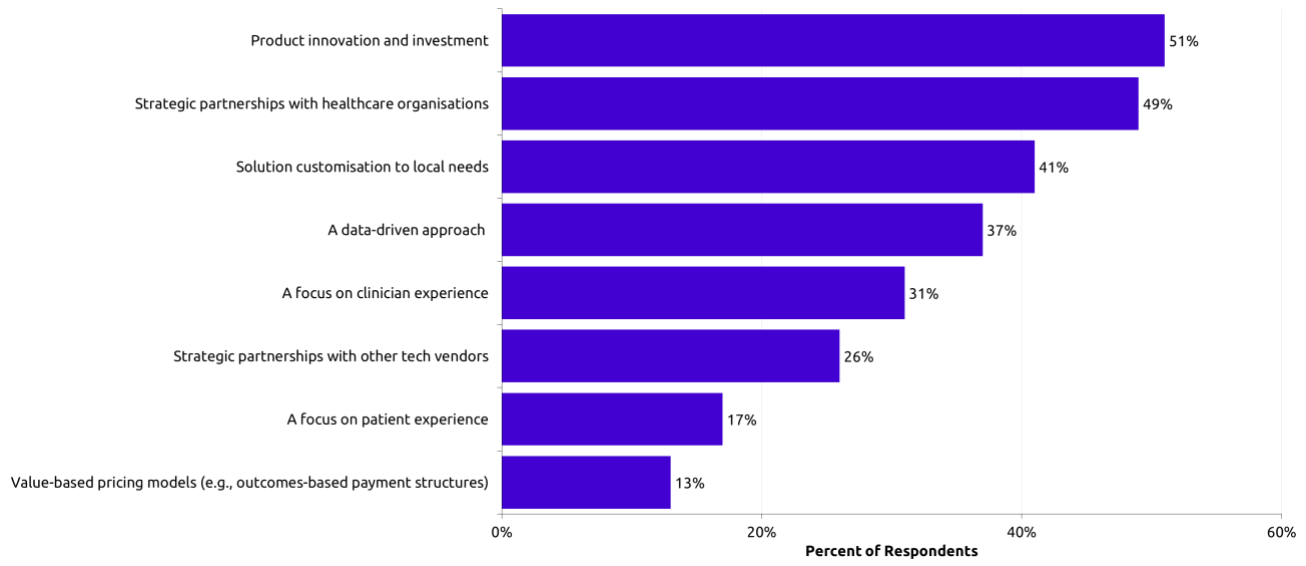


Figure 24: Competitive and Differentiation Strategies

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70. What are your organisation's key competition and differentiation strategies for achieving success in the digital health market?

4.2.5R&D allocation and investment priorities

EU digital health vendors are pursuing a measured yet purposeful approach to innovation, as evidenced by survey responses on R&D investment strategies. While 32% of vendors (particularly larger companies and medical device firms) invest over 20% of their budget in R&D, the majority allocate between 6% and 20%. These investment levels are broadly in line with those seen across the wider software and IT services sectors[31], reflecting a **balanced but strategic commitment to innovation** (**Figure 25**). R&D priorities show **encouraging alignment with healthcare system needs** (**Figure 26**): 51% of vendors focus on improving patient outcomes and experience, and 46% target operational efficiency. This reflects a positive convergence with provider priorities and growing recognition of end-user experience as a key competitive differentiator in digital health - an area historically underleveraged.

Compliance with evolving regulatory frameworks and the push for technical standardisation are also shaping R&D agendas. Forty-one percent of vendors are investing in alignment with major EU regulations, including GDPR, the EHDS, and the AI Act, while 34% are focusing on enhancing interoperability and seamless data integration across systems.

These findings highlight the importance of continuing to strengthen R&D efforts that prioritise health outcomes, regulatory compliance, and standards-based integration, ensuring digital health innovation is both patient-centred and ready for system-wide adoption.

[31] See for example: BCG's Solving Software's R&D Conundrum

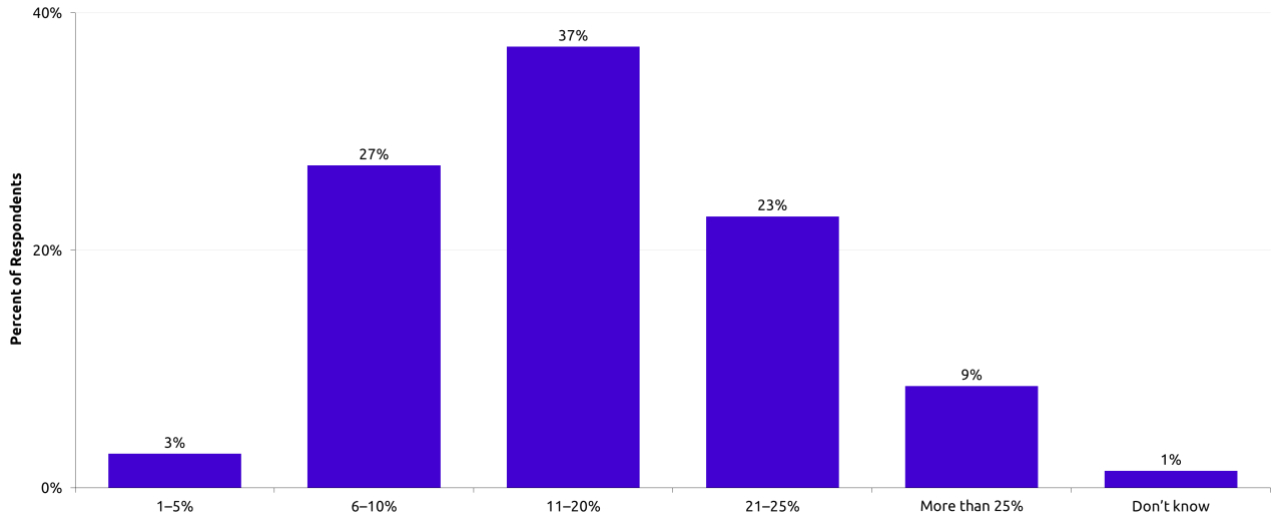


Figure 25: R&D Budgets

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70. Q. What percentage of your organisation's budget is allocated to R&D?

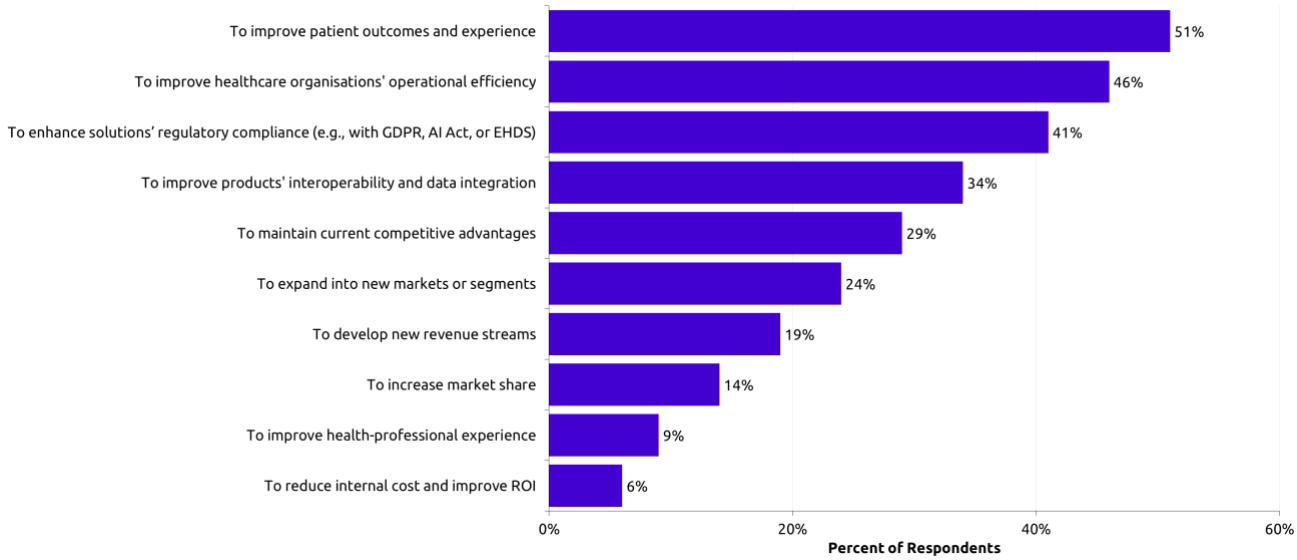


Figure 26: R&D Objectives

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. What are the primary business objectives driving your company's R&D investments?

4.2.6Revenue models and strategies

EU digital health vendors interviewed (**Figure 27**) rely primarily on **traditional product-centric revenue structure and enterprise pricing models**, with 47% identifying tiered pricing based on customer size or geography, and 46% citing one-time licensing fees as their highest revenue-generating strategies. This reflects a market where institutional procurement and upfront capital expenditure remain the norm, particularly in public healthcare systems with generally longer purchasing cycles.

A significant proportion of vendors (41%) generate **substantial revenue through consulting and implementation services, highlighting the operational reality that digital health solutions in Europe often require customised deployment, regulatory adaptation, and local integration**. This aligns with

broader findings on system fragmentation and reinforces the strategic importance of localisation. In the fragmented EU health systems landscape, vendor revenue is not solely driven by products, but by the ability to deliver tailored, compliant, and integrated implementations. While this business model adds complexity, it also reflects the high demand for local expertise and system-specific configuration.

Nevertheless, **emerging models are gaining traction**. Thirty-seven percent of vendors report revenue from **outcomes-based or risk-sharing models**, and 33% from **subscription-based pricing**, indicating that some companies are beginning to integrate value-based and recurring revenue strategies. These approaches are more closely aligned with healthcare providers' focus on continuous improvement and service innovation, as well as with the broader IT industry trend toward "as-a-service" business models. Freemium and pay-per-use models remain marginal, reinforcing the **predominance of enterprise and institutional sales** over consumer-focused approaches.

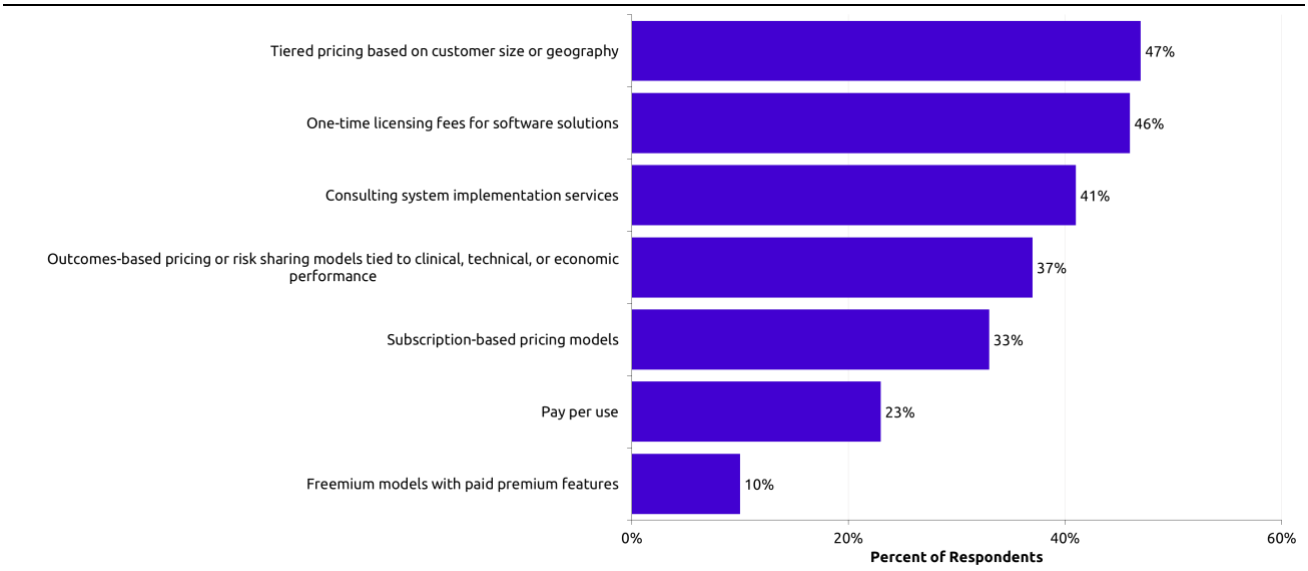


Figure 27: Revenue Streams and Pricing Strategies

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. Which revenue streams/pricing strategies generate the highest revenue for your organisation?

4.2.7 Patient engagement and accessibility strategies

When asked about strategies to improve patient engagement and accessibility, surveyed digital health vendors increasingly emphasise user-centred design and digital inclusivity (**Figure 28**). A majority (53%) prioritise intuitive, patient-centric interfaces, while 43% incorporate accessibility features to address the needs of diverse populations. In parallel, 47% identify data privacy and security as essential to building trust in digital health solutions.

Despite growing attention to design and safety, active patient involvement remains limited. Only 34% of vendors engage patients through feedback or co-development processes, and just 24% offer education or support tools to help users navigate digital solutions. Adoption of behavioural engagement strategies, such as gamification or rewards, is even lower, at 6%. This gap was also highlighted in expert interviews with patient associations, who emphasised that patient involvement is frequently overlooked. While companies often cite **the cost of involving patients early in the development process, they tend to underestimate the downstream consequences,** including lower adoption and adherence, the need to redesign features post-launch, or even product recalls related to patient safety issues, particularly with connected devices. These findings point to a recurring challenge: many digital health solutions are still developed *for* patients, but not *with* them.

In addition, only 21% of vendors report integrating their tools with existing patient workflows, and just 14% prioritise collaboration with providers to support engagement. These gaps highlight the need for stronger alignment between digital health tools and the realities of everyday care delivery. Strengthening co-creation practices, embedding support mechanisms, and ensuring workflow integration will be key to advancing inclusive, effective, and patient-empowering digital health solutions across Europe.

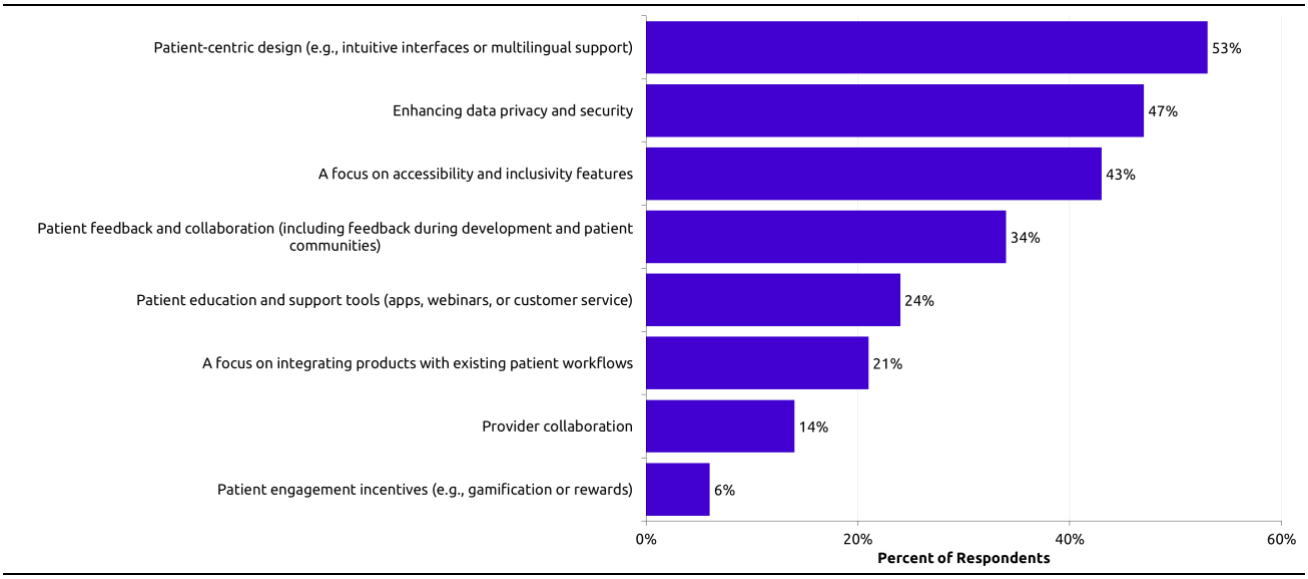


Figure 28: Patient Engagement and Accessibility Strategies

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. What are your organisation's top strategies for enhancing patient engagement and accessibility with its digital health solutions?

4.2.8 Optimising Digital Health value propositions through emerging technologies

EU digital health vendors are directing their technology investments toward more clinically actionable solutions (**Figure 29**). Robotics (27%) and advanced biosensors (23%), including wearable, ingestible, and implantable devices, are among the top areas of focus. The Internet of Things (IoT) platforms and technologies also represent a priority investment area for 19% of vendors, highlighting their role in enabling connected devices and the integration of sensor-generated data. These investment patterns reflect a strategic alignment with rising demand for precision medicine, remote monitoring, and connected health interventions, advancing the broader goals of personalised care and workflow optimisation across healthcare systems.

Artificial intelligence (AI) is emerging as a strategic investment priority among EU digital health vendors, with 23% investing in AI/ML and 20% in Generative AI. This reflects growing interest in both traditional algorithms and newer language-based models, supporting a range of clinical and operational applications. The level of investment confirms that AI is rapidly moving up the innovation agenda; however, its safe and effective integration will depend on the establishment of clear regulatory and ethical frameworks. Cybersecurity capabilities (21%) are also seen as critical enablers, reinforcing the importance of secure and interoperable infrastructures for managing sensitive health data. In contrast, technologies such as digital twins, augmented and virtual reality (AR/VR), 3D printing, and high-performance computing are attracting more limited, but targeted, investment, suggesting they remain in early-stage exploration rather than broader market adoption.

Technologies with longer time horizons, such as brain-computer interfaces, nanotechnology, drones, and quantum computing, are currently attracting minimal investment. This reflects a clear vendor preference for leveraging **more established solutions or those where the regulatory and commercial pathways are starting to be better defined**. Looking ahead, enhanced EU and national governments' support for testing, validation, and regulatory clarity will be critical to de-risk investment and foster the development of these high-potential but underexplored technologies.

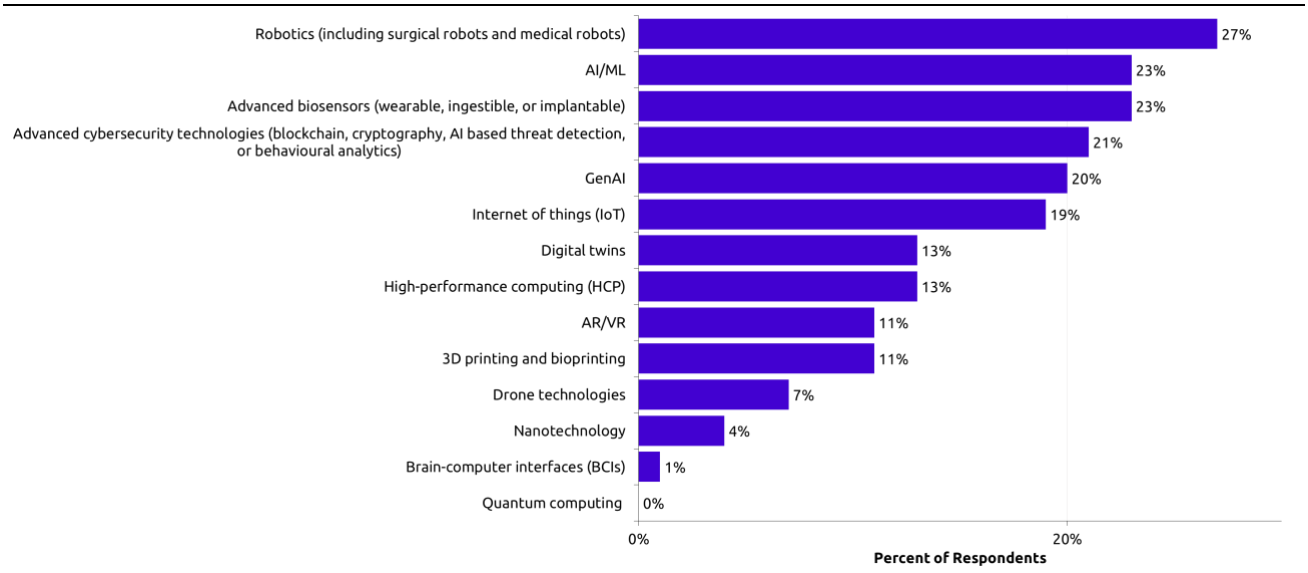


Figure 29: Advanced and emerging digital capabilities

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. Which of the following emerging technologies is your organisation prioritising and investing in to achieve its business objectives?

4.2.9Exploring partnership dynamics in Digital Health

Strategic partnerships play a central role in shaping the innovation ecosystem for EU digital health vendors, particularly through **collaboration with stakeholders in clinical care, technology, and life science**, key domains where innovation is developed and applied (**Figure 30**). Over half of vendors (51%) collaborate with healthcare providers – partnerships that are essential for clinical validation, seamless workflow integration, and continuous feedback. Partnerships with tech providers (44%) and life sciences firms (41%) reflect the **growing convergence of digital and biomedical innovation**, with the former enabling advanced capabilities and infrastructure, and the latter contributing regulatory and clinical expertise. As highlighted in expert interviews, collaboration between digital health vendors, start-ups and the pharmaceutical industry (particularly in advancing digital therapeutics) is encouraging digital health companies to adopt more rigorous, evidence-based validation models and to better navigate the complexities of national healthcare systems by leveraging the regulatory and market expertise of pharma partners.

Only 31% of vendors partner with academic or research institutions, suggesting **a potential underutilisation of Europe's research and innovation capacity** – and indicating that targeted initiatives to **expand "triple helix" collaborations between healthcare, industry, and academia** have significant room for further growth.

Limited engagement with public health authorities or regulators, reported by only 20% of vendors, may hinder early alignment on compliance and reimbursement strategies. This highlights the need to **strengthen structured regulatory engagement platforms** to close this gap. Engagement with patients (7%) and investors (4%) remains strikingly low, limiting co-creation opportunities and sustainable business model development. There is a need to involve patient groups more actively in testbeds and advisory structures, and to expand mechanisms that support these partnerships.

Partnerships play a pivotal role in the strategic priorities of EU digital health vendors (**Figure 31**), with the most significant contributions focused on innovation acceleration and evidence generation. Over half (56%) of vendors cite partnerships as key to accelerating solution development, while 49% use them to support real-world evidence (RWE) generation and technology validation. This reflects the importance of collaboration for building clinical credibility, securing early adoption, and facilitating regulatory and payer engagement.

In addition, 43% of vendors view partnerships as critical for improving market access, and 36% for enhancing interoperability, underscoring the operational complexity of entering fragmented health systems across Europe. These partnerships help vendors navigate localisation, integration with existing workflows, and procurement processes.

Notably, fewer vendors associate partnerships with growth and scalability (26%), regulatory or reimbursement positioning (21%), or ecosystem trust-building (13%). This indicates a gap in leveraging partnerships to support longer-term strategic needs, particularly around expansion, stakeholder engagement, and alignment with evolving compliance and reimbursement models. Taken together, this survey data highlights that **while partnerships are heavily used in early-stage innovation and validation, they are underutilised in advancing broader system integration and market sustainability**.

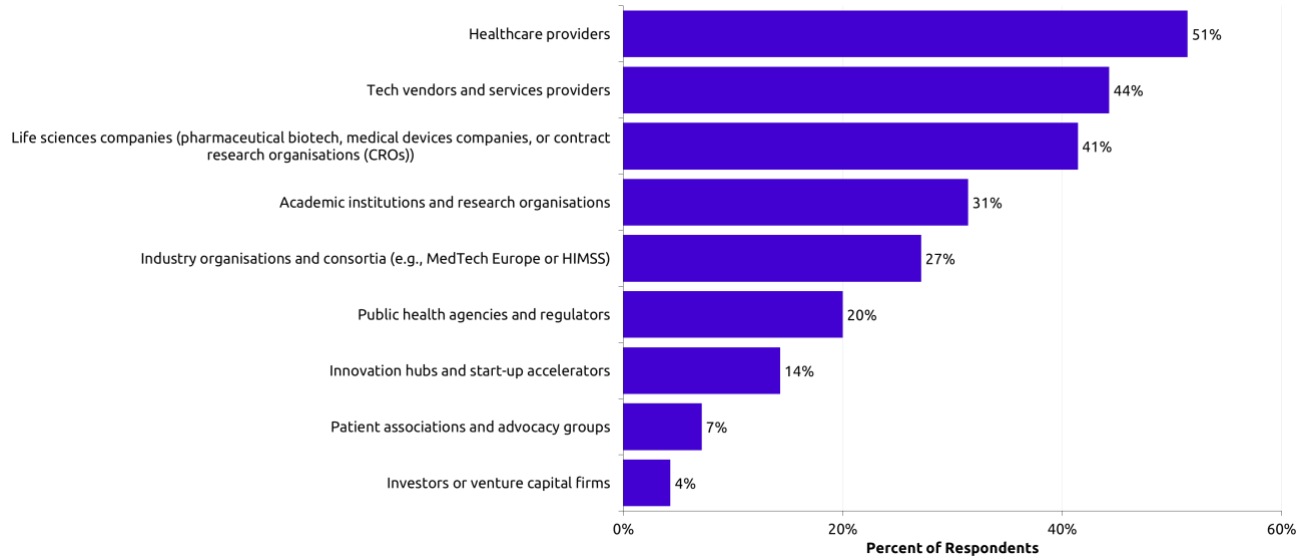


Figure 30: Partners prioritization

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. Which stakeholders does your organisation primarily partner within the digital health ecosystem?

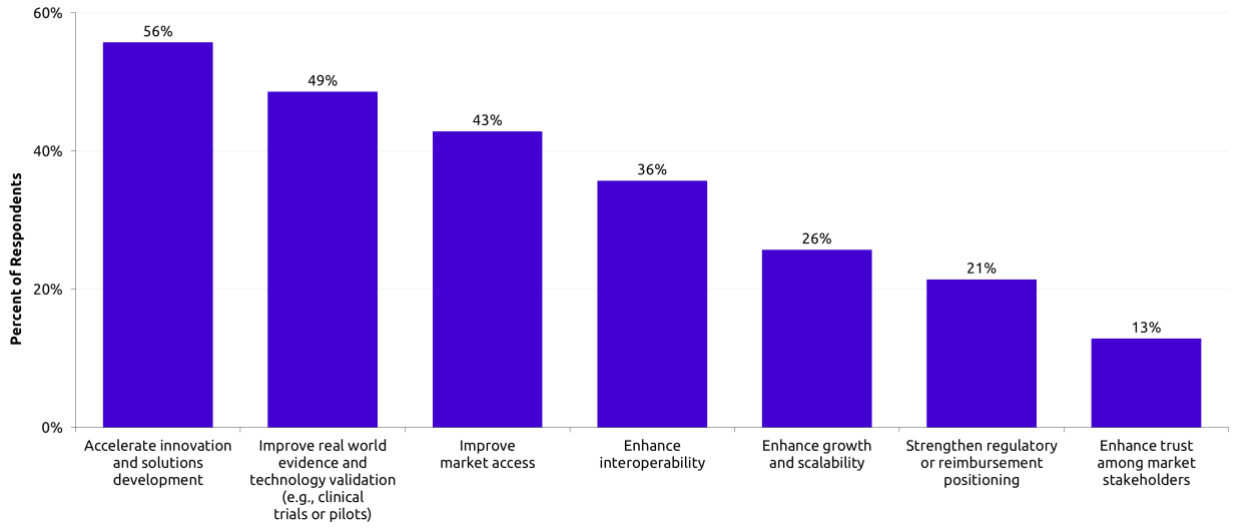


Figure 31: Partnership value areas

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. Which of the following best describes how partnerships most significantly contribute to your organisation's digital health strategy?

4.2.10 Navigating regulatory complexity: how vendors are adapting

As previously noted, regulatory compliance remains the foremost challenge for digital health vendors in the EU (**Figure 7**). When asked about the most burdensome laws and standards (**Figure 32**), 40% of respondents cited **the Medical Device Regulation (MDR) and In Vitro Diagnostic Regulation (IVDR**), followed closely by the **General Data Protection Regulation (GDPR**) at 37%. These results highlight the complexity of aligning digital (particularly software-based) solutions with the current EU regulatory framework.

Anticipated implementation mechanisms of new regulations also shape vendor strategy. Nearly 29% of vendors identify the **European Health Data Space (EHDS)** as a top compliance challenge, while 24% point to the **AI Act.** These **evolving frameworks are influencing expectations around data governance, algorithm transparency, and interoperability** – areas that are likely to incur significant compliance costs and introduce uncertainty.

Additionally, cybersecurity directives add further obligations. Nineteen percent of vendors see the **NIS2 Directive** as a significant challenge, with 13% highlighting the **Cyber Resilience Act (CRA).** These reflect increasing regulatory focus on digital infrastructure security across the healthcare sector as products become more connected and cloud based.

Interestingly, only few respondents cite national health laws (7%), international standards (4%), or reimbursement regulations (3%) as primary compliance barriers. This suggests that these localised concerns have been somewhat addressed, with the most pressing challenges perceived at EU level.

Navigating this evolving regulatory landscape is resource-intensive, especially given varying interpretations across Member States. Expert interviews further emphasised the need for a harmonised legal approach, stressing the importance of regulatory coherence, clearer technical guidance, and early implementation support—particularly for SMEs. Initiatives such as the European Interoperability Framework (EIF) and the work of the Medical Device Coordination Group (MDCG) aim to address these issues by enhancing legal interoperability and streamlining compliance processes to reduce unnecessary administrative burden.

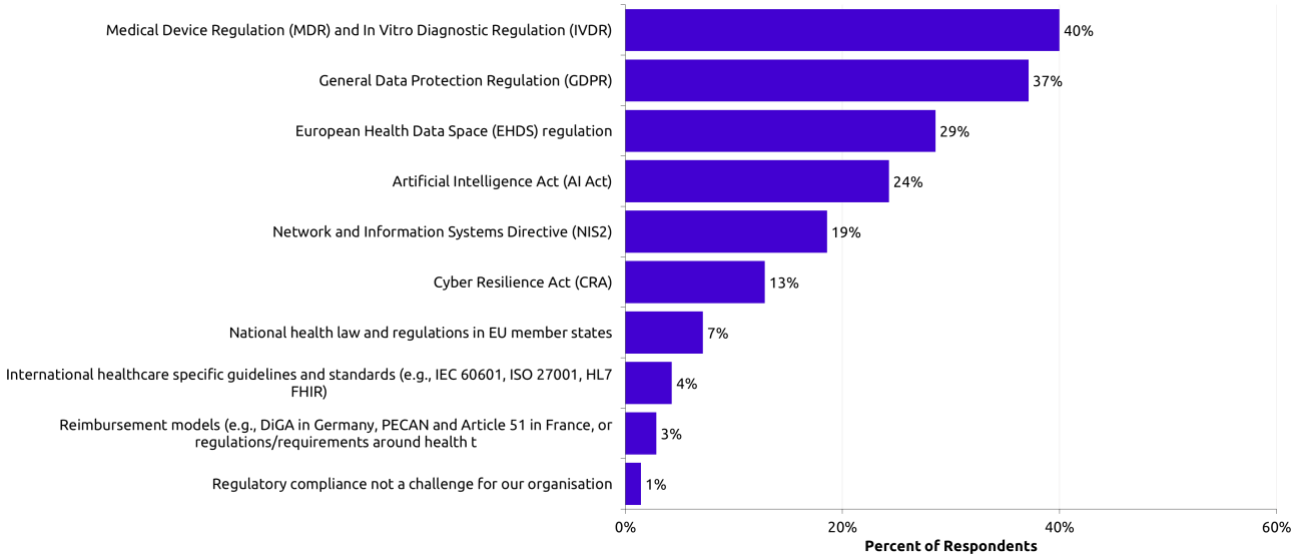


Figure 32: Greatest Compliance Challenges

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. Which laws, regulations, and standards pose the greatest compliance challenges for your organisation operating in the digital health technology market?

Digital health vendors are addressing the growing complexity of the EU regulatory environment through a **combination of internal capacity-building and external expertise** (**Figure 33**) Over half (51%) report maintaining dedicated compliance teams, and 46% rely on regulatory advisors or consultants. Additionally, 40% conduct regular audits, indicating a structured approach to staying aligned with evolving legal requirements.

Importantly, 37% of vendors are adopting **compliance-by-design practices** during product development, signalling a shift toward more proactive and embedded regulatory alignment. However, the use of compliance software tools (27%) and partnerships with healthcare providers (23%) remains relatively limited. This points to **opportunities for expanding digital compliance automation** and fostering closer collaboration with health systems to jointly address jurisdiction-specific challenges. In this context, it is particularly concerning that direct engagement with regulators is low, with only 13% interacting with national bodies and just 7% with EU-level institutions.

This limited communication, especially among SMEs, highlights the need for more accessible, structured engagement mechanisms. Without such interaction, smaller innovators may face difficulties in anticipating regulatory changes or contributing to policy development.

These findings further reinforce the importance of targeted support measures, including advisory services, compliance tools, and training initiatives, to help vendors, particularly newer entrants, navigate the layered EU regulatory landscape.

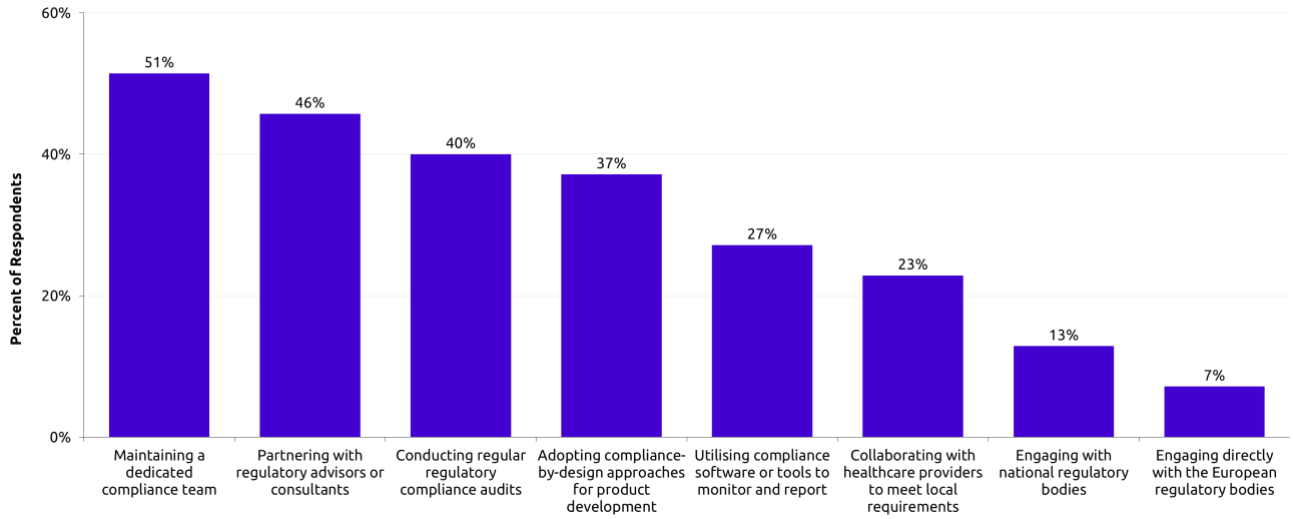


Figure 33: Strategies for ensuring regulatory compliance

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. How does your organisation navigate the complexities of the regulatory landscape for digital health technologies?

4.2.11 Navigating reimbursement mechanisms: how vendors are adapting

Digital health vendors in the EU run their business in complex and evolving reimbursement environments, which according to survey results, they navigate primarily through **specialised expertise and focusing on enhancing evidence generation** (**Figure 34**).

Nearly half of respondents (49%) maintain a dedicated market access team, and 44% work with external advisors or consultants to manage the operational complexities of securing reimbursement and viable business models. Adaptability and validation are key also levers: 41% of vendors monitor reimbursement trends in priority markets to adapt their offerings, and 37% focus on generating real-world evidence (RWE) to demonstrate clinical value and safety. Health technology assessments (HTAs) are used by 27% of respondents, though adoption remains limited, likely due to high resource demands and inconsistent implementation across Member States.

Despite growing EU-level interest in value-based healthcare, only 3% of vendors report actively developing outcomes-based pricing models. Direct engagement with reimbursement authorities is also limited, with just 11% interacting at the national level and 6% at the EU level. These figures suggest a disconnect between digital health innovators and public payers. Many vendors, particularly SMEs, may lack the incentives, resources, or structural support needed to pursue performance-based reimbursement, when available.

This highlights a critical need for clearer guidance, structured engagement mechanisms, and targeted capacity-building support to help digital health vendors align their innovation strategies with the evolving reimbursement landscape across the EU.

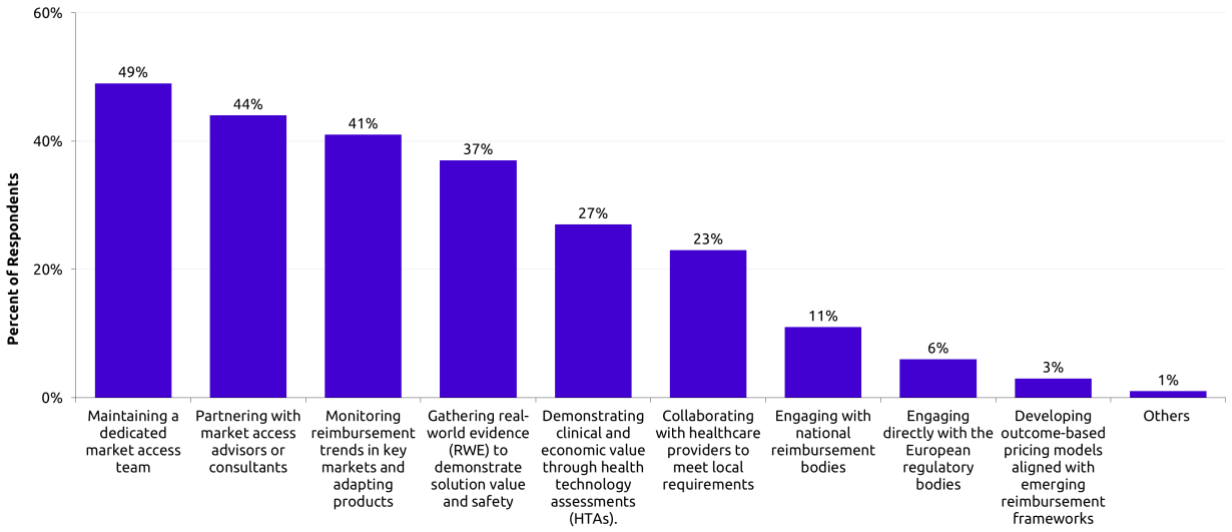


Figure 34: Navigating Reimbursement Complexity

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. How does your organisation navigate the complexities of the reimbursement models landscape for digital health technologies?

4.2.12 Strategic approaches to cybersecurity and resilience

Cybersecurity is a critical pressure point for digital health vendors, both technically and from a compliance perspective (**Figure 35**) Over half (51%) of respondents cite rapidly evolving cyberthreats as their top challenge, while 47% struggle with the complexity and misalignment of cybersecurity regulations across international, EU, and national levels. Vendors operate in a high-risk, fast-changing environment, facing the **dual challenge of countering increasingly sophisticated threats while navigating a fragmented policy landscape**. These findings highlight the urgent need for dynamic security strategies and harmonised cybersecurity guidance at both EU and national levels as also highlighted by the European action plan on the cybersecurity of hospitals and healthcare providers.[32]

Technical integration challenges further compound the risk. Legacy infrastructure in the healthcare sector creates significant compatibility and security vulnerabilities, with 44% of vendors reporting difficulties integrating with outdated systems. Additionally, the financial burden of compliance, especially for SMEs, can limit the adoption of advanced security measures; 40% cite the high cost of implementing necessary controls. This underscores that compliance challenges are not only regulatory, but also infrastructural and financial.

Organisational capacity gaps are also evident. While only 11% of vendors report limited senior management support, suggesting that cybersecurity is now recognised as a strategic rather than purely technical issue, nearly one-third (31%) face cybersecurity talent shortages. Additionally, 17% express concerns about supplier and partner security risks, a growing challenge as the sector becomes increasingly dependent on third-party digital infrastructure. This interdependence across tech vendors, hospitals, and data processors amplifies supply chain vulnerabilities, an issue particularly relevant in the context of forthcoming obligations under the Cyber Resilience Act. The overall picture suggests that vendors are struggling to keep pace with both external threats and internal capacity constraints.

[32] European Commission (2025)

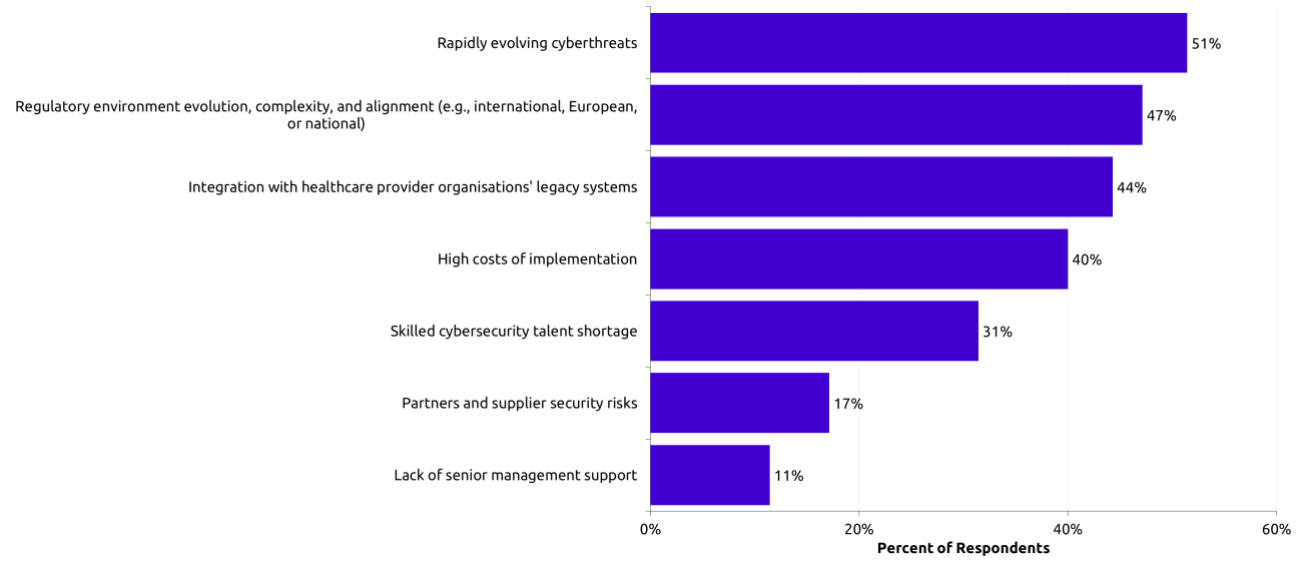


Figure 35: Cybersecurity challenges

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. What are the biggest cybersecurity compliance challenges facing your organisation?

Strategic resilience is becoming critical for EU digital health vendors, particularly as regulatory requirements tighten, and software supply chain vulnerabilities grow. Survey data (**Figure 36**) show that vendors are actively working to maintain operational autonomy and reduce reliance on third-party technologies, which is critical for ensuring service continuity and data sovereignty in a complex and fragmented landscape.

Internal capability-building emerges as the cornerstone of vendors' resilience strategies: 46% of respondents report investing in in-house R&D and technical expertise to reduce dependency on external suppliers. This approach supports long-term agility, risk mitigation, and technical independence, particularly in a context of continuously evolving regulatory conditions. In parallel, vendors are adopting complementary risk mitigation strategies, including supplier diversification (40%) and the enforcement of stricter contractual safeguards (33%).

However, despite increased regulatory emphasis on secure and sovereign infrastructure (e.g., GDPR, NIS2, EHDS), key practices remain underutilised. Only 26% of vendors conduct regular supplier audits, and just 20% implement data sovereignty measures such as EU-based sourcing or local data storage. Furthermore, only 13% report using standards-based or open-source technologies to enhance flexibility, indicating that policy ambitions for interoperability and openness have yet to translate into broad vendor adoption.

These findings suggest **a foundational awareness among vendors of the strategic risks tied to supplier dependency but also reveal critical implementation gaps,** particularly in areas related to traceability, sovereignty, and alignment with EU principles of digital autonomy. As Europe advances efforts to strengthen the resilience of its digital health infrastructure, supporting vendors in reducing single-supplier risk and improving transparency will be essential.

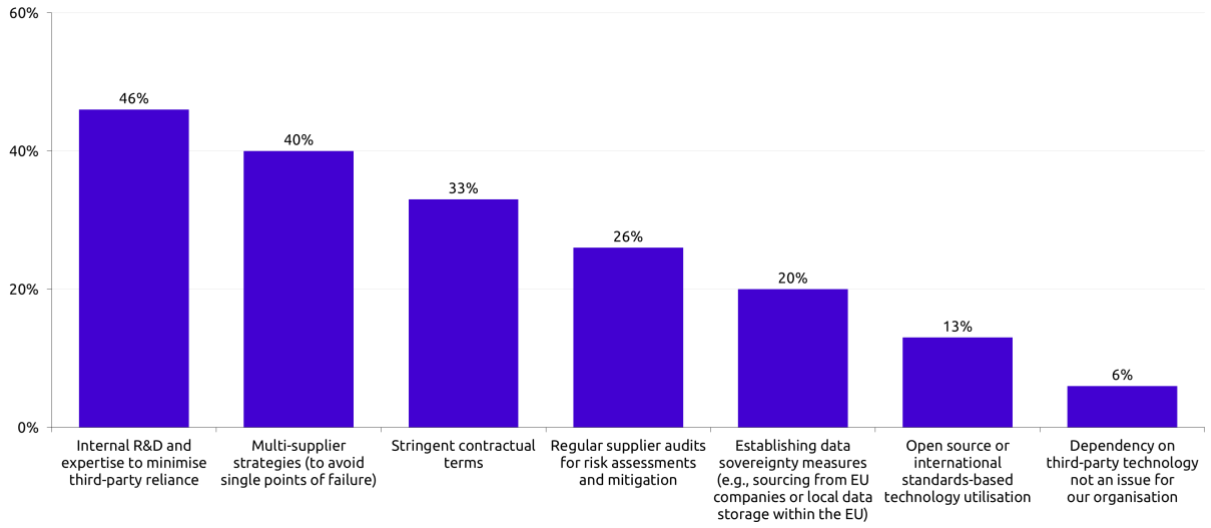


Figure 36: Enterprise initiatives for strategic independence

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. What are your organisation's key strategies for maintaining strategic independence when utilising external suppliers' technologies?

4.2.13 Strategies for talent acquisition

As seen in the survey results on cybersecurity and resilience strategies, the role of an internal skilled team is clearly strategic, reinforcing the critical importance of talent acquisition and development in the digital health sector.

Survey data (**Figure 37**) indicate that vendors are prioritising internal capacity-building across key domains, with 53% focusing on upskilling existing staff and 44% actively recruiting ICT and AI/data science professionals. A further 36% are hiring healthcare and digital health experts to support product development and commercialisation.

Less commonly, vendors are investing in cross-functional team development (27%) or partnering with academic institutions (21%). Global recruitment strategies (14%) and outsourcing (6%) remain marginal. These findings highlight a market dynamic where **internal talent development** is essential for sustaining innovation, compliance, and scalability; **yet they suggest untapped potential in expanding external collaborations and international talent pipelines**.

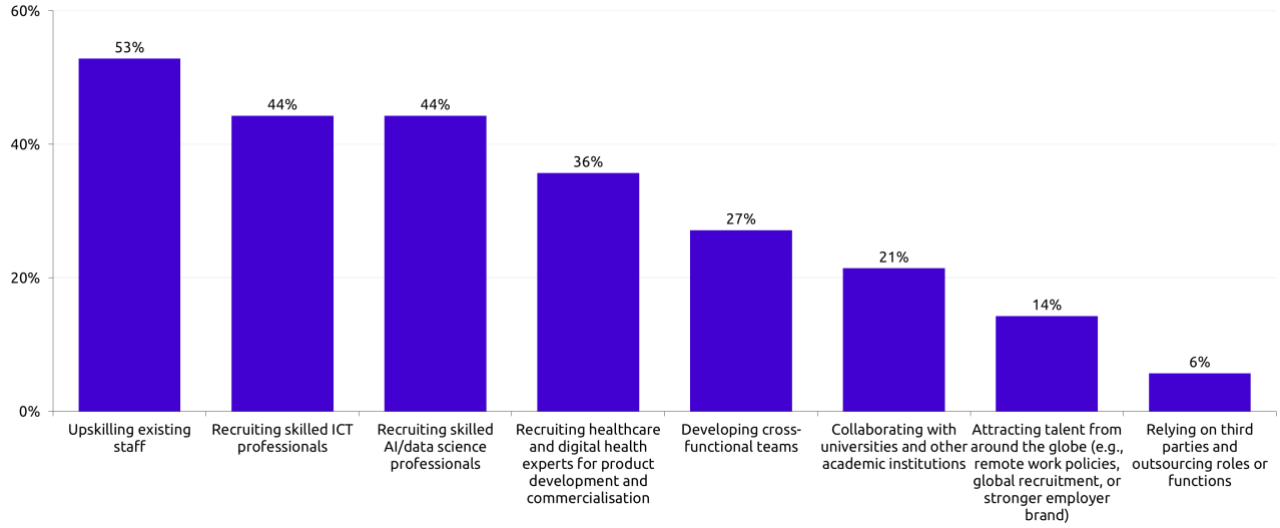


Figure 37: Talent acquisition strategies

Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70 Q. What are your organisation's key strategies for addressing talent acquisition and development needs in digital health?

4.3 Financial trends analysis

As part of the supply-side analysis of the digital health market, the study included a comprehensive review of private capital markets to assess investment trends across key international markets. The analysis covered both EU27 Member States and non-EU countries, encompassing all major geographic regions. This component contributes to a deeper understanding of the scale, nature, and evolution of capital flows into digital health technologies, offering valuable insights into market maturity, innovation trajectories, and priority areas for strategic growth.

Financial Trends in the European Union: Key Takeaways

- **Global capital flows remain heavily concentrated**: Between 2019 and 2024, the United States captured **81%** of total global digital health investment volume. The UK (5%) and China (3%) followed distantly, while no EU country exceeded 2% individually.
- **Global Investment Cycle 2019-2024**: Private capital investment in digital health surged during the Covid-19 pandemic, surpassing 260 billion of € in 2021 then corrected sharply as markets recalibrated; by 2024 the landscape shows calmer (€61 billion), more selective deal-making rather than sustained decline, signalling a maturation phase after extraordinary 2021 peaks.
- **European Union Investment Cycle 2019-2024:** The EU27 trajectory mirrors the global boom-and-cooling pattern but from a lower investment activity base. In 2024 activity remains steady (€52 million), yet modest compared to pandemic times reflecting the region's fragmented demand, and comparatively smaller pools of late-stage capital.
- **Investor Composition in the European Union:** Venture capital dominates in the EU27 (as well as worldwide) accounting for more than 90% of investments, with corporates a distant second; private-equity, debt, and public listings remain peripheral. The narrow investor mix reinforces an early-stage bias and leaves scale-ups reliant on a limited funding set.
- **Regional Disparities Across the EU27:** Private investment in digital health concentrates in the DACH (27%) and in the South and Western Europe (30%) regional cluster, with Northern Europe next; Benelux attracts a moderate share (15%), while Central and Eastern Europe (7%) lags far behind, underscoring persistent maturity gaps across the EU. Country-level patterns echo these divides, with Germany (28%) and France (23%) topping volumes while others remain more capital-constrained.
- **Deal activity differs from investment volume**: Germany and France also led in deal count (26% and 16%, respectively), but countries like Belgium and Sweden showed high deal numbers relative to capital raised, suggesting early-stage ecosystem strength.
- **Structural Funding Gaps in the EU27:** The European Union struggles to convert vibrant early innovation into large, late-stage rounds. Fragmented reimbursement paths, varying regulatory interpretations, and limited exit options discourage bigger bets, nudging founders to court non-EU investors or list abroad.
- **Policy and Strategic Implications:** Bridging the gap will require broadening the EU27's investor base, encouraging institutional and strategic capital, and aligning cross-border regulations to de-risk scale-up financing, which are key levers if Europe aims to match global competitors in digital-health innovation.

4.3.1 Methodology for financial trends analysis

To support this effort, the study team leveraged a dataset extracted from PitchBook[33], a leading global database on private capital markets.

The dataset contained over 46,000 individual deal records covering the period from 1 January 2014 to 13 February 2025.

To ensure relevance and analytical consistency, the following filters were applied for the extraction:

- **Vertical Focus**: Only companies tagged under the "*Digital Health*" vertical market were included, in line with the Observatory's technology scope.
- **Deal Type**: The analysis focused exclusively on "*full transactions*", enabling robust financial assessment.
- **Ownership Status**: Companies were included if classified as "*privately held* (with or without backing), *in IPO registration*, *publicly listed*, or *acquired/merged*", including those operating as subsidiaries.

The classification of investments by **Deal Class** is definitive and aligned with PitchBook's standard methodology, which identifies the institutional source of financing or a change in a company's operating status (e.g. bankruptcy, out of business etc.) [34]. The recognised Deal Classes are:

- Venture Capital (VC): Investments from VC firms, typically in early to growth stages
- Private Equity (PE): Capital provided by PE firms, often in later-stage or buyout scenarios
- Corporate: The company is backed or acquired by a private or publicly listed corporation, with no prior PE/VC/Angel/Accelerator backing
- Public Investment (IPO): Initial Public Offerings, where a company offers shares to the public for the first time
- Debt: A privately held company financed through private debt or mezzanine financing (combination of debt and equity) via a lender
- Individual: Financing by an individual or non-PE/VC financial investor, or where investor identity is undisclosed, but no PE/VC investors are known
- Other: Non-traditional funding sources, such as grants, accelerators, or incubators

Following extraction, the dataset was cleaned, structured, and the time frame was **narrowed to the period January 2019 to December 2024** for detailed analysis, The investments were recorded in United States Dollars (USD), and the official European Central Bank (ECB) average exchange rate for 2023 was applied[35]. **Countries** were **categorised** into **EU27 vs. non-EU27.** The EU27 countries were also grouped according to the **five EU macro-regions** defined in **Annex A2** Methodology for Market Mapping and Segmentation. The resulting outputs, referred to as "*Consortium Analysis on Pitchbook Data",* consist of a structured series of figures and visualisations capturing trends in:

- Number of investments and Investment volume over time
- Deal Class or type of investor
- Geographic comparisons within and beyond the EU27

This analysis, including the resulting figures, is based on a finalised and validated dataset extracted from PitchBook. This structured classification supports detailed segmentation by capital type, investor category, and geographic distribution, offering a solid basis for consistent cross-country and longitudinal analysis.

[33] PitchBook
[34] PitchBook report methodologies
[35] European Central Bank (ECB): Average USD/EUR exchange rate from 2 January 2023 to 29 December 2023 is **0.924**

4.3.2 Financial trends analysis -results

The financial trends analysis provides a structured view of how investment activity in digital health has evolved between 2019 and 2024 across the EU27 and globally. Drawing on over 33.000 records filtered from the initial PitchBook's dataset, this analysis explores both the volume and distribution of capital invested, with a focus on identifying emerging trends by deal size, deal count, type of investor, and geographic region.

The analysis aims to support a clearer understanding of:

- How capital flows reflect market maturity and innovation cycles
- The role of different investor categories (e.g., venture capital, corporate, public investment)
- Regional differences in deal activity between EU27 and non-EU markets.

The insights derived here will inform broader discussions within the Observatory on ecosystem development, innovation readiness, and investment bottlenecks, particularly when triangulated with qualitative findings from expert interviews and survey data.

Global Investment Activity and Type of Investment

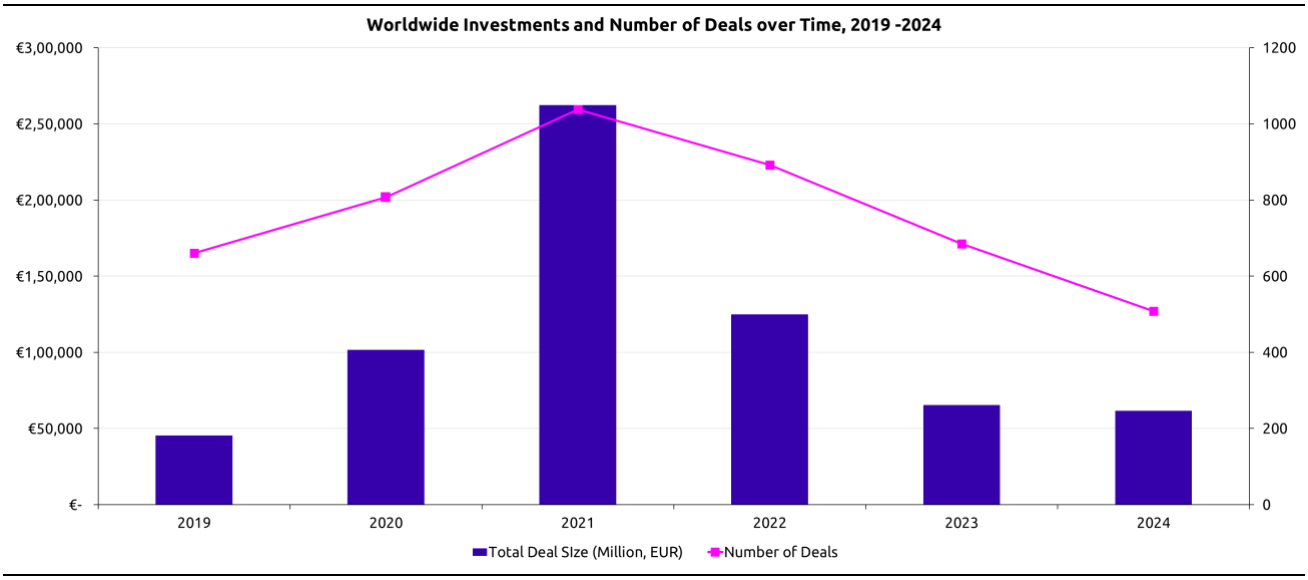


Figure 38: Global Investment Activity in Digital Health (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 38 illustrates the global evolution of digital health investment between 2019 and 2024, showing both deal volume and number of transactions. The data reveals a significant surge in 2021, likely driven by pandemic-related demand for digital solutions, followed by a marked decline in 2022 and 2023. While the number of deals remained relatively resilient, the sharp contraction in capital invested suggests a retreat from large-scale funding. In 2024, investment activity appears to stabilise. This pattern might **reflect a post-COVID correction phase and may indicate growing selectivity among investors**, with a shift toward smaller or earlier-stage deals rather than a fundamental weakening of the sector.

Analysing investment by country (**Figure 39**) shows the distribution of total digital health investment volume by country from 2019 to 2024. The data highlights the **dominant global position of the United States**, which accounts for an overwhelming 81% of total capital invested in the sector by top 10 countries. The UK (5%), China (3%), and a few others, including Germany, France, and Singapore (each at or below 2%), follow at a distant margin. The concentration of deal volume in a single market suggests a high degree of centralisation in digital health investment globally. For the EU, these figures might underscore the challenge of scaling capital deployment and competing at a global level.

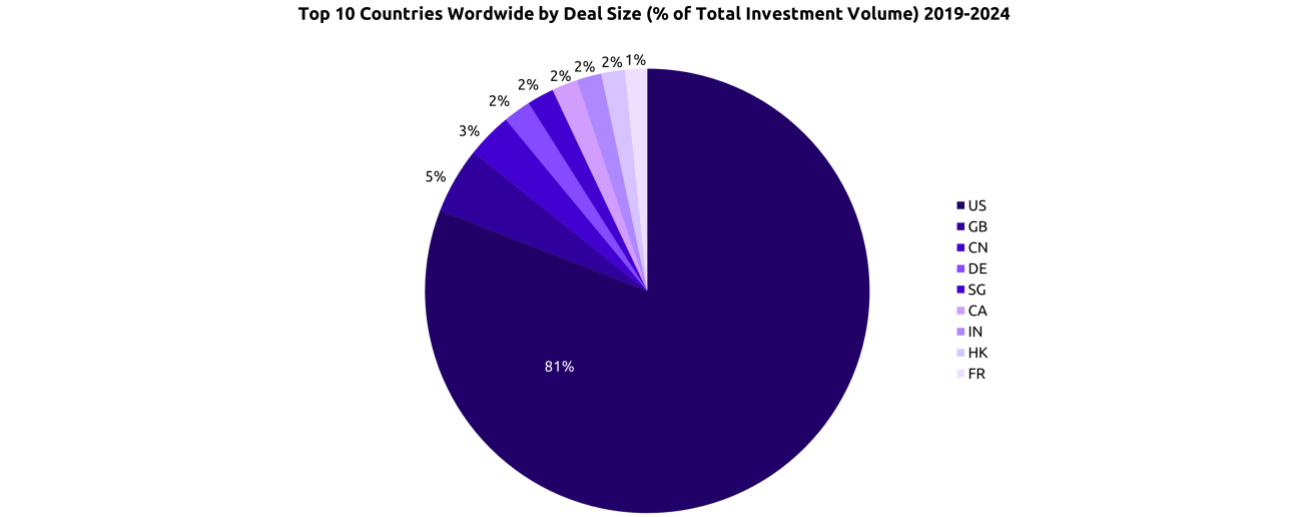


Figure 39: Top 10 Countries Worldwide by Digital Health Deal Volume (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 40 illustrates the evolution of global digital health investment by investor type between 2019 and 2024. The data highlights the central role of venture capital (VC), which consistently dominates total funding throughout the period and peaked sharply in 2021. Corporate investments represent the second most significant source, particularly in 2020–2022, suggesting active strategic interest from established firms during the height of the COVID-19 pandemic. Other categories, such as private equity (PE), public investment, and individual investors, remain marginal in scale. The overall distribution seems to underscore a strong early-stage and growth-oriented investment profile globally, while the limited presence of public and institutional funding may signal a need for more diversified capital sources to de-risk later-stage innovation.

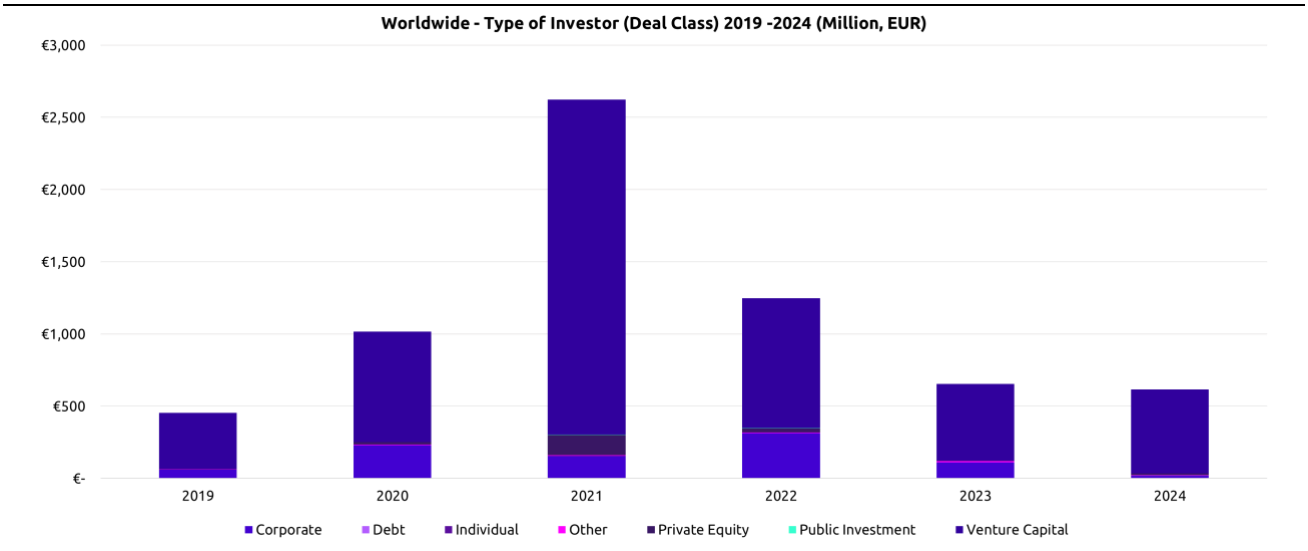


Figure 40: Global Digital Health Investment by Type of Investor (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Investment Activity and Type of Investment by Region in the EU 27

Figure 41 presents the evolution of deal size and number of digital health investments in the EU27 from 2019 to 2024. In line with the global trend, investment activity peaked in 2021, both in terms of deal value and count, reflecting pandemic-era acceleration. The subsequent decline, particularly from 2022 onward, indicates a broader market correction and possible investor caution. While deal counts remained relatively

strong through 2022, the sharper drop in 2023–2024 suggests more selective capital deployment. Overall, the data reveals a **resilient but possibly a constrained investment environment in the EU**, with **persistent gaps in scaling larger deals compared to other global regions.**

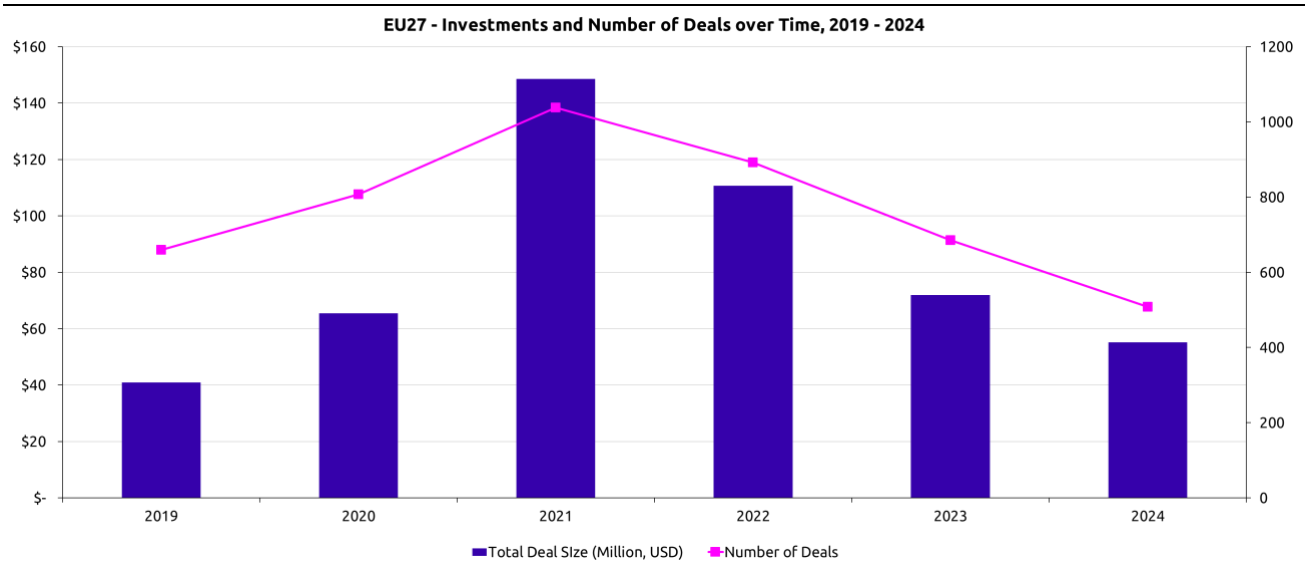


Figure 41: EU27 Investment Activity in Digital Health (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Still focusing on the European Union, **Figure 42** illustrates the breakdown of digital health investments in the EU27 by investor type from 2019 to 2024. Venture capital dominates the funding landscape, accounting for most annual investment volumes. Corporate investment plays a secondary role, especially in 2023 and 2024, while other sources, such as private equity, debt, public investment, and individual contributions, remain marginal. This narrow investor base, combined with the relatively modest overall investment size compared to non-EU27 countries, suggests a system oriented toward early-stage and growth funding, but also highlights a structural weakness in late-stage or institutional capital. Expanding and diversifying the investor pool may be critical to enabling scale-up and cross-border expansion within the EU digital health landscape.

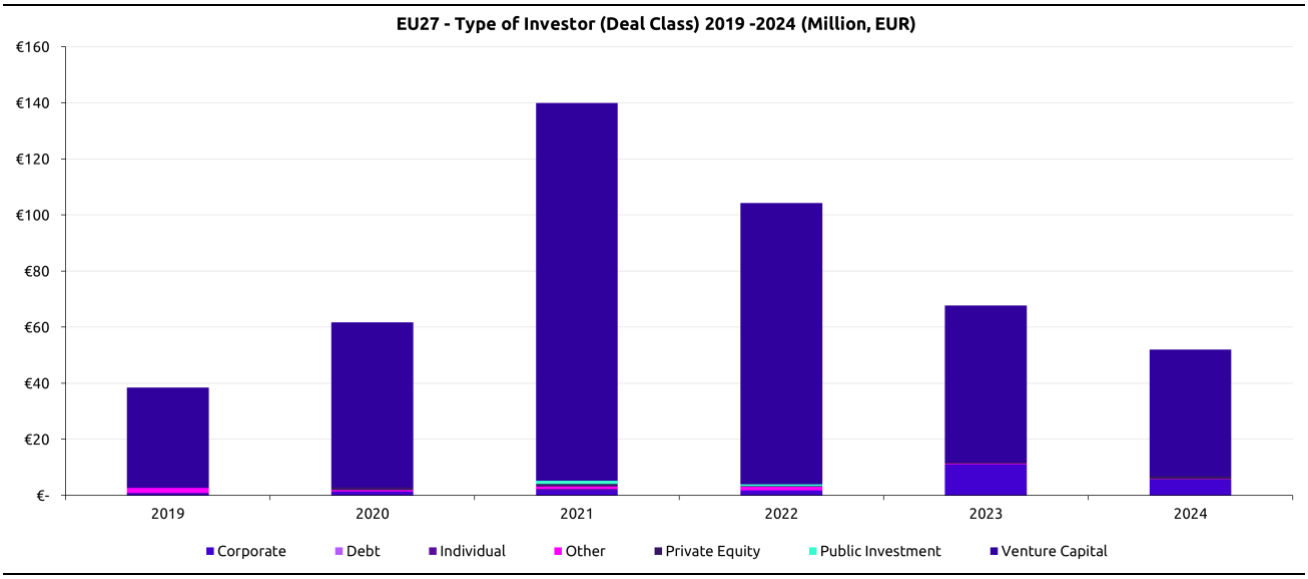


Figure 42: EU27 Digital Health Investment by Type of Investor (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

On the other hand, **Figure 43** shows the trajectory of digital health investment across non-EU countries between 2019 and 2024[36]. Again, in line with global trends, both total deal value and number of deals peaked sharply in 2021, surpassing €2.5 billion and over 6,000 deals, reflecting an intense surge of investor interest during the pandemic. The decline that follows is more pronounced than in the EU27, with volumes more than halving by 2023. Despite this contraction, deal levels in non-EU countries remain substantially higher in both scale and frequency. This might suggest deeper capital reserves, greater risk tolerance, and more mature ecosystems outside Europe, particularly in North America.

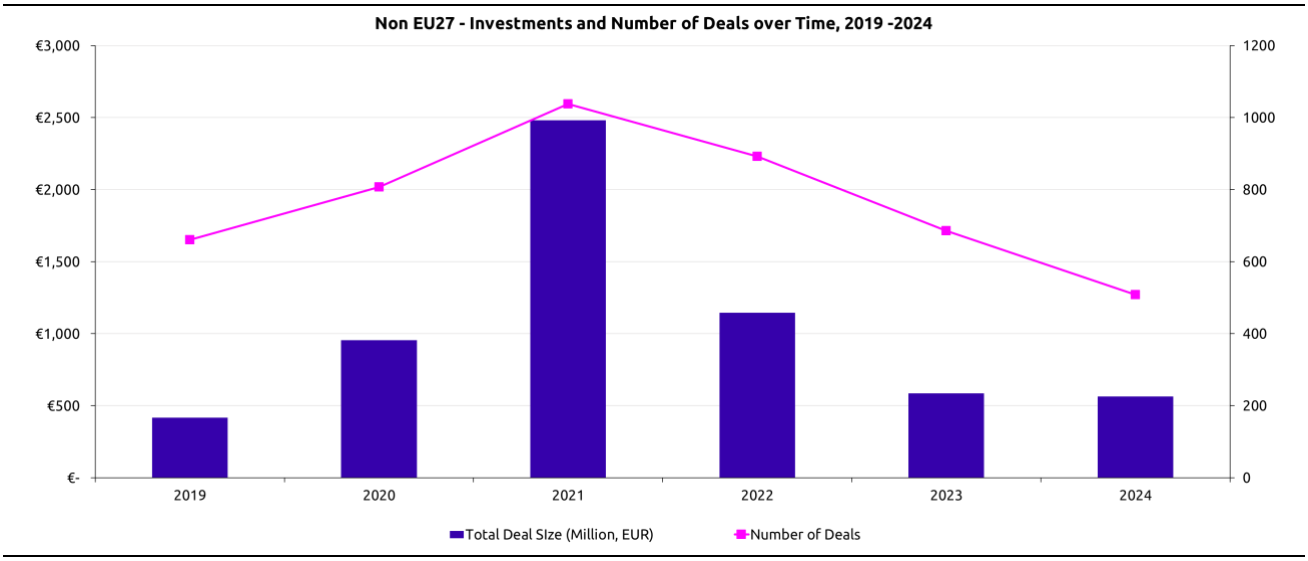


Figure 43: Non-EU27 Investment Activity in Digital Health (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Still looking outside Europe, **Figure 44** illustrates the distribution of digital health investments across non-EU27 countries by investor type from 2019 to 2024. As with the EU, venture capital is the predominant source of funding, particularly in 2021, where it accounts for the majority of a global peak in deal volume. However, the chart also reveals a more visible role for corporate and private equity investment, especially in 2020–

[36] As per the Geographic Clusters and Coverage section in Annex A2. non-EU27 regions and countries include:

- Americas – United States: it includes the United States of America only
- Americas: All other countries in the Americas, including countries such as Argentina, Brazil, Canada, Mexico.
- APJ – China: it includes the People's Republic of China (PRC) only.
- APJ – Japan: it includes Japan only.
- APeJC Asia Pacific excluding Japan and China: It Includes countries such as Australia, India, Indonesia, Malaysia, New Zealand, Singapore, South Korea.
- EMEA – United Kingdom: it includes the United Kingdom only.
- EMEA - Europe, Middle East, and Africa: It excludes the EU27 Member States and the UK. It Includes countries such as Israel, Norway, Russia, Switzerland, South Africa, Türkiye, and the United Arab Emirates, as well as other countries across Africa and the Middle East.

2022 during the COVID19 pandemic, suggesting a more diversified funding base. Public investment, individual capital, and debt instruments remain limited.

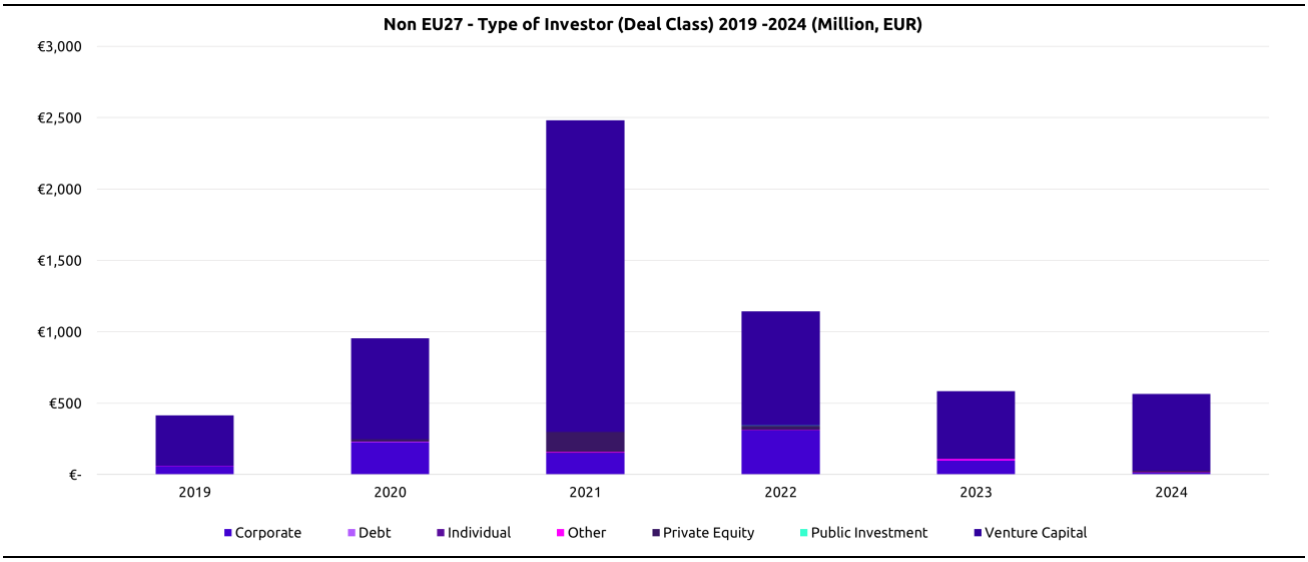


Figure 44: Non-EU27 Digital Health Investment by Type of Investor (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Investment Activity by Country and Across Regions in the EU 27

Figure 45 displays the top 10 EU27 countries by total digital health investment volume from 2019 to 2024. The landscape is clearly led by Germany (28%) and France (23%), which together account for over half of the total deal value. The Netherlands (12%), Sweden (9%), and Denmark (8%) also show strong capital inflows, reflecting the presence of active innovation ecosystems. While southern countries such as Spain and Italy appear in the top 10, their overall share remains modest. This distribution might highlight persistent investment asymmetries within the EU and may underscore the need of targeted analysis and support in certain Member countries and regions.

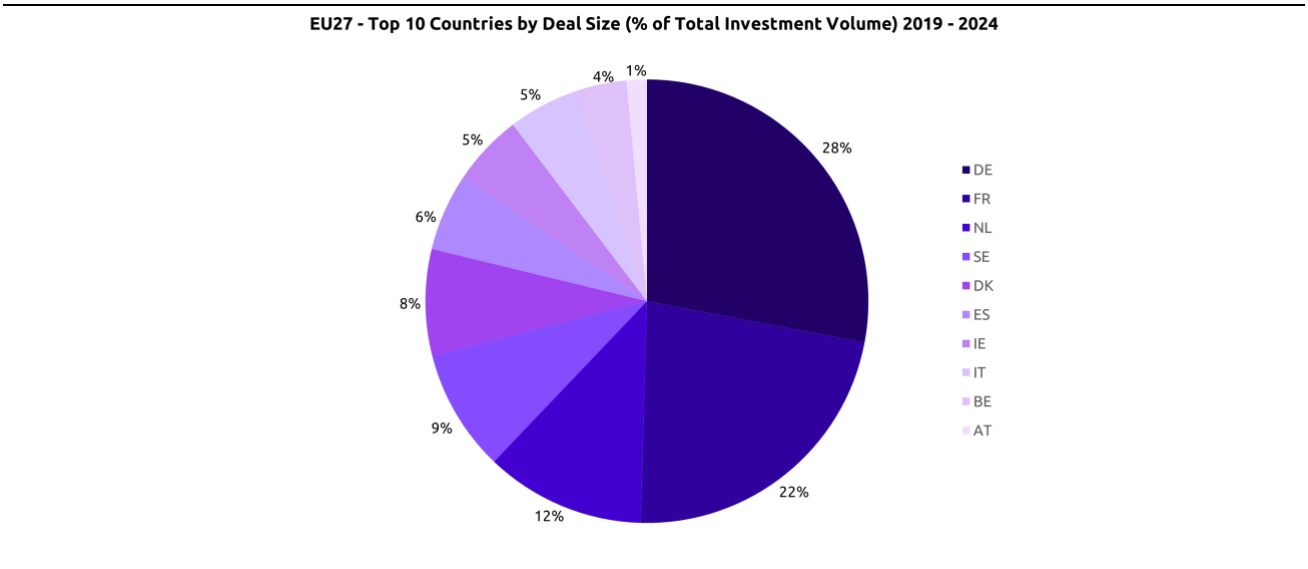


Figure 45: Leading EU27 Countries by Digital Health Investment Volume (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 46 presents the regional breakdown of digital health investment volume across the EU27 from 2019 to 2024. The highest share is held by South and Western Europe (30%), followed by the DACH region (27%) and Northern Europe (21%). Benelux accounts for 15%, while Central and Eastern Europe lags with only 7%

of the total. These findings reflect the geographic concentration of capital in regions with larger economies and more mature digital health ecosystems. Compared to **Figure 45** which detailed national-level leaders like Germany and France, this regional view reinforces the dominance of Western and Central EU countries, while also highlighting persistent gaps in investment in Eastern Europe.

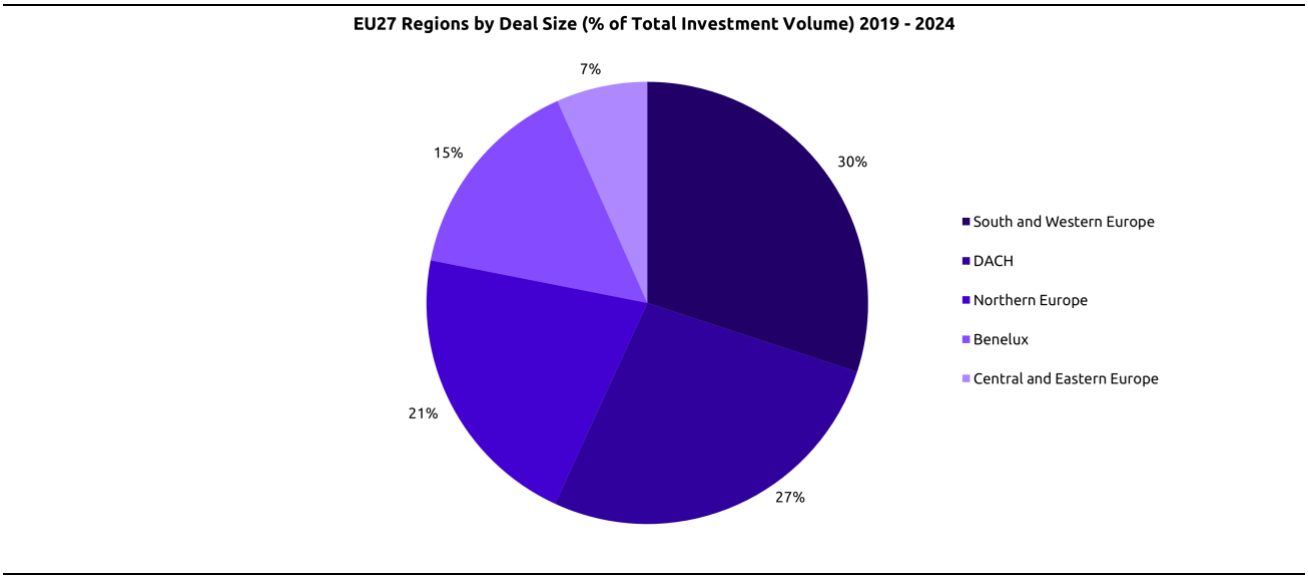


Figure 46: EU27 Regional Distribution of Digital Health Investment Volume (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Outside the European Union, **Figure 47** shows the distribution of total deal value across the top 10 non-EU27 countries from 2019 to 2024. The United States dominates with 81% of total investment volume, vastly outpacing all other markets. The United Kingdom (5%), China (3%), Singapore, Canada, and India contribute modest shares, while advanced economies like Japan, Switzerland, and South Korea remain below 2%. This sharp concentration of capital might reflect the maturity and scale of the U.S. investment ecosystem, which continues to set the pace globally in digital health. Other non-EU countries remain relevant but significantly less influential in total funding terms.

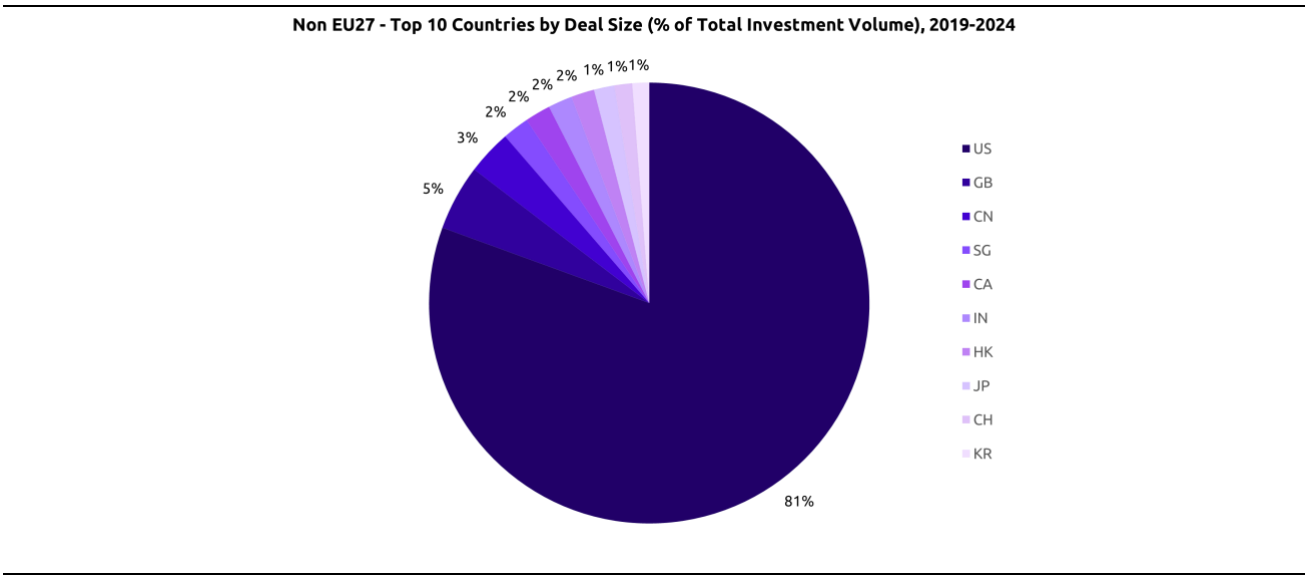


Figure 47: Leading Non-EU27 Countries by Digital Health Investment Volume (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 48 ranks EU27 countries by the number of digital health investment deals between 2019 and 2024. Germany (26%) and France (16%) lead in deal activity, reflecting strong market depth. Belgium and Sweden

follow with 10% each, showing notable deal flow despite smaller overall investment volumes compared to top-ranking countries in **Figure 45.** The contrast between **Figure 45** and **Figure 48** highlights differing investment profiles: some countries like Belgium and Sweden are active in terms of deal count but handle smaller average deal sizes, while others like the Netherlands and Denmark maintain strong positions in both metrics. This suggests variation in market maturity, with some ecosystems favouring early-stage or fragmented deal activity over high-capital growth rounds.

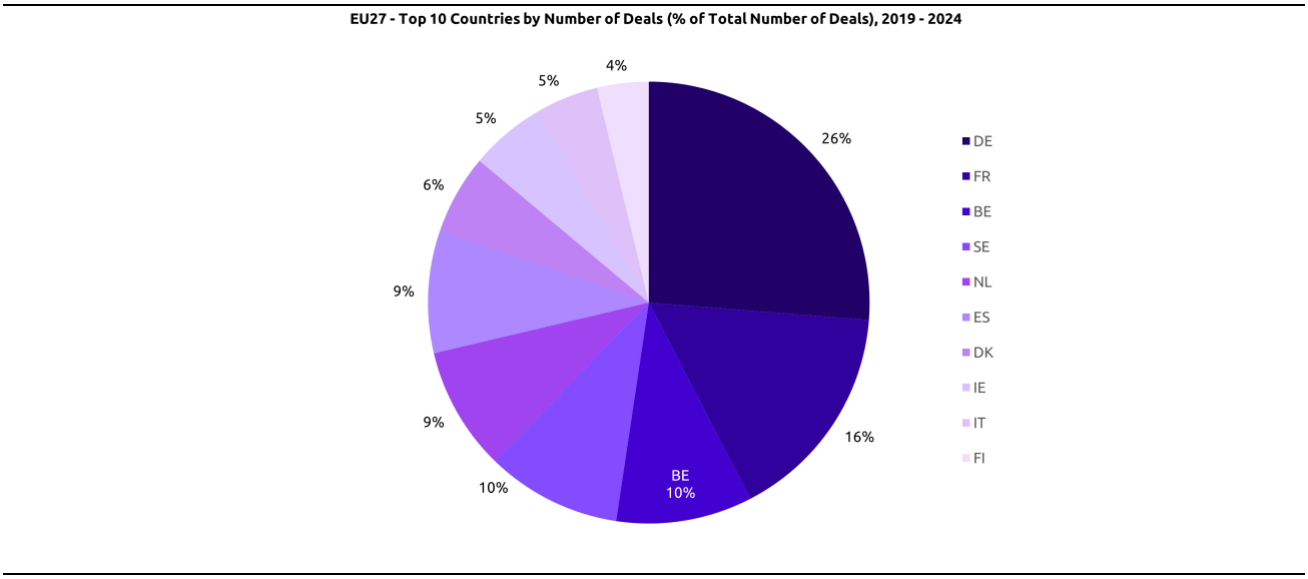


Figure 48: Leading EU27 Countries by Number of Digital Health Deal (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 49 shows the distribution of digital health deals across EU27 regions based on deal count from 2019 to 2024. The DACH region and South and Western Europe are tied at the top with 25% each, followed by Northern Europe (21%), Benelux (18%), and Central and Eastern Europe (11%). This indicates a relatively balanced distribution of deal activity across multiple regions, in contrast to the more concentrated investment volumes observed in **Figure 48** at the country level. Notably, Central and Eastern Europe shows stronger engagement in deal activity here than in **Figure 48**, suggesting increasing participation in early-stage or smaller-scale investments even if total capital remains limited.

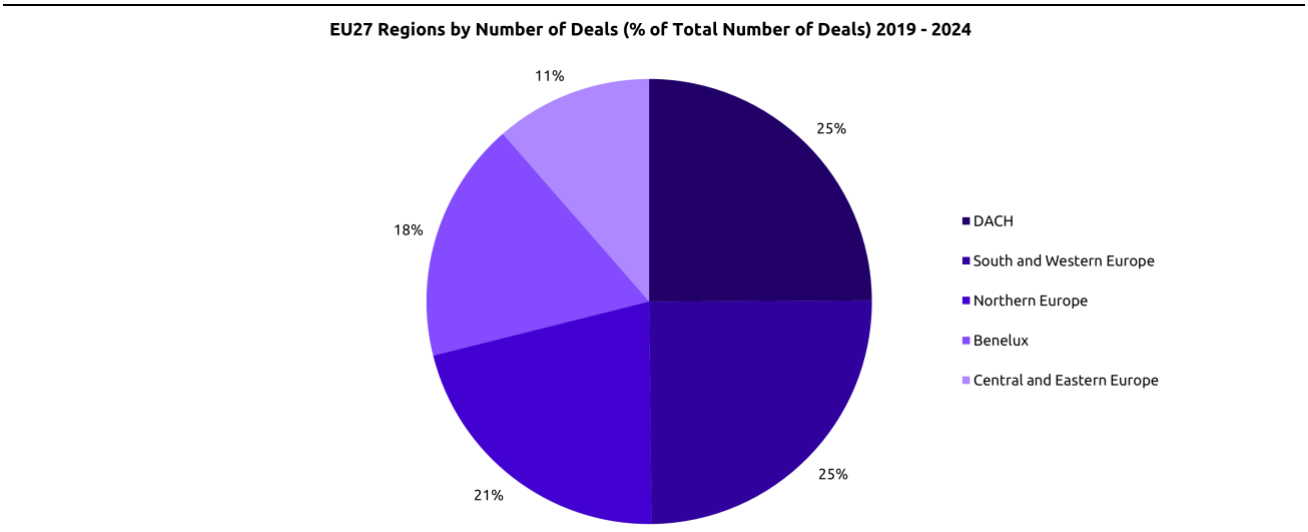


Figure 49: EU27 Regional Distribution of Digital Health Deal Count (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Looking outside the European Union, **Figure 50** displays the top 10 non-EU27 countries by deal count in digital health between 2019 and 2024. The United States leads with 66% of global deal activity, followed by the United Kingdom (9%), and a group of countries (including Canada, South Korea, India, and Japan) each contributing 4%. While **Figure 47** highlighted the US's overwhelming lead in deal volume (81%), this figure reveals a slightly broader distribution of activity by count. Several countries engage actively in smaller deals, indicating a wider base of innovation and early-stage funding even if capital concentration remains high. This might suggest a growing diversification in the global investment landscape.

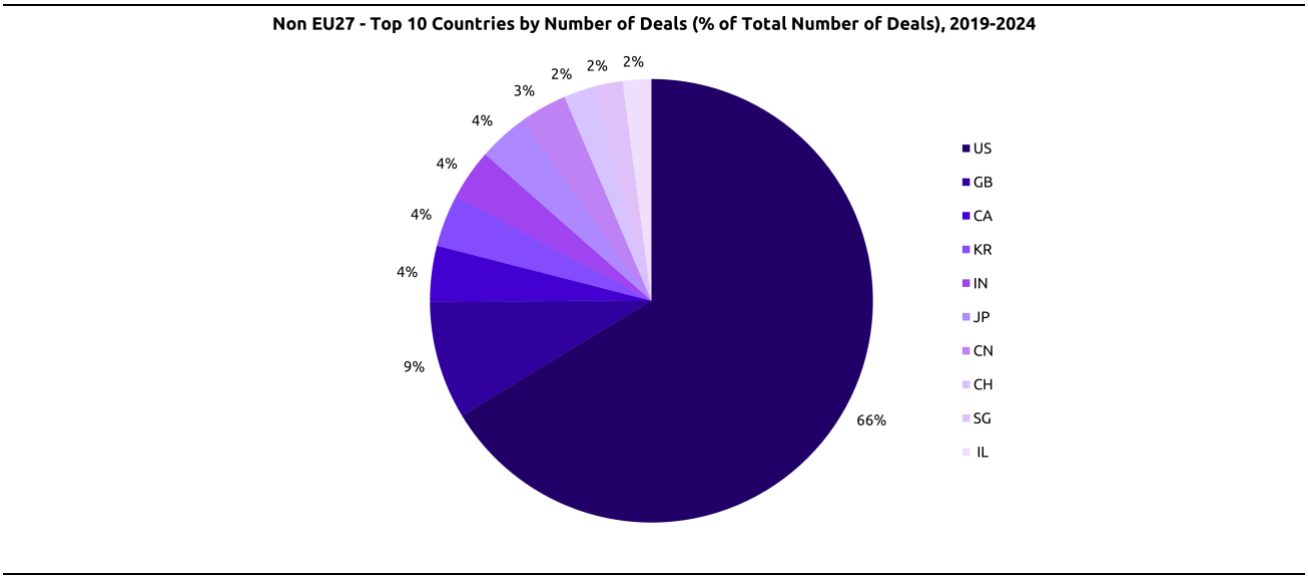


Figure 50: Leading Non-EU27 Countries by Number of Digital Health Deal (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Overall, the results indicate that between 2019 and 2024, global investment in digital health from **private capital markets** peaked during the COVID-19 pandemic before entering a correction phase, with the United States alone accounting for over 80% of total capital deployed. In contrast, the EU27 exhibited a more stable yet comparatively modest investment trajectory, heavily reliant on venture capital, similar to trends observed in other regions, and showing limited engagement from later-stage or institutional investors. Within the EU, Germany and France led in both deal volume and count, though regional disparities remain pronounced, particularly in Central and Eastern Europe. Compared to non-EU markets, which benefit from more diversified investor profiles and larger deal sizes, the European Union appears to face structural challenges in scaling digital health innovation. Addressing funding gaps, broadening capital sources, and essential to enhancing the EU's competitiveness and fostering ecosystem maturity.

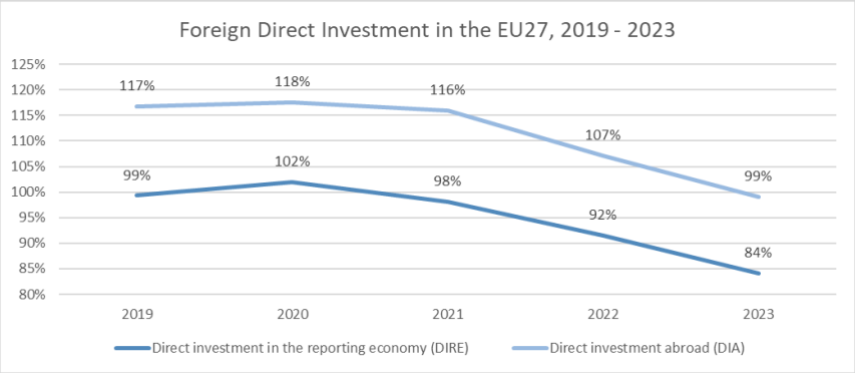
Foreign Direct Investment in the EU: Outward and Inward Trends in Context (2019–2023)

Foreign Direct Investment (FDI)is a key component of the balance of payments and reflects long-term economic linkages between countries. It occurs when a resident entity in one economy acquires a lasting interest (defined as ownership of 10% or more of voting rights or equity capital) in an enterprise located in another economy. This investment may take the form of a new business establishment (greenfield investment) or the purchase of an existing firm through mergers and acquisitions (see Eurostat, Globalization of Businesses, information on Data https://ec.europa.eu/eurostat/web/globalisation-businesses/information-data).

To enable cross-country and temporal comparisons, **cumulative FDI stocks are expressed as a percentage of GDP of a country or region (FDI stocks in % of GDP).** This normalization adjusts for differences in economic size, allowing policymakers to assess the relative importance of FDI in national or regional economies. A rising ratio may indicate greater integration into global value chains and investor confidence, while a decline could reflect divestments, slower capital flows, or shifting strategic priorities.

Although Eurostat **data do not allow sector-specific analysis** at the **granularity required for digital health technologies,** given the limitations in disaggregating by detailed **NACE codes** (such as *Section J: Information and Communication*, including NACE 62: Computer programming, consultancy and related activities, and 63: Information service activities), macro-level trends in FDI provide useful context for understanding broader investment dynamics within the EU economy.

Outward and Inward Foreign Direct Investment in the EU27, 2019 - 2023



Source: Consortium's Analysis on Eurostat Data - EU direct investments indicators in % of GDP, impact indicators and rate of return on direct investment (BPM6 - DOI: https://doi.org/10.2908/BOP_FDI6_IND), April 2025

According to Eurostat, the **European Union (EU27)** has experienced notable shifts in both **outward and inward FDI stocks (as % of GDP)** between 2019 and 2023:

- **Direct Investment Abroad (DIA)** – reflecting the stock of investments held by EU-based enterprises in foreign economies – declined from 117% of GDP in 2019 to 99% in 2023. This reduction may reflect a moderation in outward expansion, changes in corporate internationalisation strategies, or a relative increase in nominal GDP outpacing FDI growth. Despite this drop, the 2023 level still indicates a high degree of external engagement and global footprint by EU firms.
- **Direct Investment in the Reporting Economy (DIRE)** – indicating the stock of foreign direct investments within the EU – fell from 99% of GDP in 2019 to 84% in 2023. This trend may signal a reduction in inward investor appetite, potentially shaped by geopolitical uncertainty, a realignment of global supply chains, or an increasing emphasis on strategic autonomy and digital sovereignty in key sectors.

Taken together, these shifts point to a **gradual recalibration of the EU27's foreign direct investment profile**, influenced by structural trends such as the post-pandemic economic recovery, the green and digital transitions, and the emergence of new global investment regimes. **While not specific to the digital health technology market**, these broader macro-financial dynamics offer **critical context** for evaluating the EU27 overall **investment attractiveness** and its capacity to mobilize international capital. In particular, the **decline in both inward and outward FDI suggests a reduced role for the EU in global capital flows,** an environment that may constrain the growth trajectory of innovation-led sectors, including digital health, by limiting access to scale-up funding and cross-border expansion opportunities.

4.4 Emerging Digital Health technology trends

Emerging Digital Health Technologies in the European Union: Key Takeaways Landscape and Maturity Snapshot

In the European Union, the emerging digital health technology pipeline spans three readiness bands. AI-powered diagnostic tools are transitioning from pilots to routine clinical use, supported by growing operational deployment and MDR compliance efforts. Next-generation virtual care and AI-based hospital infection warning systems are at the large-scale pilot stage, with demonstrated use in real-world settings but still facing integration and scaling barriers. In contrast, virtual human twins and novel biological sensors remain in early-stage development, primarily concentrated in EU-funded research consortia and limited clinical trials.

- **AI investment is nearly universal:** 94% of healthcare providers are either using or planning to invest in AI within four years. Top use cases include clinical decision support (58%), early diagnosis (53%), and remote monitoring (44%), while AI applications at the administrative and operational level, such as supply chain, workflow automation, and quality management, remain underutilised despite high efficiency potential and fewer data governance constraints. AI is a top strategic growth area for digital health vendors, with 46% prioritising AI/ML investment, reinforcing its cross-cutting role across diagnostics, monitoring, and virtual care.
- **AI-powered diagnostic tools lead in maturity and adoption**: Currently used by 28% of healthcare providers, with 50% planning adoption by 2029. Nearly 40% consider them critical to achieving strategic goals, placing these tools at TRL 7–8, the highest among assessed technologies.
- **Next-generation virtual care & monitoring poised for rapid uptake**: Adoption is projected to reach 91% by 2029. Currently at TRL 6–7, these technologies are recognised for enabling personalised, remote care, though broader integration is hindered by fragmented reimbursement and workflow challenges.
- **AI-based hospital infection warning systems gaining traction**: Now used by 20% of providers, with 74% planning adoption by 2029. Estimated at TRL 6–7, these systems support early sepsis detection and AMR surveillance, but face data fragmentation and trust barriers.
- **Virtual human twins show strategic momentum, but low maturity**: Only 10% of providers currently use them, though 51% plan adoption by 2029. With TRL 4–5, supported by major EU projects (e.g. EDITH, VITAL, ARTEMIS), this field is advancing in simulation and academic settings but remains early-stage for clinical deployment.
- **Novel biological sensors progressing unevenly**: Ingestible sensors are currently used by 12% of providers, with 50% planning adoption; wearable biosensors show stronger uptake potential, with 60%+ projected adoption by 2029. Technologies are assessed at TRL 5–6, advancing through EU R&D but still face safety, usability, and regulatory hurdles.
- **IoT is the most mature adjacent enabler**: 30% of providers already use IoT, and an additional 47% plan to adopt. It underpins interoperability, real-time monitoring, and data integration for multiple digital health applications.

4.4.1 Methodology and overview of key technology assessed for the analysis of emerging digital health technology trends

The digital health landscape in Europe is evolving rapidly, making it crucial to identify and analyse emerging technology trends to anticipate future market trajectories, inform investment strategies, and guide policymaking at both national and EU levels.

This section builds on extensive desk research, expert interviews, and surveys insights to examine a selection of high-impact innovation areas that are shaping the next generation of digital health technologies in Europe. The technologies highlighted here were selected based on their strategic relevance, clinical potential, and alignment with recent global and European focused studies, including the 2023 WHO report emerging technologies and scientific innovations a global public health perspective[37] and the European Innovation Council Tech Report 2024[38], as well as in recent EU-funded research and initiatives[39] and academic literature[40].

Key Innovation Areas Assessed[41]:

- **Virtual Human Twins / Digital Patient Twins:** Patient-specific digital replicas of organs, tissues, or physiological systems, continuously updated using real-world data (e.g. electronic health records, imaging, wearable sensor data, laboratory results, etc.) and computational models. These twins enable:
  - Clinical decision support: simulate treatment responses.
  - Predictive health insights: anticipate disease progression and individual risk profiles.
  - Personalised treatment: optimise interventions based on individual biology and genetics.
- **AI-Powered Diagnostic Tools:** AI-driven systems that enhance diagnostic accuracy, consistency, and speed across modalities including imaging, pathology, and clinical data integration. Key applications include:
  - Medical image interpretation (e.g. MRI, CT, X-ray).
  - Workflow prioritisation and triage automation.
  - Digital pathology: tumour classification, histopathology, biomarker detection.
  - Predictive diagnostics: early disease identification using multi-source data.
- **Next-Generation Virtual Care and Patient Monitoring:** Integrated AI-enabled platforms that combine real-time clinical, behavioural, and environmental data to deliver proactive, personalised, and remote care. These systems extend beyond traditional telehealth through:
  - Multimodal data integration: e.g. wearables, genomics, patient-reported outcomes.
  - Predictive analytics: hospitalisation risk, treatment response.
  - Immersive tech (VR/AR): used in mental health, pain management, rehabilitation.
- **Novel Biological Sensors:** Advanced wearable, ingestible, or implantable biosensors designed for continuous, minimally invasive monitoring of physiological and biochemical markers. These sensors often incorporate:
  - Miniaturised, medical-grade electronics and IoT communication.
  - On-device AI analytics for personalised, real-time health feedback.
  - Applications in chronic disease management, early detection, and preventive care.
- **AI-Based Hospital Early Infection Warning Systems:** Real-time surveillance platforms using advanced analytics and machine learning to detect early signs of infection and potential outbreaks within hospital settings. These systems analyse:

[37] WHO, "2023 emerging technologies and scientific innovations: a global public health perspective"
[38] European Innovation Council Tech Report 2024 DOI 10.2826/6693253
[39] Such as the "European Cancer Imaging Initiative", one of the flagships of the Europe's Beating Cancer Plan (EBCP) and focus on to make the most of the potential of data and digital technologies such as Artificial Intelligence (AI) or High-Performance Computing (HPC) to combat cancer.
[40] Such as: "Emerging Technologies for Next Generation Remote Health Care and Assisted Living," in IEEE Access, vol. 10, pp. 56094-56132, 2022,.; "Development and validation of artificial intelligence models for early detection of postoperative infections (PERISCOPE): a multicentre study using electronic health record data"The Lancet Regional Health – Europe, Volume 49, 101163;
[41] For complete definitions please refer to Annex A1

- EHRs, vitals, lab results, and environmental data.
- Staff movement and transmission patterns.
- Use cases include sepsis alerts, hospital-acquired infection monitoring, and antimicrobial resistance surveillance.

These technologies represent promising frontiers in digital health, each with distinct levels of technological maturity, adoption, and integration potential within European healthcare systems. The analysis that follows assesses each technology's **Technology Readiness Level (TRL)**, current and projected adoption by healthcare providers, and associated policy implications. To support this, the study team applied a TRL framework[42] specifically adapted for digital health, underpinned by a comprehensive, multi-source data collection strategy (see **Figure 51)**. This includes quantitative adoption data from the European Healthcare Providers Survey, expert interviews, and desk research.

TRL Level	Description	Digital Health Context	Assessment Methods Used by Researchers and Companies
1	Basic principles observed.	Initial concept of the digital health solution.	Literature review, expert interviews, and patent analysis.
2	Technology concept formulated.	Potential applications identified in healthcare.	Feasibility studies and market gap analysis.
3	Experimental proof of concept.	Initial prototype/MVP developed.	Initial lab testing, user feedback, and technical documentation reviews.
4	Technology validated in lab.	Basic functionality tested in controlled environment.	Usability tests, security assessments, and performance benchmarking of solutions.
5	Technology validated in relevant environment.	Testing in simulated healthcare setting.	Pilot studies, feedback from healthcare professionals, and testing of integration with other relevant digital technologies in the target environment.
6	Technology demonstrated in relevant environment.	Clinical setting demonstrations.	Small-scale clinical trials and real-life implementations providing the first real-world evidence of outcomes and benefits.
7	System prototype demonstration in operational environment.	Full-scale prototype in actual healthcare settings.	Extended clinical trials and implementations in healthcare organizations, regulatory compliance assessments.
8	System complete and qualified. All functionality completed and validated.	Final clinical validation.	Full regulatory approval achieved, marking the start of post-market surveillance and monitoring.
9	Actual system proven in operational environment.	Widespread adoption and commercial success.	Extensive real-world evidence gathered on elements such as user satisfaction, business benefits and health outcomes.

Figure 51: Key stages of Technology Readiness Level (TRL)

Source: Consortium re-elaborated from TRL description in "Horizon Europe Work Programme 2023-2025 13. General Annexes"

This section primarily references healthcare providers' survey data shown in **Figure 52** and **Figure 53** with additional insights drawn from the vendor survey results in **Figure 29**. However, the overall TRL assessment also incorporates additional data from both surveys on adjacent technology areas and topics, as well as insights from literature review and secondary research, offering a more comprehensive understanding of adoption trends, maturity levels, and interdependencies within the digital health ecosystem.

[42] Horizon Europe Work Programme 2023-2025 13. General Annexes

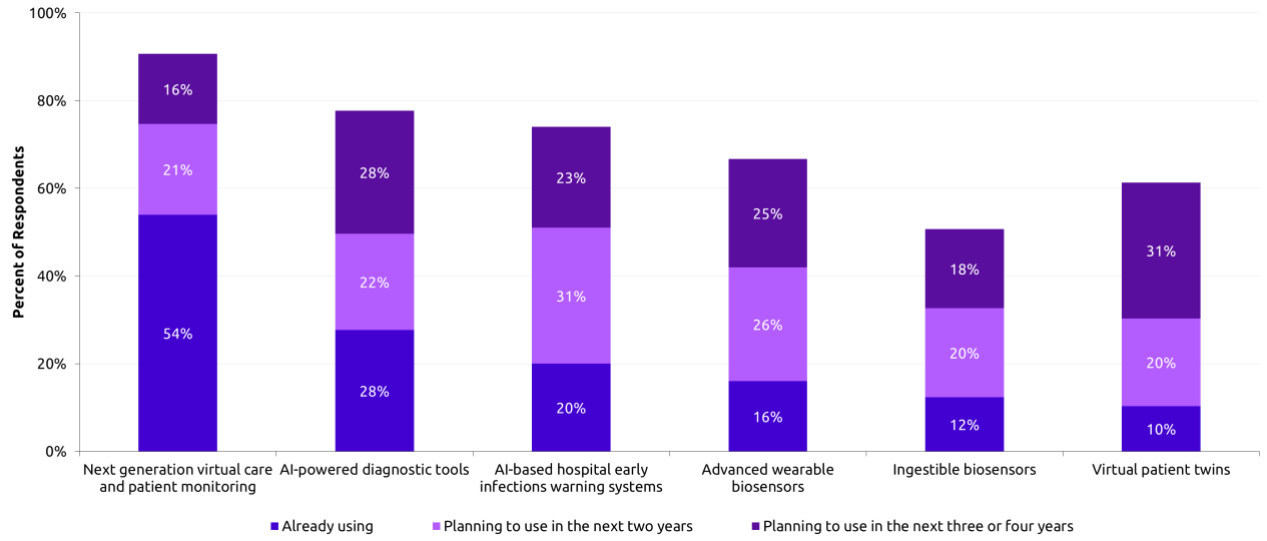


Figure 52: Emerging Technology Investment Plans Providers

Source: Digital Technologies in Healthcare: Providers 2025 survey. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Q. Which emerging technologies and solutions does your organization use or is it planning to use in the next four years?

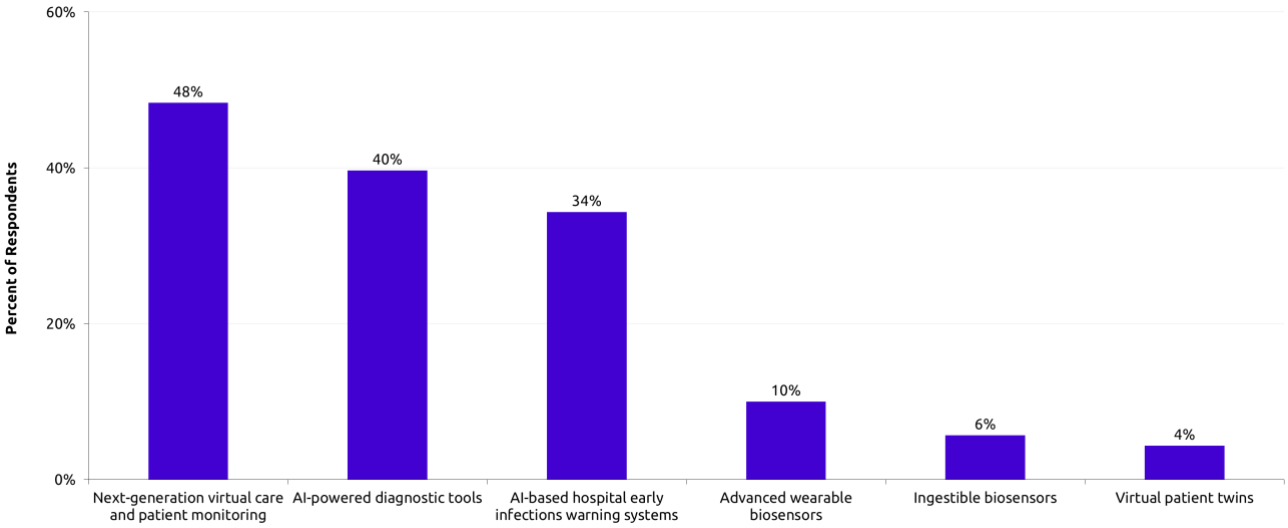


Figure 53: Emerging Technologies Deemed Critical to Achieving Organizational Goals

Source: Digital Technologies in Healthcare: Providers 2025 survey. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Q. Which of the emerging technologies and solutions that your organization uses or plans to use are crucial to achieving your organization's objectives?

4.4.2Virtual Human Twins / Digital Patient Twins

Insights from desk research, executive interviews, and anecdotal evidence—including the relatively higher number of active companies compared to other global regions—highlight Europe as a particularly dynamic market for Virtual Human Twins, supported by dedicated funding initiatives at both EU and Member State levels. A key initiative is the European Virtual Human Twins Initiative, launched in December 2023 as a framework to support the emergence and adoption of the next generation of virtual human twins solutions

in health and care.[43] The Initiative includes the European Virtual Human Twin (EDITH) project[44], a Coordination and Support Action funded under the DIGITAL programme, which is developing a strategic roadmap for the integration of virtual human twins in health and care. This roadmap outlines key enablers, including interoperable data models, secure infrastructures, and standardised workflows. Ongoing research and validation initiatives include:

- Horizon Europe – Research and Innovation Actions on "Integrated, multi-scale computational models of patient patho-physiology for personalised disease management" (EUR 80 million), featuring projects such as:
  - VITAL: Virtual twins for personalised cardiovascular care[45]
  - SMASH-HCM: Stratification and guidance of hypertrophic cardiomyopathy patients using hybrid digital twin solutions[46]
  - GEMINI[47] and TARGET[48]: Multi-scale virtual twins for ischaemic and haemorrhagic stroke, including atrial fibrillation-related stroke management
  - CERTAINTY: Virtual twins for personalised cellular immunotherapy in cancer[49]
  - VIRTUAL BRAIN TWIN: Personalised digital twin models for psychiatric disorder management[50]
  - ARTEMIS: Virtual twins for personalised management of metabolic liver disease[51]
  - dAIbetes: Federated virtual twins for privacy-preserving, personalised treatment outcome prediction in type 2 diabetes[52]
- Projects funded under the Innovative Health Initiative (IHI): Supporting the development of predictive computational models for comprehensive stroke management, integrating patient health data and advanced visualisation tools[53].
- Projects funded under the Digital Europe Programme (DIGITAL): Funding the deployment of a pan-European federated infrastructure for Intensive Care Unit (ICU) data integration[54]. This initiative supports the development of data-intensive computational models and virtual twin-based decision-support tools, and ICU data integration and data sharing frameworks contributing directly to the implementation of the European Health Data Space (EHDS).

These initiatives are collectively contributing to the advancement of Virtual Human Twins towards clinical readiness, demonstrating the EU's leadership in fostering innovation and establishing enabling conditions for future large-scale adoption.

The EU is also home to a growing and lively industry ecosystem with global reach. For instance, Dassault Systèmes has partnered with the U.S. Food and Drug Administration (FDA) on the ENRICHMENT project, which uses virtual heart models for in silico clinical trials. This initiative enables the evaluation of medical devices without human or animal testing and has produced the ENRICHMENT Playbook, a regulatory guide for integrating virtual twins into medical innovation, improving patient safety and accelerating device development.[55]

[43] European Commission (2025)
[44] EDITH (2025)
[45] European Commission (2025)
[46] European Commission (2025)
[47] European Commission (2025)
[48] European Commission (2025)
[49] Certainty (2025); European Commission (2025)
[50] European Commission (2025)
[51] European Commission (2025)
[52] European Commission (2025)
[53] Umbrella (2025)
[54] European Commission (2025)
[55] Dassault Systemes (2025); Aycock, K. I., Battisti, T., Peterson, A., Yao, J., Kreuzer, S., Capelli, C., Pant, S., Pathmanathan, P., Hoganson, D. M., Levine, S. M., & Craven, B. A. (2024); FDA (2023)

The current Technology Readiness Level (TRL) for Virtual Human Twins / Digital Patient Twins is estimated by the study team at **TRL 4–5** (Validation in Laboratory / Relevant Environment). The technology has advanced beyond the conceptual stage, with proof-of-concept applications demonstrated in controlled settings, including organ-on-a-chip platforms, tumour modelling, and cardiac electrophysiology. Validation is ongoing in laboratory environments and limited clinical simulations, particularly within academic centres and EU-funded research initiatives. Several programmes are actively advancing this technology across a range of clinical areas.

Healthcare provider survey data reveal that only 10% currently use Virtual Human Twins, yet 51% plan adoption by 2029 (**Figure 52**). This significant projected growth signals strong conceptual traction, with expected progression to TRL 6–7, contingent on addressing data heterogeneity, interoperability challenges, and the availability of supportive policy and infrastructure frameworks.

Table 2: TRL Assessment of Virtual Human Twin

TRL	Description	Assessment
TRL 1–3	Scientific research begins to be translated into applied R&D	Achieved: Strong academic base and EU funding support models and infrastructure development.
TRL 4	Technology validated in lab	Ongoing: Predictive models developed for organs (e.g., heart, liver, brain) and diseases (e.g., cancer, neurodegeneration); early simulations of treatment impact have been validated in silico.
TRL 5	Technology validated in relevant environment	Emerging: Used in early clinical simulation (e.g., pre-surgical planning, health professional training, rare disease modelling) but lacking sizable number of robust and generalizable clinical trials.
TRL 6–7	Demonstration in clinical environments	Limited: Small pilots in academic hospitals but clinical workflow integration and decision impact are not yet fully demonstrated.
TRL 8–9	Full deployment & market-ready	Not yet achieved.

Source: Consortium Assessment based on literature review[56], survey insights, and expert interviews.

4.4.3AI-Powered diagnostic tools

AI-powered diagnostic tools, trained on large-scale clinical datasets such as medical imaging, histopathology, and multimodal patient data, are rapidly reshaping diagnostic workflows—particularly in radiology, oncology, and pathology. These technologies enhance or automate diagnostic decision-making, enabling earlier disease detection, greater accuracy, and more consistent clinical outcomes. With active deployment in several European and international healthcare organisations, use cases include for example AI-assisted stroke detection, lung nodule classification, musculoskeletal triage, dementia risk estimation, Gleason scoring for prostate cancer, and intraoperative diagnostics for paediatric brain tumours.

This expanding range of clinical applications reflects a maturing ecosystem of commercial and research-driven AI diagnostic tools. Notably, the **European Cancer Imaging Initiative**[57] aims to make the most of the potential of data and digital technologies such as AI to combat cancer. The cornerstone of the Initiative is the **Cancer Image Europe** platform developed by the **EUCAIM** project: a **pan-European federated infrastructure** of harmonised and standardised **cancer imaging data**, available to researchers and innovators in a privacy-preserving setting[58]. The goal is to foster the development of AI-driven innovations to advance personalised and precision medicine for cancer patients.

[56] Please refer to notes throughout this section on Virtual Human Twins
[57] European Commission (2025)
[58] EUCAIM (2025)

EUCAIM builds upon the results of the work of the AI4Health Imaging[59] group of EU-funded projects under Horizon 2020, advances AI solutions for cancer diagnostics in radiology and pathology. Key initiatives include:

- CHAIMELEON[60] Developing a cancer imaging repository to accelerate the transition of AI tools from lab to market.
- ProCAncer-I[61] Building an AI-based platform for prostate cancer diagnostics, integrating imaging data and predictive models to support precision care through prostate cancer's continuum.
- INCISIVE[62] Creating a multimodal AI toolbox and interoperable imaging repository to enhance cancer diagnosis, prognosis, and monitoring.
- EuCanImage[63] Establishing a pan-European cancer imaging platform linking biological and health data to drive AI-enabled precision oncology.

Initiatives focused on clinical validation are also emerging to demonstrate the real-world applicability of AI diagnostic technologies. An example is AIDA, a Swedish research and innovation arena dedicated to artificial intelligence in medical image analysis. AIDA brings together academia, healthcare, and industry to translate AI advancements into clinically effective tools that benefit patients. The initiative operates within the Medtech4Health Strategic Innovation Programme, and is jointly supported by VINNOVA, Formas, and the Swedish Energy Agency[64].

Many tools are undergoing conformity assessments under the evolving EU Medical Device Regulation (MDR), placing their current maturity at **TRL 7–8, signifying** systems demonstrated in operational environments.

Healthcare providers' survey data reinforce this maturity analysis: 28% of respondents reported current use of AI powered diagnostic tools, with an additional 50% planning adoption by 2029. This growth trajectory indicates high levels of trust-building, clinical readiness, and demand for AI integration, especially in high-volume diagnostic domains as pathology. The healthcare providers survey also reveals that 40% of respondents consider AI-powered diagnostic tools to be crucial in achieving their organisation's strategic objectives, highlighting the growing role of AI in supporting diagnostic accuracy and efficiency (**Figure 53**). These figures should be interpreted also in comparison with related adoption trends in adjacent areas such as advanced diagnostic systems for genomics, radiology and pathology (see section European healthcare providers' digital health adoption and future investment plans), to contextualise maturity and readiness across interconnected digital health domains.

Despite these advances, several barriers remain. These include the need for greater explainability and transparency, seamless interoperability with existing IT infrastructures, and regulatory clarity under both the AI Act and MDR frameworks as also confirmed by executive interviews. Additionally, concerns regarding bias and generalisability persist, as tools are often trained on demographically narrow datasets. To accelerate progress toward TRL 9 and widespread clinical adoption, policies should prioritise streamlined regulatory pathways, procurement incentives, and workforce training to ensure safe, equitable, and effective deployment of AI diagnostics across Europe.

[59] European Commission (2025)
[60] Chaimeleon (2025)
[61] Procancer-i
[62] Incisive project (2025)
[63] Eucanimage (2025)
[64] AIDA (2025)

Table 3: TRL Assessment of AI Powered Diagnostic Tools

TRL	Description	Assessment
TRL 1–3	Conceptual development	Completed: AI/ML methods and use cases well-defined (e.g., convolutional neural networks for image classification)
TRL 4–5	Lab / prototype validation	Achieved: Validation in curated datasets (e.g., LIDC-IDRI[65] for lung nodules, TCGA[66] for digital pathology)
TRL 6–7	Demonstration in relevant / operational environment	Ongoing: Used in clinical pilots, decision-support for radiologists, and workflow assistance (e.g., stroke triage, prostate cancer classification)
TRL 8	Complete system qualified in operational environment	Emerging: Certified tools in some hospital deployments with evidence of improving workflow and diagnostic accuracy (e.g. Aiforia)
TRL 9	Full commercial deployment	Select tools approaching TRL 9 but limited generalizability across healthcare systems and countries

Source: Consortium Assessment based on literature review, survey insights, and expert interviews.

4.4.4Next-generation virtual care and patient monitoring

Next-generation virtual care and patient monitoring technologies represent a convergence of AI-driven remote monitoring, clinical decision support, automation, and immersive tools such as ambient sensors and VR/AR. These solutions are shaping the evolution of remote care delivery, particularly in chronic disease management, rehabilitation, mental health, and home-based care, with less invasive and more natural patient interaction model. Healthcare providers' survey results indicate that next-generation virtual care and patient monitoring are among the most promising emerging technologies, with strong expectations that they will play a critical role in advancing organisational objectives and improving care delivery (**Figure 53**). With successful pilot implementations of predictive vital sign monitors, symptom forecasting tools, and fall detection systems, alongside the growing clinical use of VR for stroke recovery, pain management, and phobia therapy, the technology is currently estimated by the study team at **TRL 6–7**, reflecting demonstration in real-world clinical environments.

Survey data shows optimistic uptake projections, with total expected adoption projected to surpass 80% by 2029. This reflects substantial momentum toward broader deployment; however, current implementation remains uneven across Member States. These figures should be interpreted in comparison with related adoption trends in adjacent areas such as virtual care and hospital-at-home models, to contextualise maturity and readiness across interconnected digital health domains.

Several European and international research initiatives are advancing the evidence base for these technologies. The VITALISE project (Horizon 2020), for example, is enabling living lab infrastructures to support real-world experimentation in digital rehabilitation and remote care solutions across multiple EU countries[67]. Similarly, HOLOBALANCE, another Horizon 2020 project, explores the use of augmented reality and AI for personalised balance training in older adults, using smart wearables and cognitive-motor exercises[68]. Other examples include the use of VR for chronic pain therapy at Charité University Hospital in Germany[69] and post-stroke cognitive rehabilitation at IRCCS San Camillo in Italy[70], both supported by EU digital health funding schemes.

Despite increasing technological maturity, several persistent barriers, affecting both next generation and traditional virtual care and patient monitoring solutions, continue to hinder full integration into routine

[65] Lung Image Database Consortium and Image Database Resource Initiative
[66] The Cancer Genome Atlas
[67] Vatalise project (2025)
[68] Holobalance (2025)
[69] Stamm, O., Dahms, R., Reithinger, N. et al. (2022)
[70] Wrzeciono, A., Cieślik, B., Kiper, P. et al. (2024); Salvalaggio S, Turolla A, Andò M, et al. (2023)

healthcare delivery. These include fragmented virtual care reimbursement mechanisms, inconsistent data quality from wearable devices, workflow integration challenges, and gaps in digital literacy among both clinicians and patients[71]. Addressing these obstacles, particularly through harmonised funding and market access frameworks, expanded living lab infrastructures, and robust interoperability, will be essential for advancing this technology to TRL 8 and beyond, enabling scalable, personalised care delivery across Europe.

Table 4: TRL Assessment of next-generation virtual care and patient monitoring technologies

TRL	Description	Assessment
TRL 1–3	Concept, early development	Completed: Prototypes of predictive monitoring tools, telehealth platforms, VR therapy validated in academic R&D
TRL 4–5	Lab/relevant environment	Achieved: Simulations and early pilots in rehabilitation (e.g. stroke, Post-Traumatic Stress Disorder), chronic disease management, and training
TRL 6	Demonstration in operational setting	Ongoing: AI-powered alert systems and virtual wards deployed in real-world care pathways (e.g., Chronic Obstructive Pulmonary Disease, diabetes) across EU member States
TRL 7	System prototype in clinical use	Emerging: Some success in workflow integration, especially in hospital-at-home and post-acute care pathways
TRL 8–9	Certification, full-scale deployment	Not yet achieved at full scale across most EU Member States

Source: Consortium Assessment based on literature review[72], survey insights, and expert interviews.

4.4.5 Novel biological sensors

Novel biological sensors, comprising advanced wearables, ingestibles, and implantables, are digital health tools for continuous, real-time monitoring of physiological, biochemical, and metabolic parameters. These technologies hold transformative potential for personalised care, early detection, and preventive health interventions, leveraging innovations in miniaturised electronics, materials science, new biosensors technologies, wireless communication, and embedded AI for smart collection and interpretation of data. Currently generally estimated at **TRL 5–6**, these technologies are undergoing clinical validation in real-world environments, marking the transition from consumer wellness applications to regulated medical use.

A broad range of use cases across different medical specialties is currently under development and validation, including, for example, sweat-based sensors for hydration and electrolyte monitoring, skin patches for non-invasive glucose and lactate tracking, and ingestible diagnostics for gastrointestinal assessment.[73] [74]. A growing body of EU-funded research, such as the ELSAH (Electronic smart patch system for wireless monitoring of molecular biomarkers for healthcare and well-being)[75] and the WELMO (Wearable Electronics for Effective Lung Monitoring)[76] projects funded under Horizon 2020, aims to demonstrate their feasibility in real-world environments.

Healthcare providers survey data highlights the early-stage maturity and diversity of these technologies. Ingestible biosensors are currently used by only 12% of healthcare providers, with combined adoption projected to reach 50% by 2029. In contrast, wearable biosensors show a stronger uptake trajectory, with

[71] As emerging from desk research and literature review see for example: Oudbier SJ, Souget-Ruff SP, Chen BSJ, et al. (2024); Tagne, J.F., Burns, K., O'Brein, T. et al. (2025); Gullslett MK, Ronchi E, Lundberg L, et al. (2025); Medtecheurope (2022); DIGTAL EUROPE (2024); Mckinsey & Company (2023)

[72] Please refer to notes throughout this next-generation virtual care and patient monitoring section

[73] Mukherjee, S.; Suleman, S.; Pilloton, R.; Narang, J.; Rani, K. State of the Art in Smart Portable, Wearable, Ingestible and Implantable Devices for Health Status Monitoring and Disease Management. Sensors 2022, 22, 4228.

[74] Thwaites PA, Yao CK, Halmos EP, Muir JG, Burgell RE, Berean KJ, et al. Review article: Current status and future directions of ingestible electronic devices in gastroenterology. Aliment Pharmacol Ther. 2024 ; 59: 459–474.

[75] European Commission (2025)

[76] European Commission (2025)

expected adoption for 2029 exceeding 60%. These differences indicate that biosensing technologies are not advancing uniformly, but rather following distinct adoption pathways based on their clinical readiness, usability, and integration potential. This trajectory underscores both the promise and the immaturity of the field.

To advance these technologies to higher TRLs, challenges must be addressed in areas such as biocompatibility and long-term safety, interference and calibration in variable environments, and ethical concerns over continuous and potentially invasive data collection[77]. In parallel, regulatory harmonisation, privacy-by-design frameworks, and dedicated trial infrastructure are needed to accelerate clinical validation and system integration.

Table 5: TRL Assessment of Novel Biological Sensors

TRL	Description	Assessment
TRL 1–3	Applied research	Completed: Materials science and miniaturised sensing platforms well explored
TRL 4	Lab validation	Achieved: In-vitro and animal testing of ingestible and continuous monitoring devices
TRL 5–6	Validation in relevant setting	Ongoing: Clinical trials underway for sweat sensors, glucose patches, and smart pills
TRL 7	Demonstration in healthcare system	Partial: Some CE-marked devices used for glucose monitoring, cardiac rhythm, or hydration
TRL 8–9	Widespread commercial deployment	Limited: Broad deployment hampered by safety, data integrity, and regulatory clearance hurdles

Source: Consortium Assessment based on literature review[78], survey insights, and expert interviews.

4.4.6AI-based hospital early infection warning systems

AI-based hospital early infection warning systems are transforming infection control by enabling real-time surveillance through the integration of electronic health records (EHRs), structured and unstructured clinical data, medical imaging, laboratory results, and sensor inputs. These solutions may operate as standalone software platforms or in combination with point-of-care diagnostics, for instance creating lab on a chip solution. These intelligent platforms detect early signals of infectious outbreaks, sepsis, and antimicrobial resistance (AMR) risks, allowing hospitals to intervene before clinical deterioration or cross-infection occurs. Currently estimated at **TRL 6–7,** these technologies have been validated in select hospitals, particularly in intensive care units (ICUs), oncology departments, paediatrics and infectious disease wards.

Findings from the Healthcare Providers Survey indicate that 20% of providers currently use AI-based infection alert systems, with projected adoption expected to reach 74% by 2029. Additionally, 34% of healthcare providers identify these systems as critical to achieving their organisational objectives, underscoring their perceived value in enhancing clinical responsiveness and operational efficiency (**Figure 52**, **Figure 53**). AI-driven early warning systems are already delivering tangible benefits, such as real-time sepsis alerts based on temperature, C-Reactive Protein (CRP), and vital sign data, detection of infection clusters, and heatmapping of hospital-acquired infections (HAI), supporting timely interventions and improved care outcomes[79]. AMR surveillance solutions, such as those integrating resistance gene profiles with antibiotic prescribing behaviour, are being piloted to support antimicrobial stewardship.

[77] Lu T, Ji S, Jin W, Yang Q, Luo Q, Ren T-L. Biocompatible and Long-Term Monitoring Strategies of Wearable, Ingestible and Implantable Biosensors: Reform the Next Generation Healthcare. Sensors. 2023; 23(6):2991; Kim, J., Campbell, A. S., de Ávila, B. E., & Wang, J. (2019). Wearable biosensors for healthcare monitoring. Nature biotechnology, 37(4), 389–406

[78] Please refer to notes throughout this section on Novel Biological Sensors

[79] Epelde, F. Revolutionizing Patient Safety: The Economic and Clinical Impact of Artificial Intelligence in Hospitals. *Hospitals* 2024, *1*, 185-194

Research projects rapidly multiplied during the COVID-19 pandemic as for instance the ICU4Covid initiative, supported under the Emergency Support Instrument, funded infrastructure for integrating real-time ICU data across Member States, contributing to infection and risk prediction efforts[80]. Today several European and international projects such the Targeted Real-Time Early Warning System (TREWS) developed by Johns Hopkins University[81], or EU funded SepTec project[82] demonstrate how these systems can identify sepsis cases early, leading to a significant reduction in mortality rate. Healthcare organisations are increasingly leveraging analytics and AI platforms to strengthen their hospital-acquired infection monitoring systems; for example, the Region of Southern Denmark has implemented the SAS AI platform to track and reduce hospital-acquired infections across its facilities[83]. EHR vendors such as Epic and Dedalus have developed early warning tools, including Epic's Infection Control Module and Dedalus's ICU sepsis dashboards, designed in alignment with clinical guidelines and mapped to standard medical terminologies. Additionally, medical device companies such as Thermo Fisher Scientific have developed solutions like SepsisFinder, which uses clinical decision support algorithms to generate real-time alerts for sepsis and hospital-acquired infections (HAIs).

Despite their promise and studies results, several barriers constrain advancement to TRL 8. Data fragmentation across hospital systems, and in particular interoperability with EHR systems, limits real-time performance[84]. Moreover, broader challenges associated with the application of AI in healthcare, such as the lack of interpretability, transparency of AI models and reproducibility of results, can contribute to issues like false positives and over-alerting, ultimately reducing clinician trust. In addition, integration with hospital antimicrobial stewardship programmes remains fragmented, limiting their overall systemic impact[85].

Policy support for hospital infrastructure modernisation, combined with inclusion of AI alert systems in national surveillance mandates, will be essential to scale these technologies. With improved data harmonisation and regulatory clarity, advancement to TRL 8 within the next 2–3 years is achievable, positioning AI-based infection warning systems as a core component of resilient, data-driven hospital care.

Table 6: TRL Assessment of AI-Based Hospital Early Infection Warning Systems

TRL	Description	Assessment
TRL 1–3	AI model design	Completed: Predictive models developed using retrospective datasets (EHR, labs, vitals)
TRL 4	Validation in lab setting	Achieved: Deployed in sandbox environments, with retrospective accuracy studies
TRL 5–6	Early hospital deployment	Ongoing: Real-world use in pilot ICUs, cancer wards, post-operative surveillance, paediatrics wards.
TRL 7	Operational demonstration	Achieved in select sites using alert dashboards
TRL 8–9	Nationwide deployment	Not yet consistent across EU due to variable data infrastructure, legal barriers

Source: Consortium Assessment based on literature review[86], survey insights, and expert interviews.

[80] European Commission (2025)
[81] Adams R, Henry KE, Sridharan A, et al. Prospective, multi-site study of patient outcomes after implementation of the TREWS machine learning-based early warning system for sepsis. Nat Med. 2022;28(7):1455-1460
[82] European Commission (2025)
[83] Sas (2025)
[84] Pennisi F, Pinto A, Ricciardi GE, Signorelli C, Gianfredi V. The Role of Artificial Intelligence and Machine Learning Models in Antimicrobial Stewardship in Public Health: A Narrative Review. *Antibiotics*. 2025; 14(2):134
[85] Cesaro, A., Hoffman, S.C., Das, P. et al. Challenges and applications of artificial intelligence in infectious diseases and antimicrobial resistance. npj Antimicrob Resist 3, 2 (2025)
[86] Please refer to notes throughout this section on AI based Hospital Infection Early Warning System

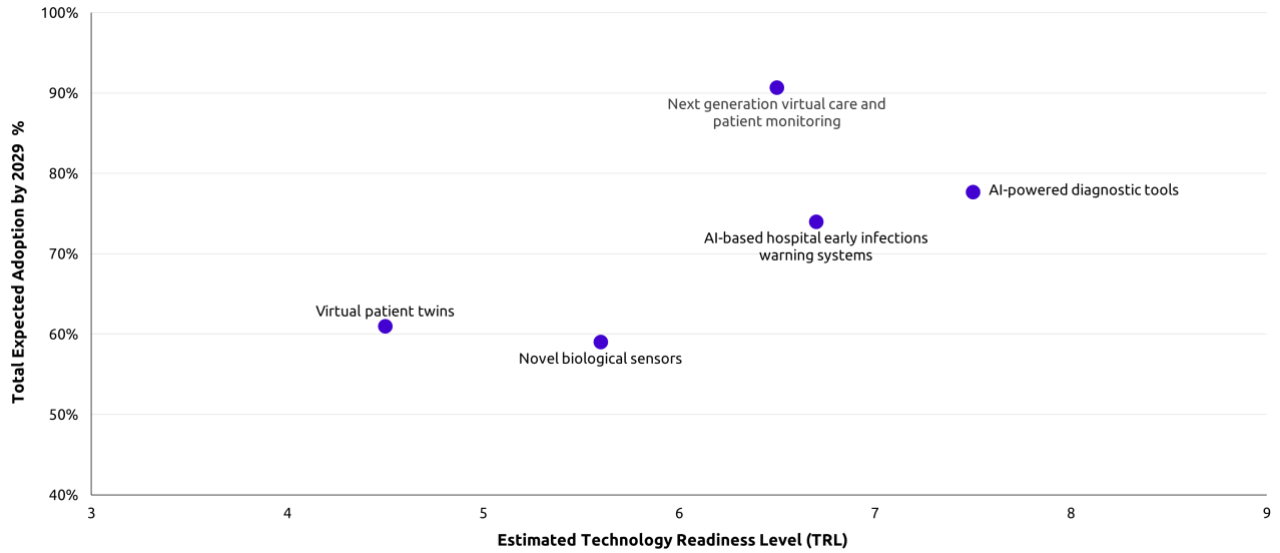


Figure 54: Comparative Analysis of Five Emerging Digital Health Technologies: Technology Readiness Levels (TRLs) vs Expected Adoption Rates by 2029

Source: Survey: Digital Technologies in Healthcare, Vendors, 2025. Respondents included a mix of executives at director level or above. Total sample: 70. TRL Study Team estimates and Q. Which emerging technologies and solutions does your organization use or is it planning to use in the next four years?

Figure 54 provides a comparative view of five emerging digital health technologies, aligning their estimated Technology Readiness Levels (TRLs) with total expected adoption rates by 2029 based on survey data. The scatterplot reveals a quite consistent alignment between technology maturity and adoption projections, highlighting three key clusters that can inform differentiated policy responses:

Sustain & Scale (High TRL, High Adoption)

- AI-powered diagnostic tools stand out as the most mature and widely accepted technology, nearing TRL 7-8 with an expected adoption near to 80%.
- This group is ready for greater scaling across EU, with a need for enhanced interoperability frameworks, procurement harmonisation, and inclusion in national clinical guidelines.

Accelerate Deployment (Mid TRL, High Adoption Intention)

- Next-generation virtual care and patient monitoring and AI-based hospital early infection warning systems are advancing toward TRL 6-7, with projected adoption rates of 91% and 74%, respectively.
- These technologies would benefit from targeted policies to accelerate clinical integration, including reimbursement reform, coordinated public procurement, targeted digital infrastructure investments.

Support Innovation (Low TRL, Moderate Adoption Potential)

- Virtual patient twins and novel biological sensors remain in TRL 4-5 and 5-6 stages, with more modest adoption projections (61% and 59%[87], respectively).
- These technologies require still require systemic enablers: R&D investment, particularly in real-world validation environments, regulatory sandboxes for iterative development, incentivised pilot schemes to bridge the gap between lab-based validation, proof of concept and healthcare deployment.

[87] Average of the projected adoption of wearable and ingestible biosensors

4.4.7 From enablers to niche innovations: adoption trajectories of adjacent emerging digital technologies

The Healthcare Providers Survey also examined adoption trajectories of complementary emerging technologies, such as IoT, AR/VR, hospital digital twins, 3D printing, robotics and drones, enabling and adjacent innovations that support or intersect with the core digital health technologies assessed (virtual patient twins, novel biosensors, AI powered diagnostics, AI-based hospital early infection warning systems, and next generation virtual care and patient monitoring). Some of these technologies act as enablers of primary solutions, while others represent more standalone innovations within the broader digital health ecosystem.

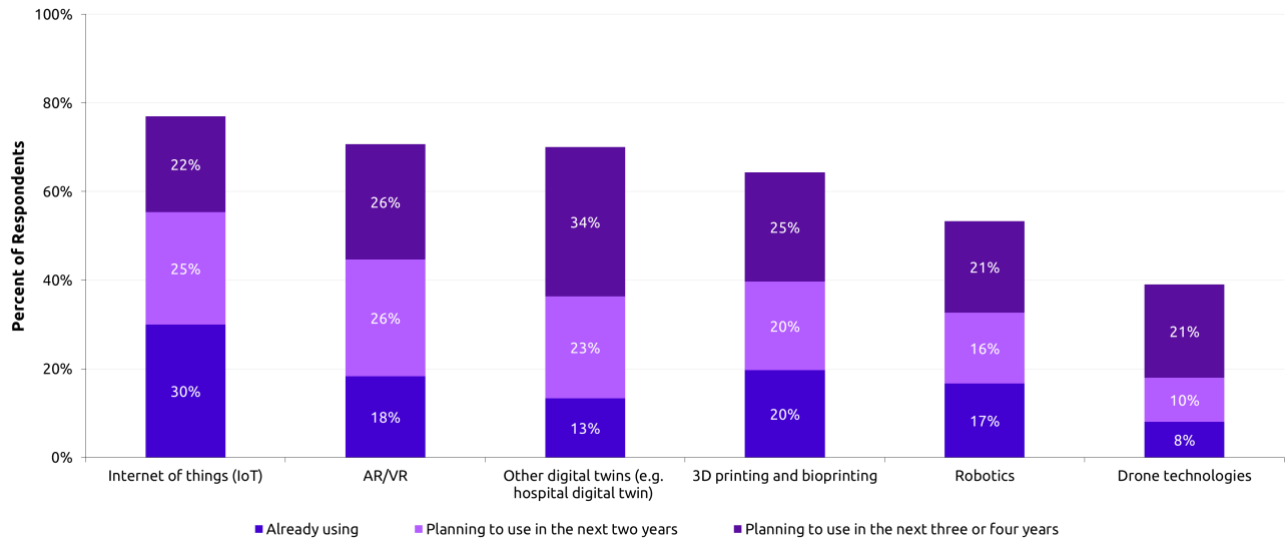


Figure 55: Adoption Trends of Adjacent Emerging Digital Technologies

Source: Digital Technologies in Healthcare: Providers 2025 survey. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Q. Which of the following emerging technologies and solutions does your organization use or is it planning to use in the next four years?

As shown in **Figure 55** the Internet of Things (IoT) emerges as the most widely adopted technology among those surveyed. With 30% of providers already using IoT and an additional 47% planning adoption within the next four years, it plays a foundational role in the digital health ecosystem. IoT underpins key functions such as real-time patient monitoring, virtual care delivery, and sensor data integration, and also serves as a critical data source for digital twin technologies. Its maturity and broad applicability make it a key enabler of system-wide interoperability and scalability.

AR/VR technologies are following a significant upward trajectory. Although only 18% of providers currently use AR/VR, more than half (52%) plan to adopt it by 2029. This growth aligns with expanding use cases in rehabilitation, pain management, and clinical training within virtual care environments. While still slightly behind compared to other advanced technologies, AR/VR is expected to transition from proof of concepts and pilots to integrated clinical applications in the coming years.

Hospital / healthcare organizations digital twins, including models for infrastructure and operational simulation, remain in the early phases of adoption. Currently used by just 13% of providers, they are gaining traction, with 34% planning to adopt over the next 3–4 years. These systems face similar challenges encountered by patient virtual twins around data integration, infrastructure requirements, and real-world validation, placing them at a lower projected adoption level despite growing strategic interest.

3D printing and bioprinting show moderate uptake, with 20% of providers already using these technologies and an additional 45% planning to adopt them. Their adoption is more specialised, with clear value in custom

medical device fabrication, implants, and regenerative medicine. While less transformative at scale than AI or IoT, 3D printing is proving highly valuable in surgical and orthopaedic contexts.

Robotics, generally associated with surgical innovation, seems to face adoption barriers. Only 17% of providers currently use robotics, and just 37% plan to adopt by 2029. High costs, complex integration, and limited interoperability and healthcare professionals' skills remain key challenges. Compared to other emerging technologies, especially AI driven diagnostics and virtual care technologies, survey results show a slower adoption path for robotics, though it's important to note that robotic systems are often hospital-targeted, and the survey sample includes both hospital and non-hospital healthcare providers.

Lastly, drone technologies remain the most nascent and narrowly adopted. With only 8% of providers currently using drones and 31% planning adoption, a majority (61%) report no plans to integrate them. Though drones offer promising use cases such as medical supply and lab sample transport, their uptake is constrained by logistical, air-space regulatory, and clinical validation challenges. As a result, drones remain highly specialised, with limited systemic integration to date.

4.4.8 AI in Digital Health: a cross-cutting driver of innovation

Artificial Intelligence (AI) has moved beyond the realm of experimentation and is now establishing itself as a mainstream pillar of digital transformation across the European healthcare landscape. The healthcare providers survey results highlight that AI is not only one of the most widely anticipated technologies, but also one of the most broadly applicable across clinical, operational, and strategic domains. It is increasingly regarded as a key enabler of innovation, underpinning many of the emerging technologies previously analysed.

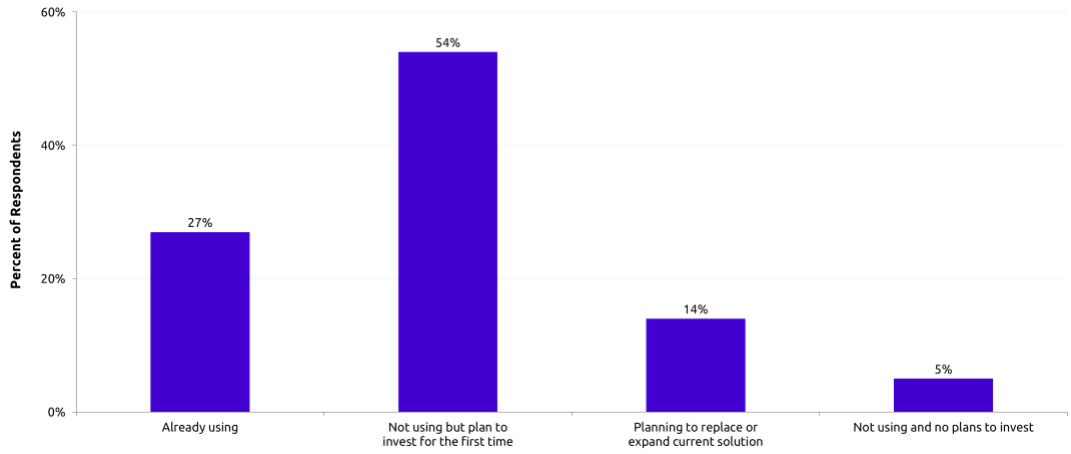


Figure 56: Healthcare Providers' Plans for AI Technology Investment

Source: Digital Technologies in Healthcare: Providers 2025 survey. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Q. Is your organization using or planning to invest in artificial intelligence (AI) technologies in the next four years?

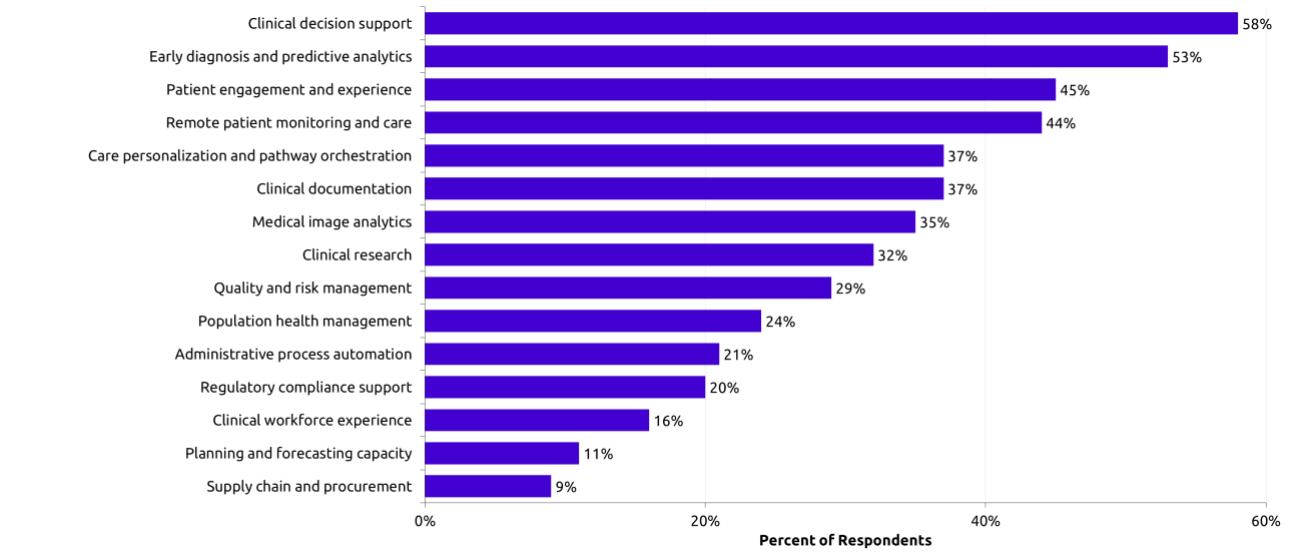


Figure 57: Healthcare Providers Key AI use cases

Source: Digital Technologies in Healthcare: Providers 2025 survey. Respondents included a mix of IT and line-of-business (LOB) decision-makers. Total Sample Size: N = 300 Q. What are or will likely be your organization's top AI use cases?

The survey reveals an overwhelming sector-wide commitment to AI investment. Only 5% of respondents report no intention to invest in AI over the next four years. In contrast:

- 27% are already using AI technologies;
- 54% are planning to invest for the first time;
- 14% intend to expand or replace their current AI systems.

In total, over 94% of healthcare providers are actively engaged in AI, either through current deployment or near-term investment plans. These figures reflect not only a strong appetite for digital innovation but also a sector-wide understanding that AI integration is becoming a strategic imperative (**Figure 56**).

Survey participants also identified a broad spectrum of AI use cases, with a pronounced focus on clinical value and operational efficiency **Figure 57**. The most cited applications include:

- Clinical decision support (58%);
- Early diagnosis and predictive analytics (53%);
- Patient engagement and experience (45%);
- Remote monitoring and care (44%);
- Clinical documentation and care pathway orchestration (37%).

While clinical functions remain the primary focus, the survey results indicate interest in applying AI to administrative processes, like regulatory compliance, workflow automation, and quality management. Interestingly, use cases such as supply chain optimisation, forecasting, and planning, areas with significant efficiency potential which are typically less sensitive from a data governance perspective, from the survey results seems to be under-prioritised despite their potential for high-impact implementation and efficiency gains. These areas represent untapped opportunities where AI could be rapidly tested and scaled to support broader system performance. Studies show that AI plays a pivotal role in transforming hospital operations and management. By integrating AI technologies, hospitals can optimise logistics and resource management, automate administrative tasks, and enhance patient flow and scheduling. AI systems can be used to predictively manage inventory, streamline facility operations, and optimize resource allocation, improving efficiency and reducing costs. Additionally, AI automates administrative processes like patient data management and revenue cycle management, enhancing accuracy and reducing workload. In patient

flow, AI optimises scheduling, reduces waiting times, and enhances overall patient experience, marking a significant advancement in healthcare management [88].

This robust commitment to AI also mirrors the Technology Readiness Level (TRL) assessments and adoption trajectories of the emerging technologies reviewed earlier. The findings confirm that AI readiness is a fundamental enabler of innovation across healthcare, supporting the deployment of digital twins, biosensors, advanced monitoring, and diagnostic systems.

Also from the **vendor survey**, AI emerges as a top strategic priority. As previously shown in **Figure 29** investment in AI is being actively pursued to support operational goals and product innovation. Moreover, AI is consistently ranked among the primary drivers of sustainable growth over the next four years (**Figure 23**), further validating its central role in shaping the future of healthcare technology markets.

[88] See for example, analysis on the potential of AI in healthcare supply chains in Deveci, M. Effective use of artificial intelligence in healthcare supply chain resilience using fuzzy decision-making model. *Soft Comput* (2023). Or a broader analysis of AI use cases and impact in Maleki Varnosfaderani, S.; Forouzanfar, M. The Role of AI in Hospitals and Clinics: Transforming Healthcare in the 21st Century. Bioengineering 2024, 11, 337

4.5 Comprehensive market structure and competitive landscape analysis of the EU Digital Health sector

EU Digital Health Market Analysis: Key Takeaways

- **Market Fragmentation and Competition**: **High.** The EU digital health market is highly fragmented, with significant variations in vendor concentration across Member States. In the Mapping, 15 EU Member States have five or fewer digital health vendors, while countries like Germany and France show high vendor density, creating regional disparities in competition levels. Competition mainly revolves around core health IT systems with 85% focusing on mature segments as EHRs and medical imaging, while emerging technologies like AI and genomics remain underrepresented. The market is service-oriented, driven more by operational modernization than by innovation.
- **Opportunities for New Entrants**: **Moderate to High.** Despite regulatory complexity, the sector's projected growth (from €11 billion in 2023 to €61.2 billion by 2035) offers significant opportunities for new entrants, especially in AI, data-driven solutions, and advanced cybersecurity. Despite strong market growth projections, high regulatory complexity (for 50% of vendors) and lack of interoperability (43%) continue to hinder expansion, especially for SMEs and startups.
- **Bargaining Power of Buyers**: **Moderate to High.** Healthcare providers have growing bargaining power, although in some case limited by the local nature of the suppliers. Providers prioritize solutions that demonstrate measurable benefits in cost-efficiency, patient outcomes, integration and interoperability.
- **Bargaining Power of Suppliers**: **High (for selected technology areas).** Suppliers of critical technologies (data infrastructure, cybersecurity, AI) hold considerable power, particularly non-EU vendors. Only 20% of EU vendors implement data sovereignty measures, and just 13% use standards-based or open-source technologies, indicating limited progress in reducing reliance on external platforms and tools.
- **EU Capabilities in Critical Enabling Technologies**: **Moderate.** The EU's capacity to develop and deploy critical enabling technologies like HPC, AI, and cybersecurity is growing but still lags behind global leaders like the US. Efforts are underway to strengthen local capabilities, R&D and reduce reliance on non-EU suppliers.
- **Strategic Focus**: To foster a competitive, resilient, and innovation-driven market, the EU should consider focusing on:
    - Strengthening local capabilities;
    - Simplifying regulatory complexities;
    - Improving interoperability;
    - Reducing reliance on non-EU suppliers for critical technologies.

4.5.1 Methodology for comprehensive market structure and competitive landscape analysis

This section presents a comprehensive analysis of the structure and competitive dynamics of the EU digital health technology market. By triangulating insights from surveys, literature review, the market mapping and segmentation exercise, and from expert interviews, the analysis explores market composition, entry barriers, dependencies and strategic positioning.

Leveraging Porter's Five Forces framework[89], the analysis assesses critical dimensions including market concentration, ecosystem resilience, foreign dependency, and growth potential. The framework analysis has been tailored to the specificities of the digital health landscape and aims to generate a nuanced, evidence-based understanding to inform targeted policy and investment decisions. It supports the identification of strategic levers to foster a more competitive, resilient, and innovation-driven market.

4.5.2 Intensity of rivalry among incumbent firms

The EU digital health market is highly fragmented, with substantial variations in vendor concentration across Member States. As shown in the market mapping and segmentation (see Figure 10: Number of Digital Health Vendors by EU27 Country (2025)), while countries like Germany and France have a high number of vendors, 15 Member States report five or fewer, leading to uneven competition levels across the region. This dynamic creates highly competitive environments in some countries and less intense competition in others. Companies looking to expand beyond their domestic markets must navigate significant regional differences in competition, demand, and technology adoption.

Most competition centres around core health IT systems (health data management, diagnostics, clinical workflows, and administrative tools), comprising over 85% of vendor activity. Emerging technologies like AI, digital twins, and genomics remain underrepresented, making the market less innovative and more focused on operational modernization.

Survey results confirm that vendors primarily focus on established sectors like EHRs, telehealth, and medical imaging, with less emphasis on frontier technologies. Although over half of respondents cite product innovation and investment as key competitive levers, current competition seems to centre on cost, functionality, and system integration, leading to a relatively undifferentiated market.

The lack of differentiation among products intensifies rivalry, driving a service-oriented market where vendors offer more personalized solutions and integration services to stand out. However, this strategy contributes to technological fragmentation and vendor lock-in, further increasing competitive pressures as it makes harder for customers to switch providers as they become reliant on specific platforms and technologies.

4.5.3 Opportunities for new entrants

The EU digital health sector presents both challenges and opportunities for new entrants. The Digital Health Vendors survey results show that regulatory complexity and market fragmentation discourage cross-border growth, reinforcing a siloed, country-specific market presence. As highlighted in expert interviews with digital health vendors and Medtech associations, navigating the interplay between multiple regulatory frameworks, such as the Medical Device Regulation (MDR), In Vitro Diagnostic Regulation (IVDR), the General Data Protection Regulation (GDPR), and national healthcare regulations, is widely perceived as a significant barrier to market entry. These challenges are further compounded by the fragmented nature of healthcare systems across Member States, inconsistent standards, and interoperability issues, making cross-border expansion costly and difficult. Such regulatory complexities complicate market entry and scaling, particularly for startups and SMEs.

[89] Harvard Business School (2025)

Despite these hurdles, the sector's projected growth (from €11.0 billion in 2023 to €61.2 billion by 2035) presents significant opportunities (see section EU Digital Health market size and). Increased investments in core technologies like EHRs, as well as innovative AI-driven solutions and advanced cybersecurity, create openings for new entrants. Vendors focusing on these areas, especially in AI and data-driven solutions, can secure a foothold. Survey responses indicate that 50% of vendors prioritize market leadership in niche areas, signalling a shift toward specialized, high-value solutions. Additionally, 46% are focusing on AI/ML and other emerging technologies, reinforcing their position in advanced digital health applications. New entrants can capitalize on existing gaps in advanced technologies and the increasing demand for patient-centred solutions if they effectively navigate the regulatory environment and target unmet needs within emerging technology areas.

4.5.4Bargaining power of buyers (healthcare providers)

Healthcare providers in the EU hold significant bargaining power in the digital health market. Healthcare providers' survey findings reveal that organisations prioritize solutions that deliver clear benefits in patient outcomes, cost-efficiency, and operational improvements, driven by increasingly complex health needs, constrained budgets, and rising healthcare costs **(Figure 4**). Providers are seeking solutions that offer measurable clinical and operational benefits, including improvements in clinician efficiency, patient throughput, medical equipment utilization, and the overall experience for both patients and healthcare professionals.

Expert interviews highlight the growing demand for solutions that seamlessly integrate into existing workflows, enhancing efficiencies and outcomes without disrupting current systems. The increasing need for interoperable solutions and evolving government policies further strengthens the bargaining power of healthcare providers. As providers face increasing pressure to meet regulatory requirements and patient care demands, they become more selective, favouring vendors whose solutions seamlessly integrate into existing workflows, offer interoperability, and adapt to their evolving needs, while demonstrating tangible improvements. Vendors who fail to address data and workflow integration, usability concerns, and lack a proven track record in the healthcare industry may struggle.

4.5.5Bargaining power of suppliers (data, infrastructure, talent)

In the EU digital health ecosystem, suppliers of critical enabling technologies (such as data infrastructure, cloud services, cybersecurity solutions, and emerging tools like AI and genomics) wield significant bargaining power. Non-EU vendors, particularly from the United States and the UK, are often at the forefront of innovation and market presence in these areas. These suppliers, who provide the foundational infrastructure for digital health technologies, hold considerable influence, as the sector cannot function without robust, secure systems.

This reliance on external suppliers creates a dependency that leaves the EU vulnerable to fluctuations in the global supply chain and geopolitical risks. As the EU strives to build a more resilient and sovereign digital health ecosystem, there is an increasing push to reduce this dependency. Efforts are underway to strengthen local capabilities through enhanced R&D, mandating compliance with EU standards, and stricter digital and data residency regulations. Survey data however shows that only 20% of vendors implement data sovereignty measures (e.g. EU-based hosting or local data storage), and a mere 13% report using standards-based or open-source technologies, suggesting vendors' reliance on proprietary, non-EU platforms (**Figure 36**).

Non-EU suppliers continue to play a dominant role, particularly in cybersecurity, where the growing sophistication of cyber threats has heightened their influence and 51% of vendors cite evolving cyber threats and 47% point to fragmented regulations as top challenges (**Figure 35**). However, as also shown by vendor survey responses, there is growing awareness within the EU ecosystem (reflected in 46% of vendors investing in in-house R&D and 40% diversifying their supplier base) that reducing reliance on dominant foreign players is essential for long-term resilience and autonomy (**Figure 36**).

4.5.6 Availability of EU capabilities in critical enabling technologies and substitutes

The EU's capacity to develop and deploy critical enabling technologies like cloud computing, high-performance computing (HPC)[90], cybersecurity, and AI is growing, but it still lags behind leading global markets like the US. The market mapping show that while some Member States, such as Germany and France, have made significant progress in areas like AI adoption and health data platforms, the overall ecosystem remains fragmented and dependent on external technology providers for critical infrastructure. Moreover, the dominance of **non-EU vendors in core areas like cybersecurity** reinforces Europe's structural reliance on external providers for key digital health components (**Figure 17**, **Figure 18**, and **Figure 19**).

This dependency poses challenges for the EU in scaling emerging and infrastructural technologies that could transform the healthcare sector. In key areas like AI and genomics, EU capabilities are often reliant on non-EU suppliers, particularly from the US, for innovation in AI-driven clinical decision support and data analytics. As demand for these technologies grows, the availability of substitutes within the EU remains limited, compelling many vendors to rely on external players to fill critical gaps.

Survey data from EU digital health vendors confirm this trend: only 20% of vendors implement data sovereignty measures, and a mere 13% use standards-based or open-source technologies, underscoring the limited availability of internal substitutes (**Figure 36**). Furthermore, 51% cite cybersecurity threats and 47% note fragmented regulatory environments as major challenges (**Figure 35**), areas that are dominated by foreign suppliers.

However, there is increasing recognition within the EU of the need to reduce this dependency. As shown by the digital health vendor survey, efforts are underway to enhance internal capabilities, upskill staff, diversify partners and supplier to ensure digital sovereignty and resilience of digital health ecosystem.

In conclusion, the EU digital health market is characterized by intense competition and fragmentation, with opportunities for new entrants focusing on emerging technologies like AI, genomics, and digital health platforms. Vendor survey results show that 46% of companies are investing in in-house R&D and 40% are actively diversifying their supplier base to improve strategic independence and digital sovereignty (**Figure 36**). Additionally, 53% are prioritising staff upskilling, and 44% are recruiting talent in ICT and AI/data science, supporting the development of local expertise (**Figure 37**).

In conclusion, the EU digital health sector remains competitive but fragmented, offering opportunities for new entrants, particularly in AI, genomics, and next-generation platforms. Yet progress is constrained by persistent **regulatory complexity, cross-border interoperability gaps**, and an overreliance on external suppliers for critical infrastructure. To build a more competitive and resilient ecosystem, the EU should **strengthen internal capabilities**, **expand R&D and talent pipelines**, **simplify compliance**, and **align procurement and certification pathways** to support the integration and scaling of emerging technologies.

[90] See section Accelerating Innovation: The State of Play in Performance Intensive Computing and Supercomputers

5 Digital Health Market Demand Analysis

This section explores demand-side dynamics in digital health technologies in the EU. The analysis is structured around two main components:

- **Analysis of Digital Health Strategies of Healthcare Providers in the EU:** Combines survey results and expert interviews to assess providers' digital health strategies, covering technology uptake, investment patterns, and procurement priorities. It highlights key barriers such as adoption challenges, interoperability gaps, cost-effectiveness, and integration issues, offering a comprehensive view of market readiness and scalability.
- **EU Digital Health Market Size and Growth Trajectories:** Provides baseline estimates for 2023 and 2025, with projections to 2030 and 2035, alongside analysis of regional variations and investment patterns by technology category and provider type. The findings offer strategic insights to guide policymakers, investors, and vendors in aligning decisions with market growth and opportunities.

5.1 Methodology for the analysis of Digital Health strategies of healthcare providers

This section draws on the European Healthcare Providers Survey, which examines technology uptake, investment patterns, and strategic priorities across hospitals, outpatient clinics, and national health systems. The findings provide both qualitative and quantitative insights into current and projected demand for digital health solutions, highlighting investment priorities and the factors shaping procurement decisions (see Methodology, Primary Data Collection: Survey and Expert Consultation, for further details).

Insights are complemented by expert interviews with healthcare leaders, authorities, patient groups, and academia, providing real-world perspectives on adoption barriers, funding models, and regulatory compliance. Together, the evidence highlights both investment priorities and gaps between vendor offerings and provider needs, particularly in interoperability, usability, cost-effectiveness, and IT integration

By combining survey data with expert insights, this section assesses market readiness, scalability challenges, and the key barriers to digital health adoption. Integrating quantitative and qualitative evidence provides a comprehensive view of the factors shaping digital transformation in European healthcare.[91]

[91] Due to the relatively limited sample size of the healthcare providers survey (N=300), it is not statistically feasible to provide a detailed analysis of digital health technology uptake at the level of individual Member States or EU regions. As a result, survey findings are reported at the aggregate EU27 level to ensure analytical robustness. However, readers are encouraged to consult the EU Digital Health market size and section to gain additional insights into likely uptake trajectories and proportional dynamics across EU regions. These data points offer a useful lens through which to contextualise adoption patterns and inform strategic considerations at both national and EU region levels.

5.2 Analysis of Digital Health budget allocation and growth in EU healthcare: a shifting landscape

Analysis of Digital Health Strategies of Healthcare Providers in the EU

Digital Health Budgets Evolution and Core Technologies Adoption: Key Takeaways

- **Spending and Budget Landscape**: Digital health spending for EU27 healthcare providers is inching upward: 42% organisations still set aside less than 5% of overall funds, and 37% allocate 5–10% while only 13% report spending above 11%. Yet the future outlook is cautiously positive with year-on-year increases are now treated as strategic rather than discretionary, signalling a normalisation of digital health as "core and strategic" expenditure.
- **Southern Europe shows growing ambition despite current underinvestment:** While 60% of Italian and 49% of Spanish providers spend less than 5%, they report some of the highest growth expectations (notably 10–20% increases).
- **Europe moves forward at different speeds**: France and Southern Europe have the highest current spenders in the 11–15% range (France 20%, Southern Europe 23%) and also lead in the 16–20% bracket (Southern Europe 13%). Conversely, France (25%) and Southern Europe (37%) have the highest proportion of organisations expecting cuts, indicating shifting priorities or emerging financial strain**.** DACH (Germany and Austria), Benelux, and the Nordics report higher digital health budget allocations: 47% of organisations in DACH and 46% in Benelux allocate 5–10% of their budgets. This suggests broader economic capacity and policy maturity continue to shape the digital health market.

European healthcare providers signal cautious optimism in Digital Health budgets

Findings from the Digital Technology European Healthcare Providers Survey indicate that digital health investment remains cautious but is steadily increasing across European healthcare organisations. A substantial majority (nearly 80%) allocate less than 10% of their annual budget to digital health technologies. Specifically, 42% of organisations dedicate less than 5%, while 37% allocate between 5-10% of their budgets to digital initiatives (**Figure 58**).

This data should be analysed within the historical context of underinvestment in digital technologies in healthcare, where most organisations have traditionally allocated less than 5% of their budgets to such initiatives. For example, the 2019 HIMSS/McKinsey European eHealth Trendbarometer survey[92] reported that the average healthcare provider allocated just 3–4% of total expenditure to digital technologies, Following the COVID-19 pandemic, this pattern of limited investment has begun to shift. During and in the aftermaths of the crisis, solutions such as telemedicine, data interoperability, remote patient monitoring, and AI-driven analytics demonstrated their value, prompting health systems and individual organisations to adjust their financial strategies accordingly[93]. The Digital Technology European Healthcare Providers Survey reveals that 58% of respondents plan to allocate more than 5% of their budget to digital health, underscoring a growing recognition of digital health as a critical area of investment, rather than a secondary or peripheral expense. Notably, no respondents selected "Don't know" when asked about their organisation's 2025 digital health budget allocation, suggesting that budgetary strategies for digital health are structured and intentional.

Future investment trends: a positive but varied outlook

The survey also provides valuable insights into how European healthcare organisations anticipate their digital health budgets evolving in 2026 compared to 2025 (**Figure 59**). The data presents a mixed, yet overall

[92] McKinsey & Company (2019)
[93] Special report 25/2024: Digitalisation of healthcare – EU support for member states effective overall, but difficulties in using EU funds. European Court of Auditors 2024. European Court of Auditors

positive trajectory, with 38% of organisations maintaining current spending levels, 45% anticipating budget increases, and 18% expecting some level of reduction, although no organisations foresee a drastic decrease in their budgets. These figures overall suggest a relatively stable positive commitment to digital health investment, though financial constraints may limit aggressive expansion in some regions. These findings indicate that maintaining minimal funding is no longer considered sufficient for advancing digital health strategies. The growing budget allocations signal that digital health investments are finally aligning with their strategic importance in care delivery. While disparities remain, the overall European trend points toward a larger share of healthcare budgets being dedicated to digital health.

Regional disparities in Digital Health investment

Despite the overall positive trend, digital health budget allocations vary significantly across Europe, with differences in spending levels and growth rates.

- Italy (60%) and Spain (49%) have the highest proportion of organisations spending less than 5% of their budget on digital health. However, these countries are also among the most optimistic in terms of future growth, with a notable percentage expecting budget increases of 10-20%.
- The 5-10% budget allocation category has the highest representation in Germany and Austria (47%) and Benelux (46%), suggesting consistent investment levels.
- Higher investments (11-15% of total budget) remain relatively rare (13% overall), with France (20%) and Southern Europe (23%) respondents showing higher rates in this category. Budgets above 15% remain the exception: only 5% allocate 16-20%, and 3% exceed 20%. The highest allocations (more than 20% of the total budget) are seen among Southern Europe (13%) for 16-20% and Central & Eastern Europe (8%)
- Budget reductions are anticipated in some regions, with France (25%) and Southern Europe (37%) having the highest proportion of organisations expecting cuts, highlighting shifting priorities (e.g. from more sustained spending in 2025 as observed in the previous point) or financial constraints.

These regional variations underscore that while Europe is collectively moving toward greater digital health investment, the rate of change remains uneven. Some health systems have made digital health a strategic budgetary priority, while others are still in the early stages of increasing investment. Economic pressures, national government policies, and healthcare system maturity levels will continue to shape the pace and scale of investment growth across different countries.

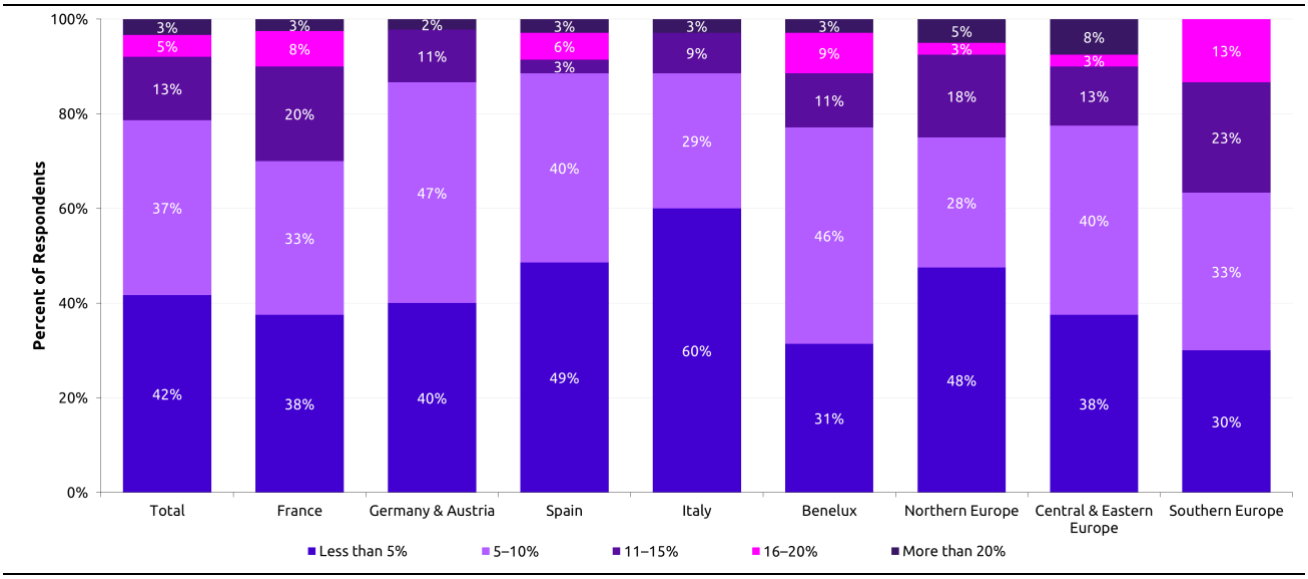


Figure 58: Percentage of organisations' annual budget allocated to digital health technologies

Survey: Digital Technologies in European Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 Q. What percentage of your organisation's annual budget is allocated to digital health technologies in 2025?

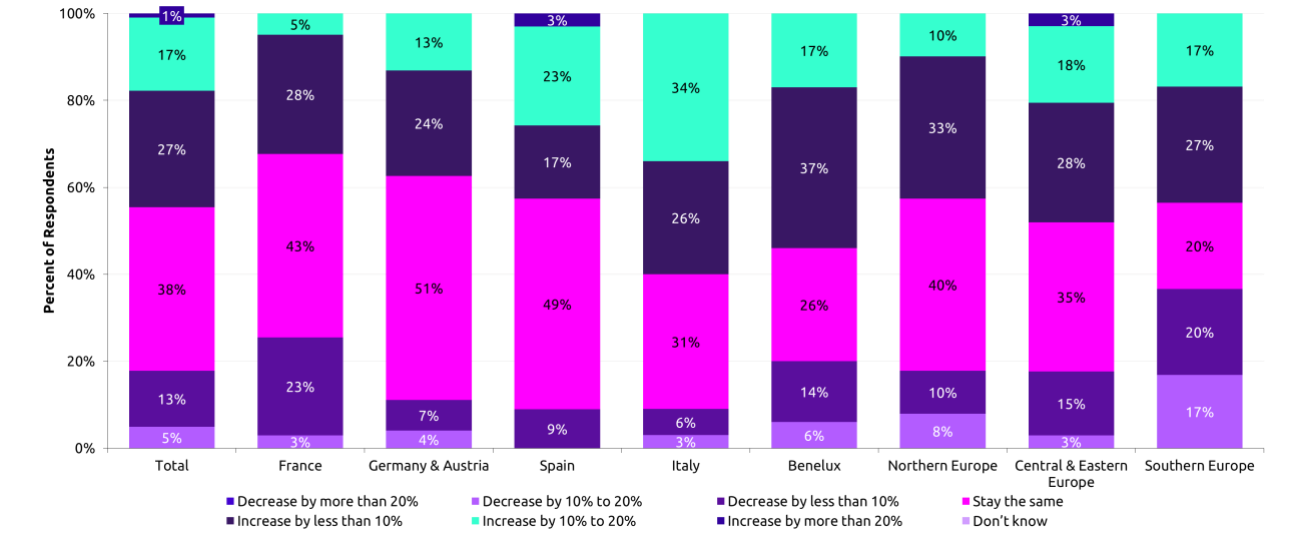


Figure 59: Evolution of digital health technologies spending

Survey: Digital Technologies in European Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 Q. How do you expect your organisation's spending on digital health technologies will change in 2026, as compared with 2025?

5.3 European healthcare providers' digital health adoption and future investment plans in core technologies

Analysis of Digital Health Strategies of Healthcare Providers in the EU

Core Technology Adoption and Investment Plans: Key Takeaways

- **Foundational digital health technologies are widely adopted**: Over 75% of providers currently use solutions for EHRs, medical imaging, clinical workflow optimisation, and patient administration.
- **Cybersecurity is a priority, but gaps remain**: Despite its critical role in trust and data protection, 22% of providers report incomplete adoption of cybersecurity measures.
- **Long-term investment plans are strong**: 81% of providers plan to invest in new or upgraded EHR systems over the next four years, highlighting strategic focus and the extended timelines required for full-scale integration.
- **Modernisation is driving next-stage investment**: Significant replacement and upgrade intentions are reported across core systems, driven by expectations of vendor innovation in AI, data analytics, and cloud platforms. Between 53% and 65% of providers plan to replace or upgrade core digital health systems (including EHRs, medical imaging, and clinical workflow tools).
- **First-time investments remain active**: In addition to upgrades, a notable proportion of providers are planning net new purchases, particularly in areas that enhance interoperability, efficiency, and care quality. Up to 34% of providers expect to make net new investments in key technologies, particularly in clinical data management, cybersecurity, and workflow optimisation, within the next four years.

When analysing adoption levels across various healthcare technologies, the survey data reveals widespread use of foundational technologies, with more that 75% of healthcare providers reporting adoption for patient record, medical imaging, clinical data and workflow optimisation, and patient administration tools. Cybersecurity measures are also prominently implemented to ensure trust and data integrity, although there is still 22% of respondents reporting to not have fully adopted them (**Figure 60**). The sustained

commitment to investing in these technologies highlights healthcare providers' recognition of their value. A significant proportion of respondents also plan to invest in these technologies over the longer term (the next four years), especially in complex areas as EHR (with 81% of respondents planning to invest in new or existing solutions) signalling strategic foresight in digital health strategies, as well as an understanding that digital health adoption requires extended timelines for successful implementation and integration (**Figure 61** and **Figure 62**). Expectations of continued innovation from vendors likely play a significant role in this trend. Key innovation accelerators, such as AI, advanced data analytics, and cloud-based solutions, are expected to drive competitive advantages in healthcare, improving patient outcomes. This approach reflects a proactive commitment to adopting transformative technologies that are set to significantly reshape healthcare delivery.

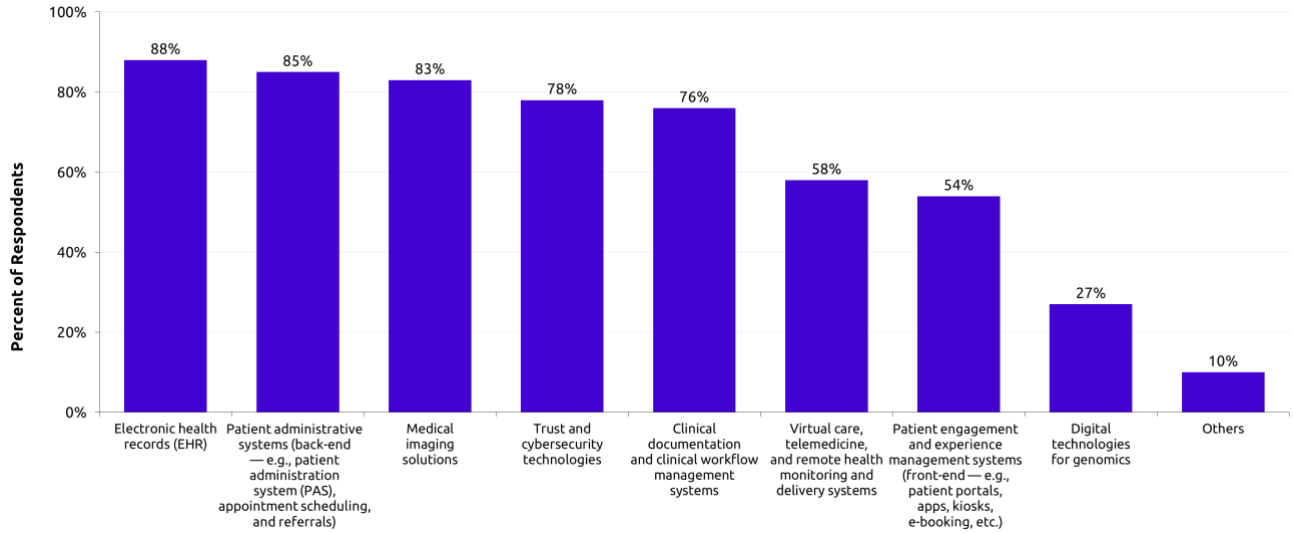


Figure 60: Healthcare providers' Core Technology Adoption

Survey: Digital Technologies in European Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 Q. Which technologies does your organisation currently use?

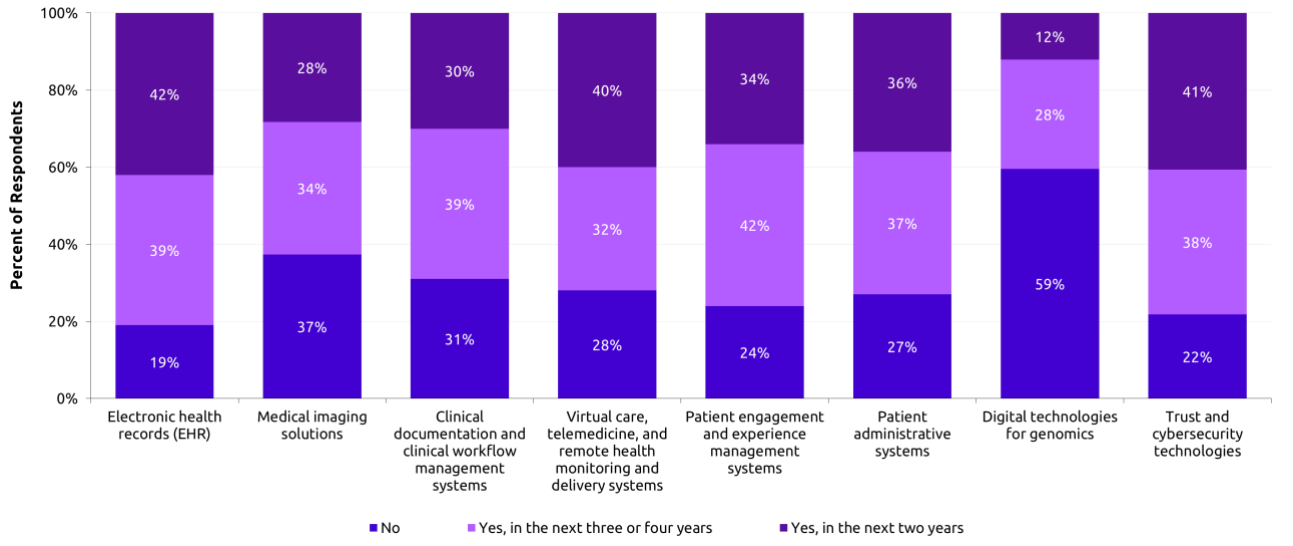


Figure 61: Healthcare Providers Core Technologies Replacement / Upgrade plans

Survey: Digital Technologies in European Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300. Q. Does your organisation plan to replace or expand/upgrade any of its current technology solutions in the next 4 years?

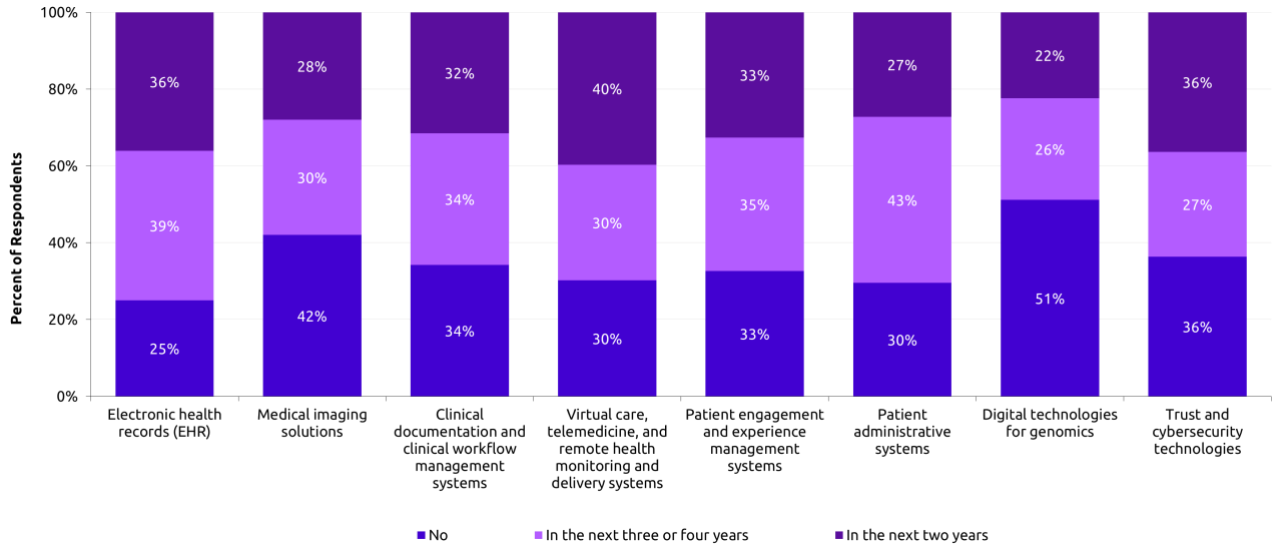


Figure 62: Healthcare Providers Core Technologies Net New Investments

Survey: Survey: Digital Technologies in European Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300. Q. Which technology solutions is your organisation planning to buy for the first time in the next 4 years?

In the following sections, the analysis will explore adoption and investment trends in greater detail, focusing on specific technologies within each category.

5.4 Digital health technologies adoption and investment plans detailed analysis

Analysis of Digital Health Strategies of Healthcare Providers in the EU

European Healthcare Providers Investment Plans for Digital Health Technologies: Key Takeaways

- **EHR Modernization and Workflow Fit:** 81% of EU27 providers plan to invest in new or upgraded EHRs by 2029, aiming to reduce clinical burden and support care beyond hospital walls. Top priorities include AI-driven decision support (42%), documentation automation (39%), patient collaboration (37%), and virtual care enablement (36%), showing that usability and data liquidity now outweigh basic data capture.
- **Imaging and Diagnostics Evolution:** Following the pandemic-driven surge, medical imaging and digital pathology investments remain steady but more targeted. Up to 75% of providers report adoption or planned investment in enterprise platforms and AI-assisted diagnostics, aiming to unify data silos and strengthen diagnostic capabilities.
- **Data and Clinical Workflow Innovation:** Interoperability solutions (27% adopted, 53% planned) and health analytics platforms (20% adopted, 61% planned) are moving toward system-level deployment. AI clinical assistants and workflow tools show lower adoption, but 65% of providers plan to invest, positioning automation as a key tool for workforce burden relief and faster decisions.
- **Virtual and Remote Care Expansion:** Virtual care is consolidating with national telemedicine platforms and lower device costs driving investment: 51% of providers plan to invest in e-visits and 55% in hospital-at-home models. Outpatient RPM shows strong growth (22% adopted, 57% planned), while inpatient RPM and virtual wards face slower uptake. Digital therapeutics remain niche but have nearly 50% planned investment.
- **Focus on Patient Engagement:** Patient engagement is no longer optional: over 80% of providers will adopt or expand engagement solutions by 2029. Established tools such as portals, mobile apps, and multichannel platforms are widespread, while chatbots and AI assistants are earmarked for the next wave (33% planned) driven by a shift towards continuous, personalised support.
- **Digitalization of the Administrative Backbone:** Patient administration tools are widely used and still growing. Appointment scheduling leads with 41% adoption and 48% planned investments e-referrals, currently at 21%, are expected to grow rapidly (53% planned), supporting integrated care pathways across institutions. ePrescription solutions (37% adopted, 49% planned) and payment systems (53% planned) reflect a push to modernise core workflows.
- **Resource and Departmental Optimisation:** High-acuity areas are embracing digital tools: 24% of providers have adopted emergency department (ED) systems, with 44% planning further investment. Real-time location systems (26% adopted, 50% planned) and command centres (17% adopted, 48% planned) show growing interest in operational intelligence. Robotics remain niche due to cost and skills barriers.
- **Digital Solution for Genomics Expected to Grow:** Despite low current adoption (4–16%) mainly due to infrastructure and skills gaps, 48–54% of providers plan to invest in genomics tools, particularly for sequencing, bioinformatics, and clinical reporting. EU initiatives like 1+ Million Genomes and the Genomic Data Infrastructure are becoming key catalysts for scaling genomics applications in oncology, rare diseases, and personalised medicine.
- **Trust and Cybersecurity:** Cybersecurity maturity is advancing across EU healthcare providers, with strong adoption of identity management (66%), data protection (63%), and SOC capabilities (53%). Training leads at 69%, underscoring a shift toward embedded security culture. However, smaller providers face persistent barriers, including limited funding, IT capacity, and outdated infrastructure.

5.4.1 Electronic Health Records (EHR)

Healthcare providers' survey respondents reported notably high adoption rates for Electronic Health Records (EHR), with data indicating particularly strong investment plans for EHR solutions. These investments are characterised by relatively shorter implementation timelines, reflecting the maturity and prioritisation of EHR systems within digital health strategies (**Figure 60**, **Figure 61**, and **Figure 62**).

When respondents were asked about their preferences for the most important advanced functionalities in EHR solutions based on their organisational needs, the data revealed a strong emphasis on AI-driven solutions (for both clinical decision support and documentation), patient-centric collaboration features, and remote care enablement (**Figure 63**).

- The prioritisation of AI-driven clinical decision support (42%) and documentation capabilities (39%) reflects the growing demand for tools that assist healthcare professionals with real-time, evidence-based recommendations to improve clinical decision-making and patient care. Additionally, these functionalities aim to reduce the documentation burden on overworked staff by streamlining processes and enhancing the accuracy of clinical records, ultimately improving efficiency and the overall quality of patient data.
- The importance placed on EHR capabilities supporting patient-centric care collaboration (37%), patient communication and engagement (36%), and virtual/remote care model enablement (36%) indicate that European healthcare providers are increasingly aware of the need for EHR systems that can adapt to and support evolving care delivery models. Patient-centric care collaboration reflects the growing demand for seamless communication and information sharing among multidisciplinary teams, enhancing continuity and coordination of patient care. Virtual/remote care model enablement reflects the shift toward more flexible care delivery, extending services beyond institutional settings to meet patient needs in diverse environments. The focus on patient communication and engagement underlines the importance of solutions that enable direct interaction between patients and providers, with features like patient portals, appointment scheduling, and secure messaging improving the patient experience. Moreover, although at a lower prioritisation level, the fact that nearly 30% of respondents highlighted the need for EHR systems to integrate with population health management tools signals that healthcare organisations are increasingly looking to leverage EHR data to better manage patient populations and proactively address emerging health trends. Collectively, these trends reveal that healthcare providers are increasingly aware of the need for EHR systems that adapt to changes in health services demand, organisational structures, workflow, and patient-facing interactions, ensuring greater efficiency, collaboration, and patient satisfaction as care models evolve.
- Although less prominent, survey results highlight the evolving role of EHR systems in optimising workflows, ensuring efficient resource allocation, and enhancing organisational performance. The integration of EHR systems with operational systems (22%) helps reduce bottlenecks and improve patient care delivery. Similarly, the indications on intelligent AI-driven workflow automation (21%) reflect a push to streamline both administrative and clinical processes. Integration with financial and business-intelligence solutions received a lower prioritisation (12%), underscoring a relatively weaker emphasis on adopting next-generation tools that intelligently and dynamically link financial and operational data. Such tools would enable healthcare providers to make quicker and more informed decisions regarding budgeting, forecasting, and resource allocation, ultimately promoting greater financial sustainability and operational effectiveness.

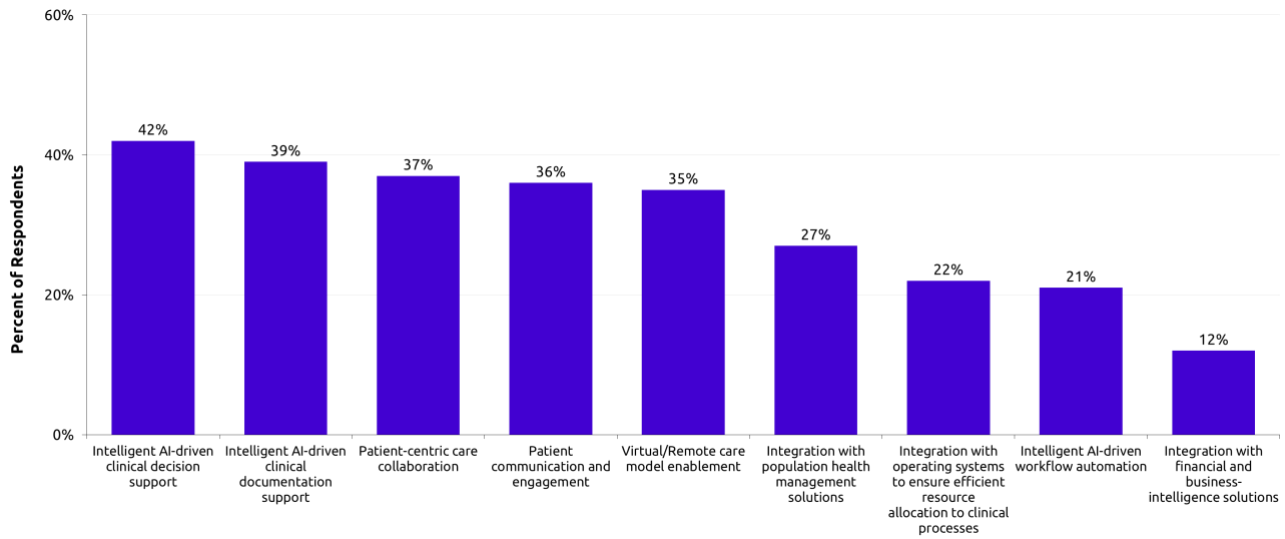


Figure 63: Advanced EHR solution functionalities considered most important

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300. Q. Which advanced EHR solution functionalities does your organisation consider the most important?

5.4.2Medical Imaging solutions

General adoption rates for medical imaging solutions are notably high, especially within larger healthcare organisations. Overall investment plans, while sustained, are slightly oriented more toward the longer term (**Figure 60**, **Figure 61**, and **Figure 62**). This trend likely reflects substantial recent investments made during and immediately after the COVID-19 pandemic, when healthcare organisations significantly upgraded their diagnostic capabilities to meet heightened health demands. As a result, the immediate urgency for additional short- to medium-term investment in medical imaging has diminished. Nevertheless, modern medical imaging technologies remain important investment areas for European healthcare providers, as they improve workflow efficiency, enhance diagnostic accuracy, and facilitate multidisciplinary collaboration.

Examining investment trends across various medical imaging technologies (**Figure 64**), survey data indicates that more established solutions, such as Picture Archiving and Communication Systems and Radiology Information Systems (PACS/RIS), currently exhibit the highest adoption rate (44%). This high adoption underscores their position as foundational medical imaging technologies within healthcare organisations. Additionally, a combined 40% of respondents plan to adopt these systems within the next four years, highlighting sustained interest and ongoing investment in these technologies.

Digital pathology solutions currently show moderate adoption (19%), with substantial planned investments (approximately 54%) expected within the next four years. This reflects healthcare providers' growing recognition of digital pathology's capabilities, including advanced navigation and AI-powered analysis of whole-slide images to facilitate quicker and more accurate diagnoses, for instance, identifying cancerous tissues or quantifying biomarkers. Digital pathology also supports the advance of precision medicine by enhancing biomarker detection and enabling more personalised treatment decisions. Additionally, it improves data management, secure sharing, and interoperability among healthcare professionals and institutions, while enabling remote consultations and telepathology. These capabilities address challenges such as pathologist shortages, ultimately streamlining diagnostic workflows and improving patient outcomes.

Vendor-Neutral Archives (VNAs), currently adopted by 22% of respondents, also demonstrate significant future investment potential, with nearly 50% planning adoption within the next four years. VNAs has been increasingly positioned as essential solutions for integrated, vendor-agnostic data storage, improving interoperability and facilitating easier data accessibility across different systems. VNAs offer significant

benefits, such as consolidating imaging data from multiple departments, including radiology, cardiology, and pathology, into a single, accessible repository, thereby streamlining data management and reducing costs associated with maintaining multiple proprietary systems.

More comprehensive enterprise medical imaging platforms, which build upon the capabilities of PACS, VNAs, and enterprise viewers, also currently show moderate adoption rates (20%), with notably strong investment intentions as 55% of healthcare providers plan to invest within the next four years. These platforms enable end-to-end management of imaging data, providing a more complete and integrated patient view while optimising imaging workflows, processes, and resource allocation. Increasingly, they either embed advanced AI capabilities or facilitate integration with AI-based medical imaging analysis tools, enhancing diagnostic accuracy and efficiency. Additionally, these platforms support integrated diagnostics by consolidating data from multiple imaging modalities, fostering clinical collaboration through centralised, rapid, and secure access to comprehensive patient imaging histories.

Understanding the investment evolution in enterprise imaging platforms is critical, as these platforms provide the foundation for adopting more advanced capabilities. In this context, it is noteworthy that interest in AI-powered solutions for radiology and pathology, as well as teleradiology and telepathology systems, is particularly strong, with approximately 70–75% of healthcare providers either already adopting these technologies or planning to invest in them. This trend indicates a strategic focus on enhancing remote diagnostic capabilities and leveraging AI-driven tools to improve clinical insights, efficiency and increase access to medical imaging services. More forward-looking technologies, such as advanced visualisation tools (e.g., those leveraging 3D, AR, and VR), currently have lower adoption rates (9%), with planned investments (42%) skewed toward the longer term. With nearly half of providers indicating no plans for adoption, the data suggests a relatively cautious approach, likely due to uncertainty around the immediate, scalable impact of these technologies on healthcare delivery, as organisations weigh their clinical value, cost-effectiveness, and complexity integration.

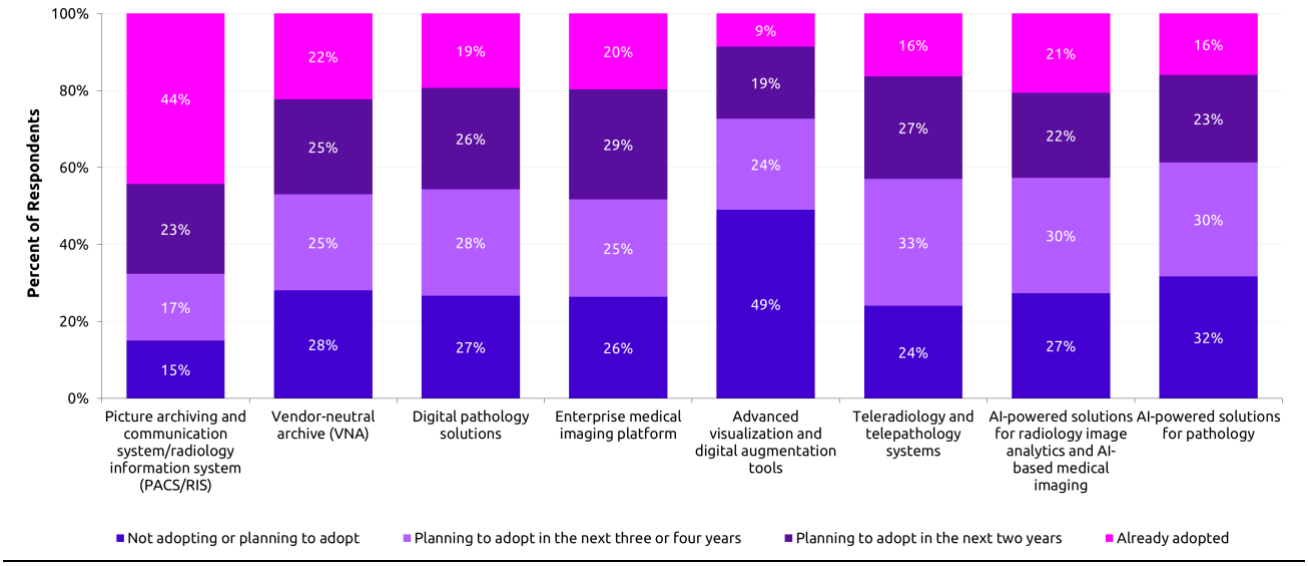


Figure 64: Medical imaging, radiology, and pathology systems adoption and investment plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300. Q. Which medical imaging, radiology, and pathology systems has your organisation adopted or does it plan to adopt in the next four years?

5.4.3 Health data, clinical documentation and clinical workflow management solutions

The survey also investigated trends in the adoption of and planned investments in several health data management clinical information and department specific solutions (**Figure 65** and **Figure 66**).

Investments in technologies designed to enhance data management, exchange, and utilisation for clinical and operational purposes offer noteworthy insights:

- Interoperability and Health Information Exchange (HIE) systems show consistent interest, with 27% of respondents currently adopting and an additional 53% planning adoption. This highlights healthcare providers' growing awareness of the critical role interoperability plays in streamlining workflows, facilitating care coordination, and overcoming traditional challenges posed by fragmented systems and isolated point solutions.
- Health data and analytics platforms currently demonstrate more moderate adoption (20%), but stronger future investment intentions (61%), especially in the short term. This reflects an increasing emphasis among healthcare providers on harnessing data for actionable insights, improved decision-making, and operational efficiency.

Examining solutions and capabilities designed to support healthcare professionals, improve care quality, and streamline clinical workflows, the survey data reveals relatively high current adoption rates alongside solid investment intentions, particularly within the next two years:

- Clinical decision support systems (CDSS) currently have a notable adoption rate (28%), and strong planned investment (35%) is planned in the next two years. This reflects healthcare providers' strategic focus on leveraging clinical insights and evidence-based approaches to enhance decision-making accuracy and patient outcomes.
- Order entry and medication management systems exhibit one of the highest current adoption rates (35%), with substantial planned investments (41%), indicating a continued commitment to these established systems. This highlights the appreciation of their role in ensuring patient safety and operational efficiency, particularly given that medication management involves critical aspects of healthcare interventions and represents a significant portion of healthcare expenditure.
- Clinical documentation support systems show significant current adoption (33%), combined with ongoing near-term investment (31%), driven by the need to minimise administrative burdens and enhance the accuracy and efficiency of clinical documentation.
- Clinical communication and collaboration platforms, adopted by 26% of respondents, have notably high planned investment rates (57%). This underscores the importance providers place on improving multidisciplinary collaboration, enhancing care coordination, and ultimately delivering better patient outcomes.
- Clinical workflow optimisation tools, including AI/GenAI-enabled clinical assistants, currently have lower adoption (16%) but display exceptionally strong planned investment intentions (65%). This highlights widespread anticipation of AI's potential to transform clinical workflows, reduce clinician workload, and improve overall care delivery efficiency and quality.
- The growing availability of health data is driving greater interest in analytics-driven solutions. These solutions enable healthcare organisations to leverage insights at both the micro (organisation, individual patient) and macro (population, health systems) levels, supporting enhanced decision-making, proactive care management, and operational improvements.
- Infection control and monitoring systems currently have moderate adoption (21%) but demonstrate strong projected growth with substantial planned investments (61%). This trend likely suggests an ongoing emphasis on proactive and preventive health management, particularly in response to heightened awareness following the pandemic.
- Population health management systems show relatively lower current adoption rates (16%), but also in

this case providers indicate significant planned adoption (57%). This underscores a growing strategic focus on proactively managing patient populations, leveraging analytics to better address broader health trends, improve resource allocation, and ultimately achieve superior long-term health outcomes.

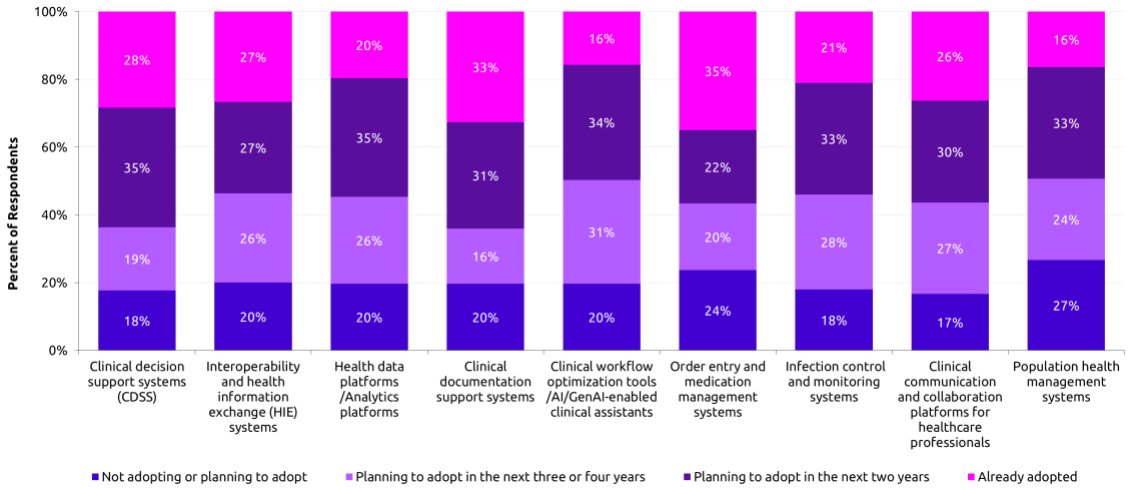


Figure 65: Health data management and clinical information solutions adoption and investment plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300. Q. Which health data management and clinical information solutions, besides EHR, has your organisation adopted or does it plan to adopt in next 4 years?

Survey data highlights varying levels of adoption and investment intentions across departmental solutions among European healthcare providers, reflecting diverse strategic priorities and maturity:

- Laboratory Information Management Systems (LIMS) have the highest current adoption rate (39%), with significant additional planned investments (42%). This underscores the critical role laboratory diagnostics play in healthcare delivery, particularly following the COVID-19 pandemic, which prompted healthcare organisations and national government to reevaluate and modernise laboratory capabilities and operations.
- Emergency Department management systems show relatively high adoption (24%), with an additional 44% of respondents planning investments over the next four years. This highlights the urgency to improve operational efficiency and patient flow, addressing challenges such as prolonged waiting times and increased emergency care demand.
- Operating Room (OR) and Intensive Care Unit (ICU) management systems currently show moderate adoption rates (around 19%), but strong future investment intentions (approximately 48–50%). Perioperative management systems have lower current adoption (13%), and a substantial proportion (41%) do not plan to adopt. Nevertheless, nearly half (46%) of respondents still anticipate investments in perioperative systems within the next four years emphasising perioperative systems' potential to enhance surgical pathways and improve OR efficiency and turnaround. Overall, investment trends in these technologies reflect increasing awareness among healthcare providers of the need to optimise workflows, resource allocation, and patient safety in these high-cost, resource-intensive care settings.
- Robotic-Assisted Surgery (RAS) systems and medical robots (including autonomous delivery and assistive robotics) currently have the lowest adoption rates (approximately 11%), along with the highest proportion of respondents indicating no plans for adoption (47–56%). This cautious approach likely reflects that relatively few healthcare organisations are currently equipped to effectively implement these new technologies, given their implementation costs, specialised resource requirements, and the advanced skills necessary to realise their full potential and scalability.
- Cardiology Information Systems (21% current adoption, 51% planned investment) and Oncology Information Systems (19% current adoption, 49% planned investment) both exhibit moderate adoption rates with significant planned future investments. This trend highlights healthcare providers' increased

future focus on specialised systems designed to manage cardiovascular diseases and oncology—two disease areas that substantially contribute to population health burdens. These solutions offer tailored support for complex care pathways, facilitate multidisciplinary collaboration, and enhance patient outcomes through more precise, coordinated pathway management.

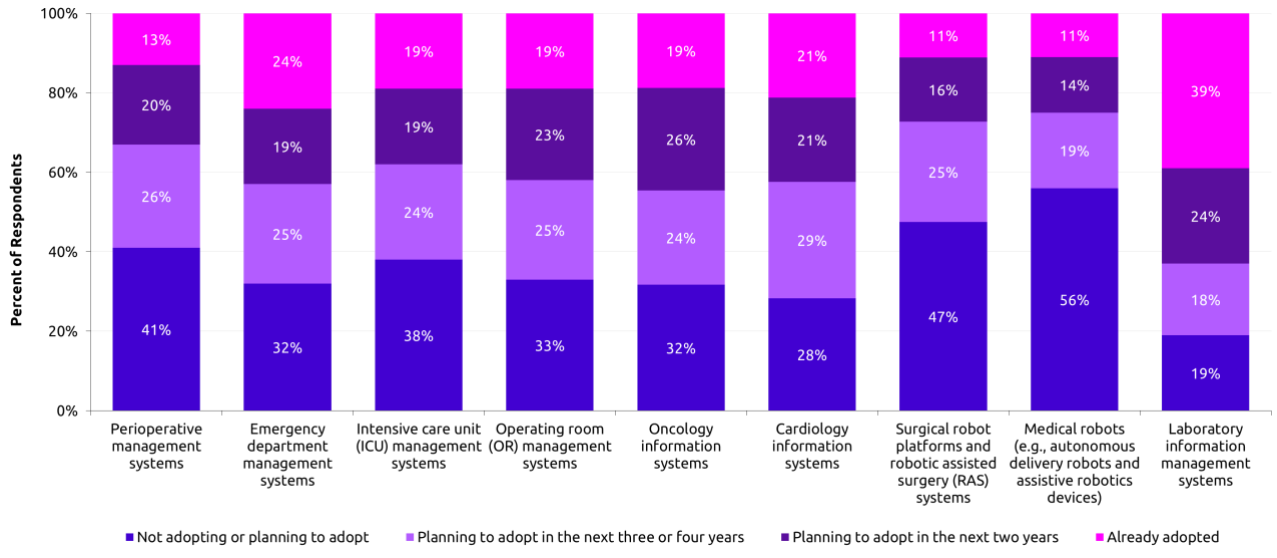


Figure 66: Departmental solutions Adoption and Investment plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300. Q. Which departmental solutions has your organisation adopted or does it plan to adopt in next 4 years?

5.4.4Virtual care and remote health services provision solutions

Overall current adoption of virtual care, telemedicine, and remote health monitoring and delivery system is high, with notably higher adoption rates among hospitals, physician offices, and homecare and community care providers. Investments in these technologies have been growing especially during the pandemic, but they continue to be sustained in the future (**Figure 60**, **Figure 61**, and **Figure 62**).

The interest can likely be attributed to national initiatives like the Italian National Telemedicine Platform (PNT)[94]. The platform establishes essential interoperability standards for telemedicine across Italy's regions, enhancing and integrating service offerings, aiming to drive innovation and digital transformation within both national and local healthcare services. Moreover, technological advancements, particularly in cloud, AI and sensor miniaturisation, present promising opportunities for automating patient data collection, extending care delivery models, and personalizing patient engagement, further driving investment and sustained interest in these solutions.

Insights into adoption and investment trends across specific technologies and implementation settings illustrate how European healthcare providers are increasingly leveraging digitally enabled remote and virtual care services (**Figure 67**). These trends reflect a strategic shift toward more flexible, decentralised, and patient-centric models of healthcare delivery.

- Remote consultation systems and e-visits show the highest current adoption rate among the surveyed virtual care solutions (30%), with an additional 51% of respondents planning future investment. This sustained and robust interest is driven by healthcare providers' recognition of the value these solutions offer in expanding access to care and meeting patient expectations for convenience, responsiveness, and timely service. From an implementation standpoint, these solutions are relatively less complex, as

[94] PNT (2025)

they primarily replicate traditional in-person consultations in a virtual format and do not typically require integration with devices or advanced monitoring systems. Adoption is particularly strong in physician offices, home, and community care settings, although adoption and investment plans are consistent across the whole range of healthcare providers interviewed.

- Remote patient monitoring (RPM) for outpatient and home use, utilising connected medical-grade devices shows moderate adoption (22%) but considerable planned investments (57% over four years). Providers recognise RPM's potential to proactively manage patient health, particularly for chronic conditions, prevent health deterioration, reduce hospital admissions, and enhance patient engagement and care quality. By delivering care in less expensive and generally safer home environments, RPM helps improve overall outcomes.
- Symptom checker solutions currently have low adoption (11%) due to ongoing safety concerns that must be addressed for widespread use. However, European healthcare providers show strong plans for long-term investments, recognising the potential of these tools to guide patients more effectively, reducing unnecessary clinical visits, and meeting patients' information needs.
- Digital therapeutics (DTx) currently have the lowest adoption rate (9%) and the highest rate of non-adoption intention (45%). However, planned investments by nearly half of respondents indicate a growing interest in their potential to complement traditional therapeutic approaches and enhance patient self-management. Digital therapeutics (DTx) is a segment that is maturing, driven by the availability of specific reimbursement models (for example DIGA in Germany) and a growing body of scientific evidence demonstrating their clinical value, both as standalone therapeutics and as companions to pharmaceuticals and medical devices.
- Telehealth and virtual care platforms are increasingly adopted, with 26% currently using them and 40% planning investments in the next two years. These platforms enable the remote delivery of a broad range of clinical services (including diagnosis, treatment, follow-up, and patient education) via video conferencing, messaging, and, in some cases, AI-driven capabilities. They increasingly integrate with electronic health records, chronic disease management tools, and provide patient engagement features, supporting both real-time and asynchronous communication. The high level of planned investment reflects a maturing approach among healthcare providers, who now view telehealth as a strategic component of care delivery. This shift underscores a commitment to extending services beyond traditional clinical settings, improving accessibility, and providing more seamless, end-to-end patient experiences across virtual and in-person touchpoints.
- Remote patient monitoring (RPM) for inpatient monitoring shows moderate current adoption (19%), with somewhat relatively lower investment intentions (45%) and a significant portion (37%) indicating no plans to adopt. This cautious approach likely stems from concerns regarding complexity, costs, and immediate operational benefits within hospital settings, particularly regarding integration with existing clinical information systems such as EHRs and workflows. Nevertheless, numerous organisations are piloting RPM technologies to address challenges like nursing staff shortages and enhance patient safety on hospital wards. For instance, RPM data can facilitate early detection of hospital-acquired infections, thereby improving response times and patient outcomes in critical scenarios. In this context, research from the PRAISE (Providing a Roadmap for Automated Infection Surveillance in Europe) network, funded by the Joint Programming Initiative on Antimicrobial Resistance (JPIAMR) and involving 29 nations and the European Commission[95], offers guidance and a roadmap for implementing enterprise-wide automated surveillance systems[96]. These systems aim to reduce healthcare professionals' workload while enhancing data accuracy in combating antimicrobial resistance across European healthcare facilities.
- Hospital-at-home or virtual ward solutions currently have lower adoption rates (13%), yet exhibit strong anticipated growth, with 55% planning adoption in the coming years. This shift towards home-based acute care aims to reduce hospital capacity strain, enhance patient comfort, and improve outcomes.

[95] Jpiamr (2025)
[96] Information technology aspects of large-scale implementation of automated surveillance of healthcare-associated infections. Behnke, Michaelvan Mourik, Maaike S.M. et al. Clinical Microbiology and Infection, Volume 27, S29 - S39

Internationally, virtual wards have shown strong results. In the UK, over 12,000 virtual 'beds' are operational, aiming to reduce length of stay, hospital readmissions, and emergency department waiting times. Initial assessment findings, including a reduction of 9,000 hospital admissions in the southeast of England in 2023-2024[97], and an NIHR research[98] demonstrate the potential of virtual wards, though success is dependent on efficient operation models, patient selection, and the right technology. A two-year national evaluation has been now launched to assess the impact on patient outcomes and healthcare efficiency through econometric modelling and cost-effectiveness analysis. Virtual ward initiatives are also expanding across the European Union. For instance, a Virtual Ward for gynaecological post-surgery patients has been introduced at Policlinico Universitario A. Gemelli IRCCS in Italy. Through an app, patients share health data and receive regular questionnaires about symptoms, wound status, and complications, while a virtual assistant offers post-operative lifestyle guidance. This model combines traditional monitoring with real-time, personalised care. A dedicated care team ensures regular contact with patients and timely interventions based on data. Early results highlight how continuous symptom monitoring enables timely intervention, faster bed turnover, early discharge, and better patient management, with the model evolving for enhanced care[99].

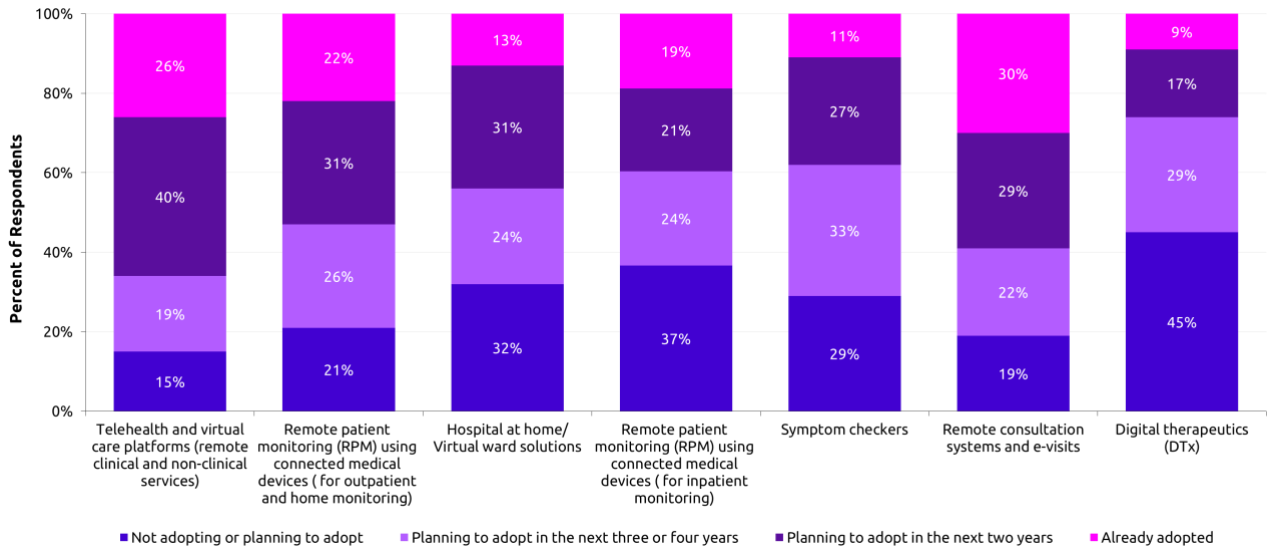


Figure 67: Virtual Care and Remote Health Service Provision Solutions Adoption and Investment Plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 Q. Which Virtual Care and Remote health service provision solutions has your organisation adopted or does it plan to adopt in the next four years?

5.4.5Patient engagement and experience management

The general adoption rate for patient engagement and experience management solutions remains above 50%, with investment plans positively sustained but oriented slightly more toward the medium-term horizon of three to four years (**Figure 60**, **Figure 61**, and **Figure 62**).

Survey results related to specific patient engagement capabilities reveal that across the range of solutions, European healthcare providers are demonstrating high levels of current adoption or near-term investment intentions (**Figure 68**), with projected global adoption over the next 4 years generally above the 80%. This reflects a strong recognition that effective patient engagement is critical to the success of digital health strategies. Providers increasingly understand that patient-centric solutions designed around the patient journey are essential for fostering adherence, sustained usage, and overall satisfaction.

[97] NHS (2024)
[98] NIHR (2024)
[99] Trendsanita (2024), Gemelli (2023)

- Established tools such as patient portals, front-end access services (34%), mobile apps (26%), multichannel communication platforms (including SMS, email, and chat) (23%), and CRM systems (21%) are already widely adopted, with continued short-term investments. These technologies support personalised communication, improve care coordination, and optimise outreach, ultimately enhancing service efficiency and patient experience.
- Looking further ahead, investment is expected to grow in more advanced engagement tools over the next three to four years. Key areas include AI-based virtual health assistants and chatbots (33%), with strong indications that providers see their potential to enhance patient interaction and streamline administrative processes. Similarly, patient education apps are gaining traction (31%), further confirming a shift towards empowering patients with accessible, relevant health information. These long-term investments highlight a strategic commitment to building platforms that educate, engage, and connect patients through intuitive, community-oriented digital experiences.

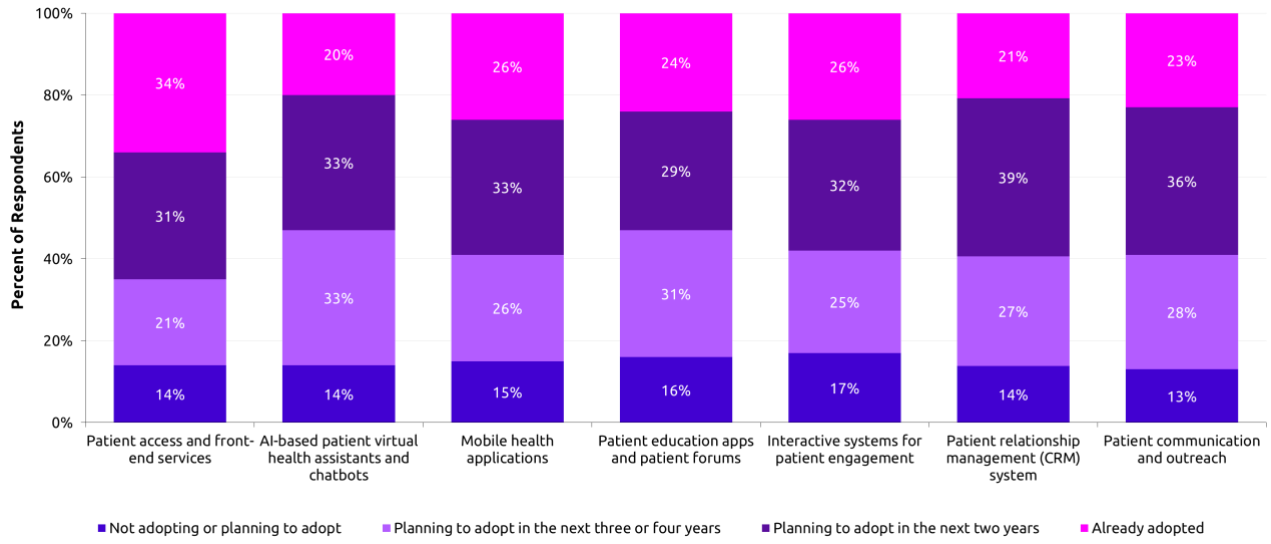


Figure 68: Patient Engagement and Experience Solutions Adoption and Investment Plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 Q. Which patient engagement and experience solutions has your organisation adopted or does it plan to adopt in the next four years?

5.4.6Patient administrative systems

Patient administrative systems exhibit overall high adoption rates and a strong ongoing commitment from providers, emphasising the importance of accurately and efficiently managing patient appointments, scheduling, referrals, and eligibility checks to ensure effective healthcare service delivery (**Figure 60, Figure 61**, and **Figure 62**) Investments in specific capabilities reflect a generally mature and strategic approach to strengthening core administrative functions and enhancing the patient journey across all touchpoints (**Figure 69**).

- Internal-facing systems, such as Patient Administration Systems (PAS), Patient Management Systems, and Admission-Discharge-Transfer (ADT) systems, show solid current adoption (36%), with an additional 48% of organisations planning to adopt within the next four years. While these systems are increasingly embedded within EHRs and hospital information systems, their widespread use reflects their foundational role in managing patient flow and administrative processes across the continuum of care.
- Shifting focus to the management of the patient journey across organisational boundaries, it is noteworthy that e-Referral solutions, though currently adopted by only 21% of providers, show strong future investment intent (53%). This trend suggests growing recognition of the importance of seamless digital referral pathways to improve care coordination and continuity across the broader healthcare ecosystem.

- Appointment scheduling systems have the highest current adoption rate (41%), with another 48% planning to implement them in the near to medium term. This underscores the importance of efficient scheduling tools in improving access and reducing no-shows to enhancing operational performance.
- Solution supporting prescription processes are also widely adopted (37%), with 49% planning to adopt. This reflects not only a focus on medication safety and adherence but also the growing need for integrated systems that manage dispensing and prescribing workflows more effectively.
- Payment systems show a more balanced profile, with 27% already implemented and over 53% planning adoption. This indicates increasing attention to modernising billing processes, improving efficiency, and delivering more seamless, patient-friendly financial interactions.
- Finally, patient portals and mobile apps demonstrate strong momentum, with 33% currently in use and nearly 40% planning adoption within two years. These end-to-end engagement tools play a critical role in enabling self-service, improving communication, and delivering a more transparent, connected healthcare experience.

Collectively, these trends illustrate a clear prioritisation of solutions that enhance both operational efficiency and patient engagement, even in traditionally administrative areas. By investing in these capabilities, healthcare organisations are better positioned to deliver more streamlined, coordinated, and patient-centric care services.

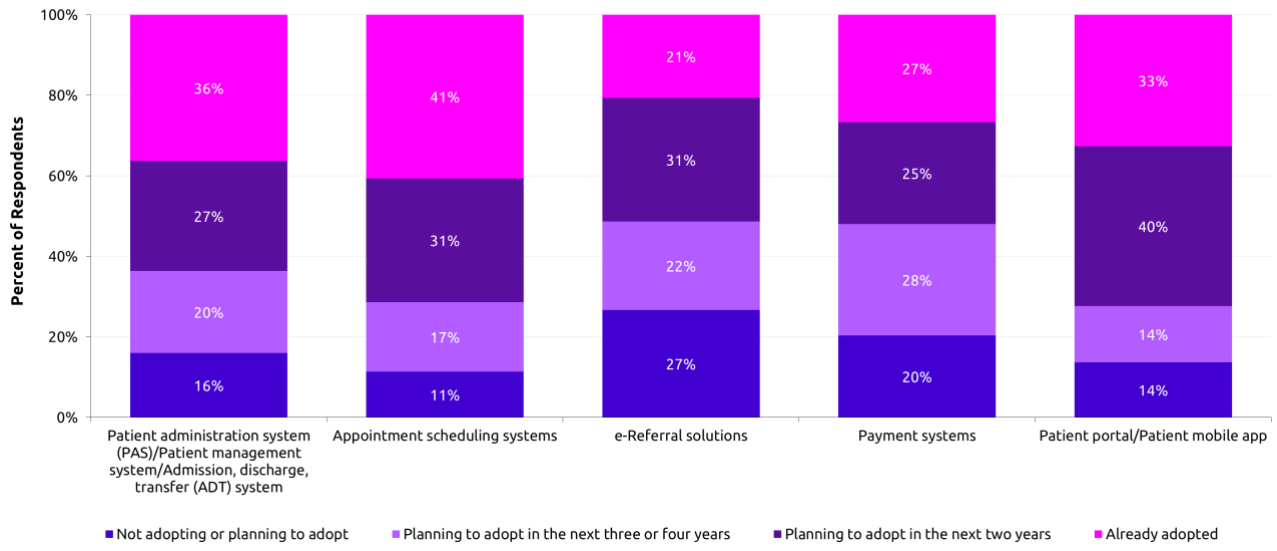


Figure 69: Patient Administration Solutions Adoption and Investment Plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 – Unweighted base: N=300. Q. Which patient administration solutions has your organisation adopted or does it plan to adopt in the next four years?

5.4.7Resource management solutions

The survey data on resource management systems reveals a clear commitment among European healthcare providers to strengthen their operational infrastructure across people, processes, and resources. While some systems are well-established, others, particularly in coordination, visibility, and resilience, are emerging as strategic priorities. Collectively, these investments will play a crucial role in enabling more efficient, responsive, and sustainable healthcare delivery models (**Figure 70**).

- Optimising people management and enabling collaboration
  - Workforce and human capital management systems show the highest current adoption (44%), with strong short-term investment intentions (35%). This reflects the growing need for efficient rostering, shift scheduling, and workforce optimisation, particularly relevant amid persistent

staffing pressures across European healthcare systems.

  - Collaborative workspaces and platforms are gaining traction, with 24% of organisations already using them and a further 59% planning adoption. These platforms are increasingly vital for supporting remote collaboration, multidisciplinary clinical coordination, and agile teamwork within and across care settings.

- Optimising and enhancing visibility of resources
  - Clinical resource scheduling systems (covering equipment, beds, and medical devices) are currently adopted by 36% of respondents, with 39% planning implementation within the next two years. These solutions are essential for optimising resource utilisation and improving operational flow in high-demand environments.
  - Real-time location systems (RTLS) for tracking equipment, personnel, and patients are adopted by 26%, with another 50% planning to implement them. RTLS technologies enhance operational visibility, reduce asset search times, and support efficient care delivery, particularly valuable in large, complex hospital infrastructures.
  - Command and control centres, while less commonly adopted today (17%), have strong projected uptake (48%). Their growth signals increased interest in centralised oversight capabilities to support dynamic decision-making, crisis response, and system-wide resource coordination.
  - Maintenance management systems, including those for medical equipment, have a current adoption rate of 25%, with 59% of organisations planning future investment. These tools are increasingly seen as essential for ensuring equipment uptime, supporting preventative maintenance, and managing asset life cycles effectively.
- Ensuring operational resilience
  - Supply chain management systems are gaining momentum, with 32% current adoption and 55% planning implementation. The pandemic underscored the importance of resilient, transparent supply chains, making this a strategic area for investment to ensure continuity of care and optimise procurement.
  - Pharmacy and drug management systems are already implemented in 37% of organisations, with a further 53% planning to adopt. These systems are critical not only for ensuring patient safety through accurate dispensing and tracking but also for managing inventory, improving compliance, and reducing medication-related costs.

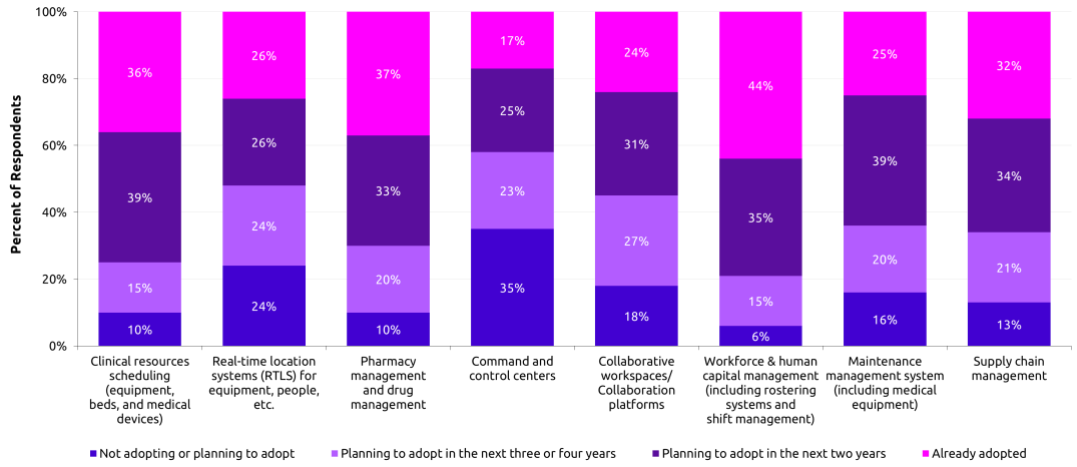


Figure 70: Resource Management Solutions Adoption and Investment Plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 Q. Which resource management solutions has your organisation adopted or does it plan to adopt in the next four years?

5.4.8Digital technologies for genomics

There is a growing interest in genomics among European healthcare providers; however, the adoption of digital genomics technologies remains relatively limited, largely due to ongoing challenges related to infrastructure, specialised expertise, and implementation capacity. Despite these constraints, medium-term investment intentions are relatively strong—albeit concentrated among a smaller group of organisations with the resources and capabilities to lead the way (**Figure 60**, **Figure 61**, and **Figure 62**).

Against this backdrop, survey findings (**Figure 71**) provide valuable insights into the adoption and investment trends of specific technologies, which can be grouped into four key categories:

- **Computing platforms and software for genome sequencing**. These systems are critical for managing and processing raw sequencing data and supporting genomic research through data management, storage, visualisation, workflow management, and the application of bioinformatics tools. Survey results for these solutions suggest a growing interest in building foundational capabilities, although adoption remains at an early stage.
  - Genomic sequencing technologies currently have an adoption rate of 16%, with 48% of respondents planning to adopt within the next four years.
  - Genomic workflow management systems are less widely adopted (8%), though 41% of organisations anticipate adoption in the medium term.
- **Advanced analytical solutions for genomic research**. These systems include high-performance computational tools, such as AI, machine learning, and advanced bioinformatics software, designed to analyse complex genomic datasets, integrate multi-omics data, predict disease risks, and support precision diagnostics and therapies. Survey results show that advanced analytics and bioinformatics tools have a current adoption rate of 13%, with 50% of respondents planning to adopt them within the next four years. AI/ML-driven genomic data analysis platforms, while currently adopted by only 4%, also demonstrate strong future potential, with 48% planning future implementations.
- **Genomic data ecosystem and collaborative platforms** enable the secure management, sharing, and collaborative analysis of genomic data. By integrating databases, biobank systems, standardised data models, APIs, cloud technologies, and advanced security, they provide a robust environment for multi-site research while ensuring data privacy and protection. Current adoption among surveyed organisations is low (6.3%), with only 37% planning implementation in the medium term. A majority (57%) report no plans to adopt these solutions.
- **Genomic insights and clinical translation platforms** are designed to integrate genomic data into clinical practice. These include clinical interpretation and reporting tools (10% adopted, 54% planning), genomic insights and clinical translation platforms (8% adopted, 39% planning), patient-facing genomics technologies (7% adopted, 44% planning), and solutions for EHR integration of genomic data (7% adopted, 40% planning). While current adoption remains modest, the consistently strong investment intentions (ranging from 39% to 54%) highlight a growing focus on using genomic data to advance personalised care, clinical decision support, and patient engagement.

Although digital genomics adoption is still in its early stages, strong investment intentions, particularly in clinical application and analytical capabilities, point to a maturing strategic interest. However, foundational infrastructure gaps, especially in workflow management and data sharing, remain key challenges. Addressing these limitations will be essential to unlock the full potential of genomics, enabling secure, federated, and collaborative cross-border collaborative research.

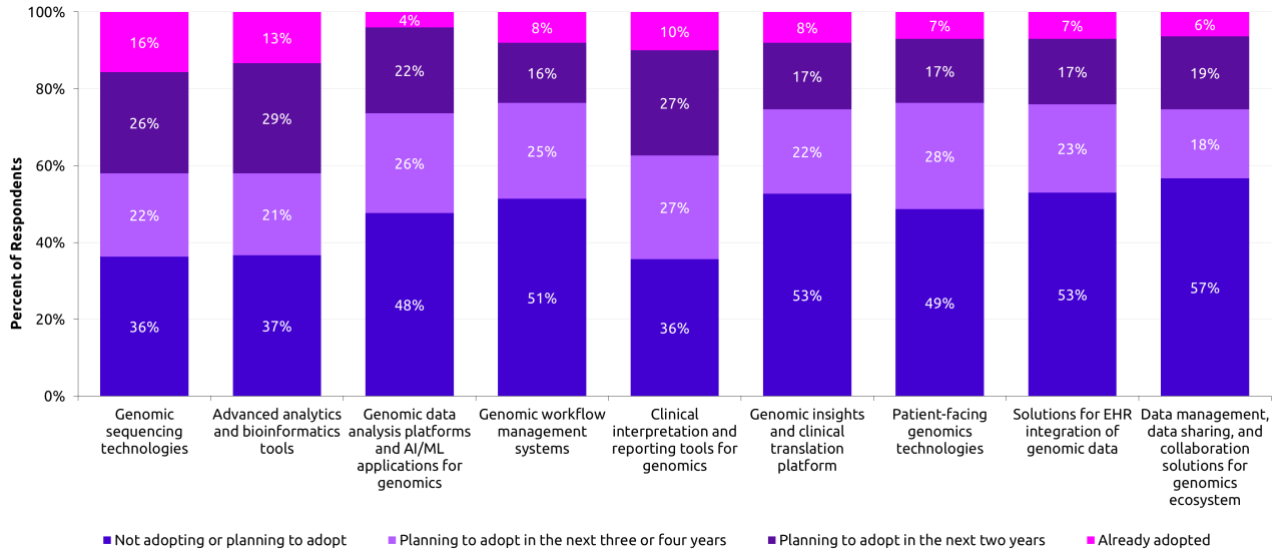


Figure 71: Digital Capabilities for Genomics Adoption and Investment Plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300. Q. Which digital capabilities for genomics has your organisation adopted or does it plan to adopt in the next four years?

5.4.9 Advancing genomic medicine: how the EU 1+ million genomes (1+mg) initiative is accelerating the adoption of digital genomics technologies

The development of digital infrastructure and capabilities to support the use of genomic data is a central pillar of the **European Union's flagship 1+ Million Genomes (1+MG) initiative**[100]. This initiative aims to enable secure, cross-border access to genomic and corresponding clinical data across Europe, fostering groundbreaking research, informing evidence-based health policy, and accelerating the adoption of personalised healthcare treatments with the potential to significantly enhance disease prevention and management. The 25 EU countries, along with the United Kingdom and Norway, signed the Member States' Declaration to strengthen collaboration in building a European data infrastructure for genomic data and committed to implementing common national frameworks to enable federated access to genomic and clinical data across borders.

The 1+ Million Genomes (1+MG) initiative is being implemented through a two-phase roadmap, structured around four key dimensions: governance, trust framework, infrastructure, and data. The first phase, Design and Testing (2018–2022), focused on laying the groundwork for cooperation, defining infrastructure requirements, and developing a trust framework to support secure genomic data sharing. This phase was supported by the Horizon 2020-funded Beyond 1 Million Genomes (B1MG) project, which provided essential legal, technical, and operational guidance. Key outputs from this phase include a set of recommendations, data standards, and best practices[101], which have been consolidated and made publicly accessible through the 1+MG Framework platform[102]. These include also the development of a "Roadmap for Genomics in Healthcare[103]" supported by a Maturity Level Model (MLM)[104] developed for national healthcare systems to evaluate the maturity of their genomic medicine practices and define a path to optimisation.

[100] European Commission (2025)
[101] See for example. B1mg-project (2022)
[102] Onemilliongenomes (2025)
[103] Zenodo (2023)
[104] B1mg-project (2025)

The second phase, Scale-Up and Sustainability (2023–2027)[105], includes the implementation of common recommendations and guidance, enabling distributed learning across countries, enhancing the interoperability of genomic and clinical data, and fostering public trust through targeted communication and engagement strategies. Importantly this phase marks the launch of the Genomic Data Infrastructure (GDI) project[106], co-funded under the Digital Europe Programme. Building on the outcomes of the first phase, the GDI project aims to establish a decentralised technical infrastructure for secure, federated access to genomic and clinical data across Europe. According to the roadmap, by 2027, the initiative aims to achieve several key milestones related to the GDI:

- The establishment of a common European legal entity to ensure the long-term sustainability and governance of the 1+MG infrastructure.
- Deployment of an operational 1+MG infrastructure, built on open community standards and validated across key use cases including population genomics (Genome of Europe), cancer, infectious diseases, and rare diseases. A starter kit – comprising initial versions of the infrastructure, synthetic datasets, and software – was already released in 2023[107].
- At least 15 countries will be actively providing access to genomic and clinical data through the infrastructure and making use of its capabilities.
- Ongoing expansion of the infrastructure to additional use cases, with the introduction of advanced functionalities such as federated analytics and federated learning, further enabling secure, collaborative research across Europe.

As part of this second phase, a key priority is aligning the 1+MG initiative with the European Health Data Space (EHDS) and other major European health and research initiatives. Achieving interoperability and integration across these efforts is essential for the successful implementation of genomic medicine at scale[108]. By 2027, the initiative aims to achieve:

- Adoption of the 1+MG Framework components, or at a minimum, ensuring interoperability within other initiatives managing genomic data.
- Coordinated collaboration among relevant European projects and initiatives to facilitate integration, data sharing, and alignment of technical and governance standards, thereby supporting a more unified and effective European health data ecosystem.

5.4.10 Digital trust and cybersecurity capabilities

Digital trust and cybersecurity solution adoption is generally high, with medical testing, laboratory, and diagnostic services followed by hospitals showing the highest adoption rates. The survey data illustrates a relatively mature posture, particularly in foundational areas. Rising investment in advanced capabilities like SOCs, endpoint security, and supply chain risk management suggests growing sophistication in how organisations are preparing for an increasingly complex threat landscape. The emphasis on training and governance reinforces a holistic approach to digital trust, critical in today's interconnected healthcare ecosystem **Figure 72**).

- Core security foundations such as Identity and Access Management (IAM) and broad data security technologies are among the most widely adopted solutions, with 66% and 63% of respondents, respectively, having already invested. These are foundational elements of digital trust, ensuring secure access to systems and protecting sensitive healthcare data.
- Device-level security is gaining momentum with endpoint and medical device security has been adopted by 59%, reflecting awareness of vulnerabilities associated with connected medical devices. Another 34%

[105] The European 1+ Million Genomes (2023)
[106] European Genomic Data Infrastructure (2025)
[107] Genomic Data Infrastructure (n.d.)
[108] Relevant initiatives include the European Health Data Space, the European Cancer Imaging Initiative, the European Virtual Human Twins Initiative, the development of future cancer data hubs, the Cancer Mission actions, and the European Partnerships on Rare Diseases, Personalised Medicine, and Transforming Health and Care Systems.

plan to invest within four years, signalling continued expansion in securing clinical endpoints.

The data also reflect a growing focus among European healthcare providers on establishing more proactive, end-to-end cybersecurity strategies.

- Security Operations Centres (SOCs) and security analytics software have a strong current presence (53% adoption), and another 39% plan to adopt, indicating growing reliance on real-time threat monitoring and response.
- Software supply chain security, a relatively newer focus area, has a lower current adoption rate (45%) but a robust future investment intention (44%). This future investment signal rising awareness of risks related to third-party and open-source software components and the need to secure the broader digital ecosystem beyond the organisation's immediate perimeter.

Healthcare organisations are not only prioritising technical safeguards but also embedding cybersecurity into their operational culture and compliance frameworks, an essential step in strengthening resilience against an evolving threat landscape.

- Cybersecurity and regulatory compliance training drive adoption, leading at 69%, emphasising recognition of the human factor in security. The continued investments (28% planning adoption) demonstrate an ongoing commitment to upskilling staff and leadership.
- Governance, Risk, and Compliance (GRC) systems are also widely adopted (57%), with over 37% planning further investment. This highlights a maturing broader approach to regulatory alignment, risk assessment, and policy enforcement.

While overall adoption is high, data reveals lower uptake levels among smaller healthcare institutions. Several factors help explain this gap. Financial constraints often force smaller providers to prioritise direct patient care and operational needs over cybersecurity, which may be perceived as a secondary concern. Many lack dedicated IT or cybersecurity staff, making it difficult to implement and maintain modern protection systems, particularly when working with outdated legacy infrastructure. In some cases, there may also be a misplaced sense of security, with reliance on basic antivirus software or firewalls, underestimating the risks posed by increasingly sophisticated threats like ransomware or phishing. Given the growing threat landscape and the demonstrated success rate of cyberattacks in healthcare, particularly ransomware[109], these challenges point to the urgent need for targeted support, awareness-building, and scalable cybersecurity solutions tailored to the needs of smaller healthcare organisations. This urgency aligns with the European action plan on the cybersecurity of hospitals and healthcare providers as a priority initiative in the first 100 days of the European Commission new mandate[110].

[109] As highlighted for instance by the "ENISA Threat landscape: Health Sector" report of July 2023 that mapped and analysed cyber incidents in healthcare from January 2021 to March 2023

[110] European Commission (2025)

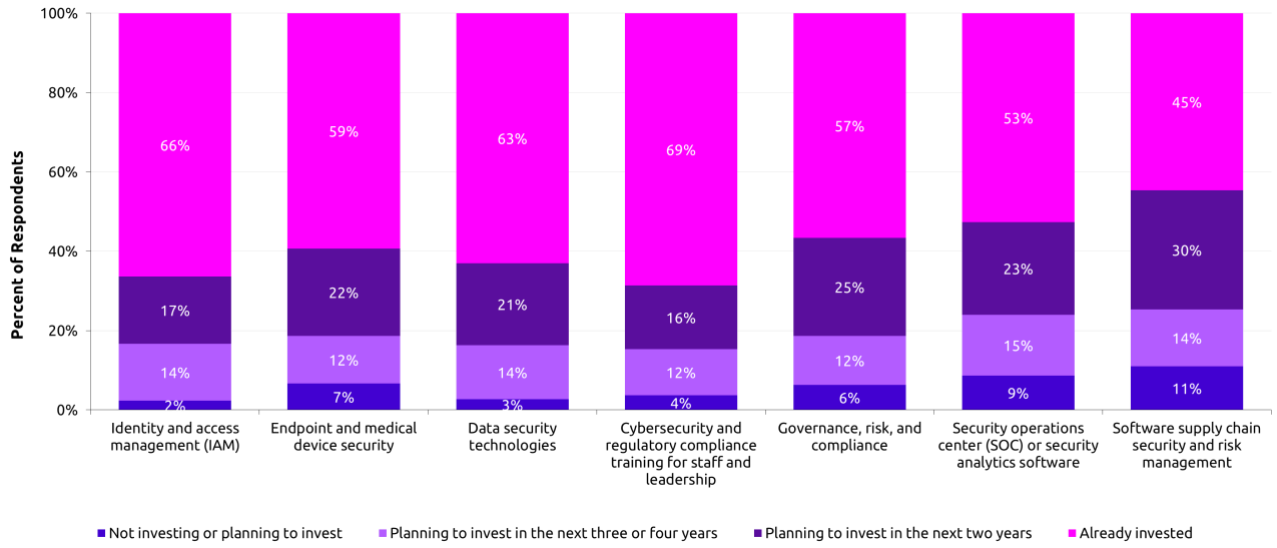


Figure 72: Digital Trust And Cybersecurity Capabilities Adoption and Investment Plans

Survey: Digital Technologies in Healthcare, Providers – Sample: B2B, CATI, Hospital and other Healthcare Services, mix of IT and LOB decision makers – Total sample: N=300 Q. Which digital trust and cybersecurity capabilities has your organisation adopted or does it plan to adopt in the next four years?

5.5 EU Digital Health market size and growth trajectories

Estimating the size of the digital health technology (DHT) market is a foundational element in evaluating the economic impact of digital transformation across Europe's healthcare landscape.

The assessment explores regional variations and identifies markets with the most significant levels of digital health investment. It also offers a granular segmentation of spending patterns across technology categories, care delivery settings, and healthcare provider types, based on proprietary datasets and primary data collection.

By providing a structured and evidence-based outlook, this section supports strategic decision-making by highlighting key investment trends, identifying high-growth segments, and quantifying the market potential of digital health technologies. These insights are intended to support policymakers, public authorities, investors and digital health vendors in aligning their actions with the evolving digital health ecosystem across the EU.

EU Digital Health Market Size and Growth Trajectories: Key Takeaways

- **Robust Market Expansion**: The EU27 digital health market is projected to grow from €11.0 billion in 2023 to €61.2 billion by 2035, reflecting a CAGR of 15.1%, driven by modernisation, digital policy mandates, and continued, yet more stabilised post-pandemic investment momentum.
- **Regional Leaders:** DACH (Germany & Austria) presents the fastest growth with 16% CAGR, backed by AI strategies and cybersecurity funding. South & Western Europe (including large countries as France, Italy) shows a 15% CAGR, fuelled by EHR investments and EU recovery funding long tails. Together, these regions will account for ~75% of total EU digital health spending by 2035.
- **Structural Gaps Remain:** Central & Eastern Europe starts from a lower base but shows 13% CAGR, highlighting the need for sustained investment, infrastructure upgrades, and workforce development to close regional disparities
- **Technology Growth Hotspots:**
  - Medical Imaging: Fastest-growing tech segment; spending to rise 6.2x among hospitals, driven by AI-enabled diagnostics and teleradiology (CAGR: 19.1% hospitals, 20.4% other healthcare providers- OHP).
  - Genomics: From niche to mainstream; total spending to reach €7.13B by 2035 across hospitals and OHPs (CAGR: ~18%).
  - EHRs: Remain foundational; projected €9.37B by 2035, supported by EHDS-driven interoperability requirements (CAGR: 13.9% hospitals, 16.0% OHPs).
  - Cybersecurity: Growing at 15%+ CAGR, with spending to exceed €3.78B by 2035, reflecting mounting systemic risks and compliance needs.
  - Hospitals vs OHPs: While hospitals dominate current investment, other healthcare providers (OHPs), including outpatient clinics and labs, are catching up fast, particularly in imaging and EHRs.

5.5.1 Methodology and data sources for market sizing and growth forecast

The Market Size and Growth Forecast delivers a robust market sizing and growth forecast for digital health technologies (DHTs) in the European Union, supporting evidence-based policy and investment planning. It establishes baseline estimates for 2023 and 2025 and provides forward-looking projections for 2030 and 2035, reflecting the strategic evolution of the digital health ecosystem across the EU27.

The analysis quantifies total digital health investments at the EU level and disaggregates the data across multiple dimensions to enhance interpretability and relevance:

1. **Geographic segmentation:**
   - **Macro-regional Analysis**: Forecasts are provided for five EU27 macro-regions – Southern and Western Europe, DACH, Northern Europe, Benelux, and Central and Eastern Europe – enabling comparative assessment across different healthcare and policy contexts (see **Table 7** for countries included in each macro region).
   - **Country-level Disaggregation**: Where data availability permits, individual Member State profiles are developed, with focused attention on the largest healthcare markets such as Germany, France, Italy, and Spain.
2. **Technological segmentation:**

- Estimates for selected key technology areas and types[111] aligned with the structured taxonomy in **Annex A1**.

3. **Provider-type segmentation:**
   - For selected key technology areas and types, investment levels are broken down by healthcare provider type, distinguishing between hospitals (including secondary and tertiary care institutions) and other health service organisations such as outpatient clinics, laboratories, and long-term care providers.

Table 7: EU27 Countries Covered in the Five Geographical Regions

Regions	EU27 Country
South and Western Europe	Italy, Spain, Portugal, France, Malta, Greece, Cyprus,
DACH	Germany, Austria
Northern Europe	Sweden, Denmark, Finland, Ireland
Benelux	Belgium, Netherlands, Luxemburg
Central and Eastern Europe	Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia

Source: Consortium, 2025

Data sources and coverage

The model is informed by both primary and secondary research conducted specifically for this study and leverages international data sources such as the WHO Global Health Expenditure Database, OECD, and Eurostat. These sources offer insights into healthcare spending, availability of key medical technologies (e.g., CT and PET scanners), and R&D investments relevant to digital health.

IDC's datasets and analytics solutions served as the starting point for this model, ensuring robust and reliable market sizing and forecasting. In particular, these two IDC's proprietary datasets were used:

- IDC Worldwide Digital Transformation Spending Guide 2024 | October (V2 2024)[112]
- IDC Worldwide Security Spending Guide 2025 | February (V1 2025)[113].

These datasets support forecast development across industry (healthcare providers), geography (EU Member States and global comparators), and digital health technology categories. They are updated regularly twice a year and reflect IDC's internal data governance and quality assurance protocols[114].

Methodology approach for market sizing and forecasting

The methodology for estimating the size and growth of the DHT market combines both demand-side and supply-side analyses, which run in parallel to produce a consistent, validated, and structured market estimate. These complementary perspectives ensure alignment between observed market activity and future investment patterns. The process is structured across three steps:

Step 1: Bottom-up industry it spend – base year

[111] The selection of these technologies was informed by their impact on healthcare organisations' budget allocations, their applicability across the patient care value chain, and their strategic relevance in emerging and advanced diagnostic domains, notably genomics. This prioritisation draws on findings from the European Healthcare Providers Survey and the informed judgment of the study consortium team.
[112] IDC Worldwide Digital Transformation Spending Guide
[113] IDC Worldwide Security Spending Guide
[114] IDC Spending Guides provide forecasts in constant U.S. dollars, using a single average annual exchange rate from the base year (e.g. 2023 for the 2024 guide). This method eliminates exchange rate volatility; for conversion to euros, the same USD/EUR base-year rate must be applied across all values. For this study, the European Central Bank (ECB) average USD/EUR exchange rate from 2 January to 29 December 2023 (0.924) was used

This step involves building the market baseline using a bottom-up estimation process which leverages IDC knowledge on pricing structure, vendor revenues, and insights from the surveys data. Data also build on third party data – extensive list of demographics as well as macroeconomic and business indicators from WHO Global Health Expenditure Database, OECD, and Eurostat. It captures actual spending across healthcare provider organisations and segments the data by:

- **Industry**: Focused on the healthcare provider sector, in line with the scope of digital health technologies supporting care delivery.
- **Country/Region**: Includes national-level granularity across EU Member States, aggregated into five EU macro-regions. It also includes selected non-EU regions (see below).
- **Company Size**: Where data permits, spending is further disaggregated by organisation size bands, based on firmographic data.

This baseline estimation covers 2023 and 2025 and serves as the foundation for multi-year projections.

Step 2: Bottom-up industry 5-year and 10-year forecasts

Using the segmented baseline from Step 1, IDC's internal forecasting models are applied to project spending over five- and ten-year horizons, that is 2030 and 2035. These models integrate historical patterns, digital transformation trajectories, and anticipated technology adoption across all covered segments. Projections are guided by IDC's standard forecasting practices that are updated semi-annually.

Step 3: Top-down validation and reconciliation

This final step ensures coherence between market segments and overall totals. Bottom-up forecasts are reconciled with IDC's broader market-level estimates and data series to ensure consistency. This study's surveys data, as well as where available, IDC's supply-side data (e.g., vendor revenue analysis, deployment metrics) is used to validate growth patterns and adjust assumptions where appropriate. This two-directional calibration enhances forecast reliability.

This methodology is used to estimate comparable market size and forecast growth in selected non-EU regions (See Section Global Digital Health market size and) These include:

- The United Kingdom
- The United States
- China
- Japan
- The broader Asia-Pacific region excluding Japan and China (APeJC), which includes Australia, New Zealand, India, and other emerging Asian markets

The data for these non-EU markets will be used primarily for comparative purposes but will follow the same methodological principles as applied in the EU analysis.

5.5.2Market size and forecast analysis

The digital health market across the EU27 is set for robust and accelerating growth, with total spending projected to rise from €11.0 billion in 2023 to €61.2 billion by 2035, more than quintupling over the period. An average compound annual growth rate (CAGR) of 15.1% reflects a strong commitment by Member States to modernising healthcare systems through digital transformation.

A regional breakdown reveals both common momentum and structural differences (see **Figure 73**, **Figure 74**, and **Table 8**).

- **DACH (Germany and Austria)** leads with a **16% CAGR**, fuelled by infrastructure modernisation, AI strategies, and targeted funding for digital innovation and cybersecurity.
- **South Western Europe**, particularly **Italy and France**, follows with a **15% CAGR**, driven by large-scale

EHR deployment and post-pandemic digital health investments backed by EU funding.

Together, these two regions are expected to account for **nearly 75% of total EU27 digital health expenditure** by 2035.

- **Central and Eastern Europe (CEE)**, while starting from a lower base, is projected to grow at a **13% CAGR**. Despite challenges such as infrastructure gaps, workforce shortages, and market fragmentation, targeted EU structural funds and incentives could accelerate progress beyond 2025.

Digital health investment is growing rapidly across all EU regions, though the **pace and structure of growth differ significantly**, underlining the importance of segmented strategies and policy support

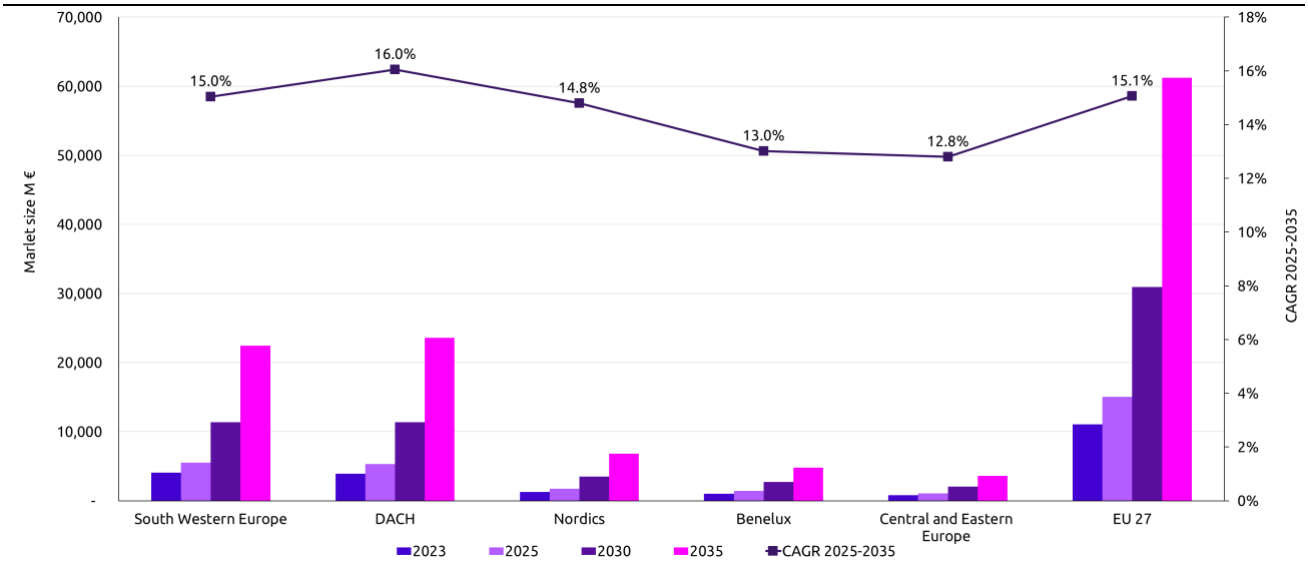


Figure 73: EU 27 Regional Digital Health Market size and Forecast

Source: Consortium, 2025

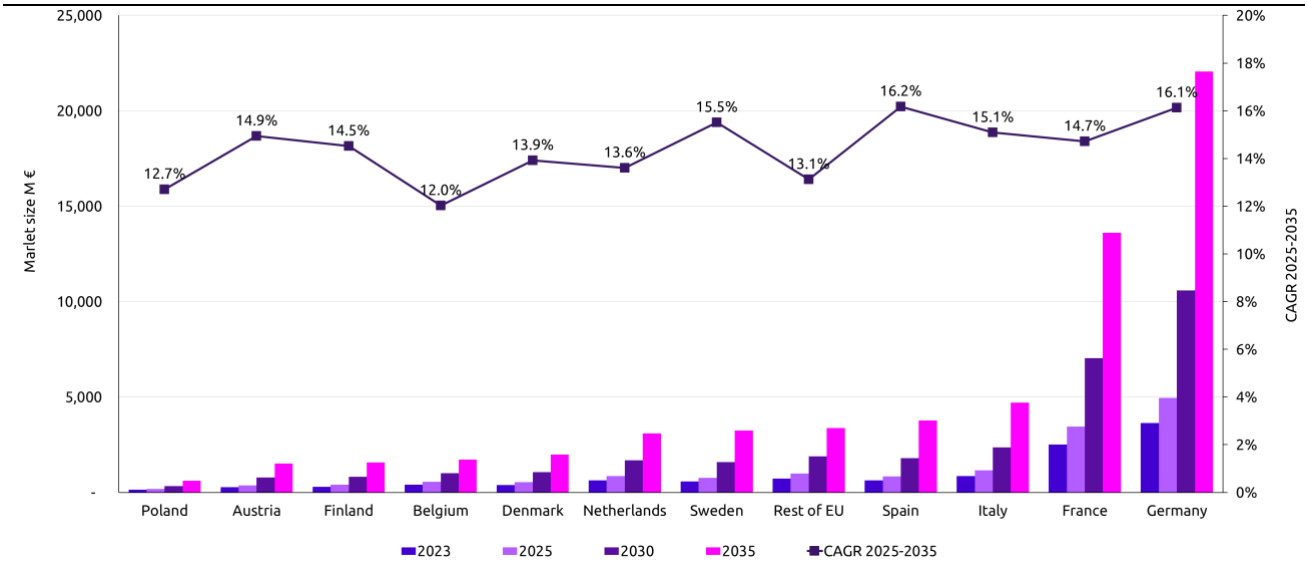


Figure 74: EU 27 Digital Health Market size and Forecast in selected countries

Source: Consortium, 2025

Table 8: EU 27 Digital Health Market size and Forecast in selected countries

	Digital Health Technology Total Spend in EUR Millions			
Country	**2023**	**2025**	**2030**	**2035**
Austria	266	375	785	1,510
Belgium	408	552	1,012	1,717
Denmark	389	540	1,065	1,987
Finland	290	403	815	1,563
France	2,513	3,446	7,031	13,601
Germany	3,638	4,943	10,584	22,052
Italy	852	1,155	2,365	4,708
Netherlands	626	862	1,684	3,088
Poland	141	183	337	605
Spain	624	840	1,789	3,763
Sweden	568	767	1,592	3,243
Rest of EU	733	985	1,887	3,380
Total EU27	**11,048**	**15,051**	**30,946**	**61,217**

Source: Consortium, 2025

The market forecast for key digital health technologies across the EU27 reveals robust and sustained growth, underpinned by a shift toward data-driven, patient-centred healthcare delivery. The technologies included in this forecast (EHR, medical imaging, clinical documentation and workflow tools, cybersecurity, and genomics[115]) reflect core elements of digital infrastructure and growing priorities for healthcare providers. As this is a focused subset, their combined market size does not equal the total digital health market size analysed above.

While hospitals remain the dominant force in digital investment, other healthcare providers (OHPs) are rapidly catching up, underscoring the shift toward more decentralised and connected healthcare ecosystems (See **Table 9** and **Figure 75**).

- Medical imaging technologies show the fastest growth across all categories, with spending in hospitals projected to rise at a 19.1% CAGR and 20.4% among OHPs. This surge is fuelled by increased reliance on AI-enhanced diagnostics, teleradiology, and advanced imaging analytics. The scalability of these tools across hospitals, diagnostics centres, and ambulatory care makes them a strategic priority, particularly in the context of growing healthcare demand and limited workforce capacity.
- Genomics is witnessing a balanced and sustained rise in investment. Hospital spending is forecast to grow from €545M to €2.83B (17.9% CAGR), while OHPs will see growth from €707M to €3.76B (18.2% CAGR). This trajectory reflects the ongoing decentralisation of precision medicine, as genomic testing

[115] These technologies were selected based on their strategic relevance and investment levels, as also confirmed by the healthcare providers' survey results. EHR and medical imaging remain the backbone of digital health systems, absorbing a substantial share of budgets. Clinical documentation and workflow tools, spanning a wide range of applications, are critical to both routine operations and specialised care. Genomics, though still in the early stages of adoption, is gaining traction for its role in personalised medicine and research. Cybersecurity has emerged as a clear strategic priority, with spending increasing steadily to meet regulatory and operational demands.

moves beyond academic centres into mainstream outpatient and specialist care. Continued uptake will depend on broader access to technology and skilled professionals.

- EHRs remain a cornerstone of digital health infrastructure. Hospital investment is projected to grow from €1.67B to €6.16B (13.9% CAGR), with OHPs seeing even faster growth (16.0% CAGR). These trends are driven by national mandates for integrated care, cross-provider interoperability, and compliance with the European Health Data Space (EHDS), which is expected to accelerate adoption across both sectors.
- Spending on clinical documentation and workflow tools is expected to grow steadily: 12.5% CAGR in hospitals and 15.0% CAGR among OHPs. With mounting pressure from workforce shortages and administrative workloads, healthcare organisations are increasingly prioritising automation, AI-assisted documentation, and streamlined digital workflows to boost operational efficiency.
- Cybersecurity investment is expected to grow at 15.0% CAGR in hospitals and 15.1% CAGR in OHPs. This reflects mounting concerns around data breaches, ransomware, and systemic vulnerabilities in complex IT environments. The adoption of advanced capabilities like Security Operations Centres (SOCs), endpoint security, and supply chain risk management points to a more mature, proactive approach, reinforced by regulatory frameworks such as the NIS2 Directive.

These technology-focused estimates reveal **three clear, interwoven trends** shaping the future of digital health in the EU27. First, technology-driven specialisation is taking centre stage, with advanced areas like medical imaging and genomics leading innovation efforts. These high-impact domains are advancing rapidly, supported by AI, advanced analytics, and the mainstreaming of personalised medicine. These high-growth segments are complemented by the continued importance of foundational systems such as electronic health records (EHRs) and clinical documentation platforms, which remain critical to enabling system-wide transformation. Second, there is a noticeable convergence across care settings, as other healthcare providers (OHPs) increasingly match hospitals in digital investment. This shift reflects the gradual but steady transition toward distributed, patient-centred care, where digital tools are being scaled across outpatient, primary, and community-based services. Finally, cybersecurity investments emerged as a critical enabler, growing in lockstep with digital adoption. As health systems become more connected and data-driven, investment in infrastructure protection, compliance, and risk management is accelerating, driven not only by operational needs but also by regulatory imperatives under the EHDS and NIS2 Directive.

In summary, the EU27 digital health market is poised for a decade of accelerated growth, presenting significant opportunities for innovation, system transformation, and improved care delivery. Yet, unlocking this potential will require sustained effort to address persistent challenges, particularly around financing, digital workforce capacity, and the maturity of data infrastructure. The forecasted trajectory positions Europe as a globally significant player in digital health, provided it maintains momentum and coherence across its policy and investment frameworks.

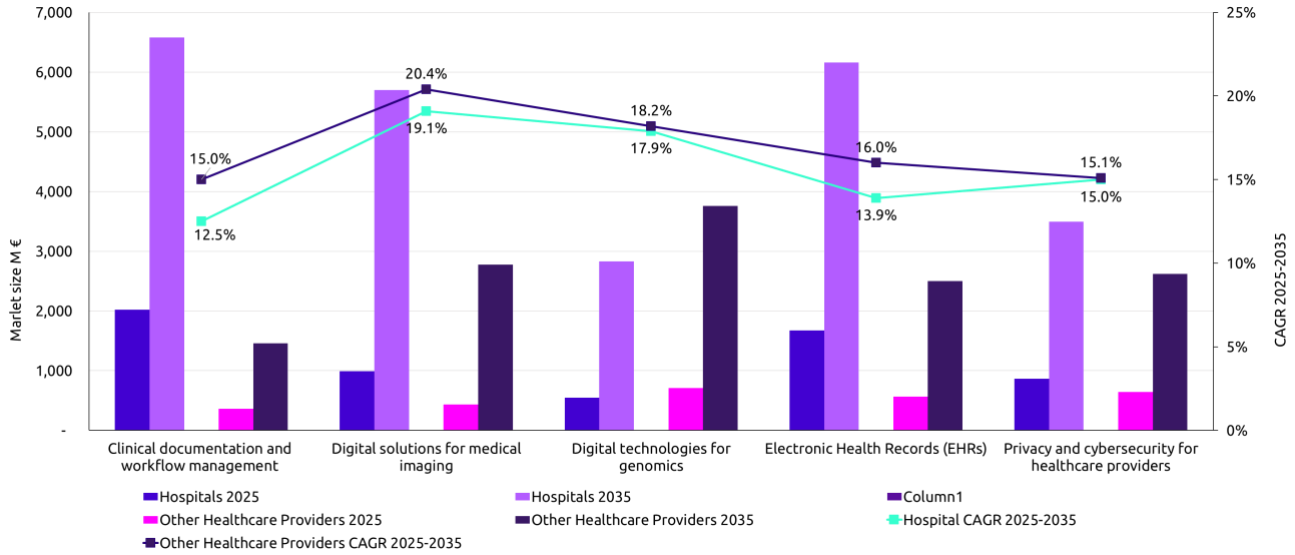


Figure 75: EU 27 - Market Sizing and Forecast by Selected Digital Health Technologies and Care setting

Source: Consortium, 2025

Table 9: Market Sizing and Forecast by Selected Technologies with Geographic and Provider-Type breakdown (Million EUR)

Geographic Region	Provider Type	Technology Category	Technology	2023	2025	2030	2035
South and Western Europe	Hospitals	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	407.5	585.1	1,133.0	2,060.1
			Electronic Health Records (EHRs)	451.4	622.8	1,227.7	2,275.9
			Digital solutions for medical imaging	283.2	365.6	849.5	2,113.8
		Digital technologies for genomics	Digital technologies for genomics	137.4	205.5	483.4	1,079.4
		Trust	Privacy and cybersecurity for healthcare providers	233.1	308.4	622.8	1,260.2
	Other Healthcare Providers	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	87.4	134.6	285.0	538.4
			Electronic Health Records (EHRs)	135.3	210.0	463.8	926.9

Geographic Region	Provider Type	Technology Category	Technology	2023	2025	2030	2035
DACH			Digital solutions for medical imaging	121.3	161.4	397.5	1,040.2
		Digital technologies for genomics	Digital technologies for genomics	151.1	271.0	643.9	1,426.7
		Trust	Privacy and cybersecurity for healthcare providers	175.9	232.9	469.4	937.6
	Hospitals	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	523.2	732.0	1,307.4	2,149.0
			Electronic Health Records (EHRs)	389.8	534.8	1,057.6	1,984.0
			Digital solutions for medical imaging	262.6	345.3	802.0	1,909.5
		Digital technologies for genomics	Digital technologies for genomics	120.9	181.8	432.5	968.4
		Trust	Privacy and cybersecurity for healthcare providers	206.0	268.7	526.5	1,019.5
	Other Healthcare Providers	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	69.3	104.7	225.5	440.7
			Electronic Health Records (EHRs)	104.9	159.6	361.8	759.7
			Digital solutions for medical imaging	109.2	147.7	364.8	926.7
		Digital technologies for genomics	Digital technologies for genomics	130.5	239.5	574.0	1,298.5
		Trust	Privacy and cybersecurity for healthcare providers	151.8	198.0	388.5	761.8
	Hospitals	Health data management	Clinical documentation	186.6	267.3	505.1	894.3

Geographic Region	Provider Type	Technology Category	Technology	2023	2025	2030	2035
Northern Europe		and diagnostic and therapeutic workflow management systems	and workflow management				
			Electronic Health Records (EHRs)	134.1	193.5	393.3	742.0
			Digital solutions for medical imaging	70.3	95.3	228.5	574.9
		Digital technologies for genomics	Digital technologies for genomics	37.1	55.6	127.5	272.5
		Trust	Privacy and cybersecurity for healthcare providers	75.4	100.5	212.9	454.1
	Other Healthcare Providers	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	41.1	62.7	132.8	256.2
			Electronic Health Records (EHRs)	65.9	102.3	221.4	431.8
			Digital solutions for medical imaging	41.4	57.7	144.2	370.5
		Digital technologies for genomics	Digital technologies for genomics	50.6	89.4	209.4	459.0
		Trust	Privacy and cybersecurity for healthcare providers	75.7	100.9	213.7	455.7
Benelux	Hospitals	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	154.8	221.8	433.5	801.6
			Electronic Health Records (EHRs)	128.7	184.0	365.2	664.9
			Digital solutions for medical imaging	72.4	99.3	241.5	603.7
		Digital technologies for genomics	Digital technologies for genomics	35.7	53.6	126.2	274.8

Geographic Region	Provider Type	Technology Category	Technology	2023	2025	2030	2035
		Trust	Privacy and cybersecurity for healthcare providers	67.8	92.1	194.6	404.8
	Other Healthcare Providers	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	27.4	41.2	85.4	158.3
			Electronic Health Records (EHRs)	44.6	68.2	144.4	279.5
			Digital solutions for medical imaging	31.6	44.4	113.7	292.1
		Digital technologies for genomics	Digital technologies for genomics	36.1	66.7	161.2	370.7
		Trust	Privacy and cybersecurity for healthcare providers	50.9	69.1	146.3	307.4
Central and Eastern Europe	Hospitals	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	151.0	212.8	395.4	673.0
			Electronic Health Records (EHRs)	102.0	136.2	262.3	491.7
			Digital solutions for medical imaging	64.5	83.1	199.3	495.5
		Digital technologies for genomics	Digital technologies for genomics	36.5	52.5	120.0	252.2
		Trust	Privacy and cybersecurity for healthcare providers	77.0	100.4	196.8	383.8
	Other Healthcare Providers	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	14.3	20.8	41.2	71.8
			Electronic Health Records (EHRs)	20.0	29.2	60.5	113.5

Geographic Region	Provider Type	Technology Category	Technology	2023	2025	2030	2035
			Digital solutions for medical imaging	17.9	23.9	60.6	158.9
		Digital technologies for genomics	Digital technologies for genomics	21.8	44.3	102.8	220.1
		Trust	Privacy and cybersecurity for healthcare providers	34.2	44.6	87.4	171.5
Total EU27	Hospitals	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	1,540.0	2,185.1	4,084.9	7,119.0
			Electronic Health Records (EHRs)	1,305.1	1,808.7	3,578.0	6,665.0
			Digital solutions for medical imaging	815.0	1,069.9	2,511.7	6,166.2
		Digital technologies for genomics	Digital technologies for genomics	394.8	589.9	1,386.0	3,060.7
		Trust	Privacy and cybersecurity for healthcare providers	707.2	933.5	1,881.6	3,780.6
	Other Healthcare Providers	Health data management and diagnostic and therapeutic workflow management systems	Clinical documentation and workflow management	258.0	392.2	829.7	1,580.0
			Electronic Health Records (EHRs)	399.5	613.6	1,349.8	2,708.6
			Digital solutions for medical imaging	346.4	469.0	1,164.8	3,004.6
		Digital technologies for genomics	Digital technologies for genomics	420.4	765.6	1,822.0	4,067.3

Note: As these are selected technologies within the broader digital health market, the total for the EU27 differ from to the overall market figure shown in the previous table.

Source: Consortium, 2025

6 Comparative Analysis – EU vs. Non-EU Markets

To contextualise Europe's digital health market globally, this section compares financial investment levels, market size, technology adoption trends, and regulatory frameworks across selected non-EU regions.

The analysis explores how national priorities, policy frameworks, and the maturity of technological ecosystems influence diverse digital health strategies globally. In particular, the analysis focuses on comparing public and private funding models, regulatory responsiveness, and the adoption of technologies accelerating innovation. These insights will support a nuanced assessment of Europe's international positioning and highlight strategic opportunities to align with global best practices, while building on its core values of data privacy, compliance, and interoperability.

6.1 Macro regional financial trends analysis

Analysis of Worldwide Macro Regional Financial Trends: Key Takeaways

- **Capital Concentration Skews Global Balance:** The United States dominates global digital health funding, attracting 72% of global capital. A second tier, led by China, India, and high-growth Asia-Pacific hubs, is growing but remains far behind. The United Kingdom consistently draws more investment than any individual EU Member State, while the EU27 as a whole retains a modest, largely static share (7%) of total deal volume.
- **Deal Flow vs. Deal Size**: Despite modest capital inflow, the EU27 accounted for 15% of global deal count, showing healthy early-stage deal activity, but a lack of large-scale funding rounds. In contrast, the U.S. and several Asia-Pacific markets attract significantly higher capital per transaction, suggesting ecosystems with better access to late-stage funding.
- **Investor Mix and Maturity Gaps:** The U.S. and Asia benefit from a slightly more diverse investor base, including venture capital, corporate funds, private equity, and strategic investors, providing stronger late-stage firepower. In contrast, the EU27 remains dominated by venture capital, limiting access to follow-on funding, reinforcing an early-stage focus.
- **Strategic Implications for the EU:** The EU27's share of global capital remained stable at 5–9%, and deal count at 10–12%, from 2019 to 2024, highlighting entrenched disparities in capital access and ecosystem maturity especially in comparison with the U.S. Without a broader investor mix and scale-up incentives, the EU risks cementing a structural disadvantage, with domestic digital health innovators struggling to compete against better-capitalised U.S. and Asian peers. EU-level coordination will be critical to expand growth-stage financing, attract institutional capital, and strengthen Europe's position in the global innovation race.

Building on the data, definitions, and methodology outlined in the Financial section, this section examines digital health investment from private capital markets adopting a macro-regional lens. The analysis considers both total deal size and deals count[116], segmented by geographic global macro-regions. EU27 countries are grouped and analysed as a single region, while non-EU macro regions follow a standardised geographic segmentation, as outlined in **Annex A2** – Methodology for Market Mapping. This comparative perspective provides insight into the global distribution of capital, the relative maturity and diversity of global regional ecosystems, and evolving dynamics among leading digital health innovation hubs.

Figure 79 reveal additional geographic asymmetries to the dominance of the United States highlighted in the Financial section. These include the EU27's persistently low share of global funding (both in absolute and relative terms); the concentration of capital in key non-EU regions; and a more dispersed pattern in the

[116] As in the main Financial Trend Analysis section, deal count and deal size represent distinct dimensions of investment activity. Deal count (number of deals) refers to the number of discrete transactions, with each counted once regardless of financial size—i.e., a €100,000 deal and a €100 million deal each contribute one unit to the total deal count. Deal size or volume, by contrast, reflects the capital deployed and captures the financial scale of total investment activity

number of transactions. The figures also illustrate temporal shifts in investment flows (2019–2024), providing further clarity on the EU's evolving position in the global digital health landscape.

Figure 76 illustrates the global distribution of digital health investment by total deal size between 2019 and 2024. The dominance of the United States, part of Americas, region is overwhelming, capturing 72% of total capital deployed**.** This pattern aligns with the findings from **Figure 39** and **Figure 47**, which also highlight the overwhelming concentration of investment activity in the U.S., both globally and when considering only non-EU27 countries. In the macro-regional view presented here, the EU27, treated as a single bloc, accounts for 7% of global deal volume, a notable increase from its sub-2% share when EU countries are analysed individually as in **Figure 39**. Nonetheless, the EU27 still ranks below the broader Asia Pacific Japan (APJ) region (which includes Japan and China) and only marginally above the EMEA region. The United Kingdom, presented separately from both the EU27 and EMEA for analytical clarity, slightly surpasses the EU27 with a 4% share of global volume. These findings **underscore a strong concentration of financial capital in a limited number of global hubs, particularly the U.S**., while also highlighting the relatively modest capital flows reaching continental Europe and emerging digital health markets in EMEA and APJ. The data reinforces the importance of addressing regional investment imbalances and strengthening the EU27's position within the global innovation financing landscape.

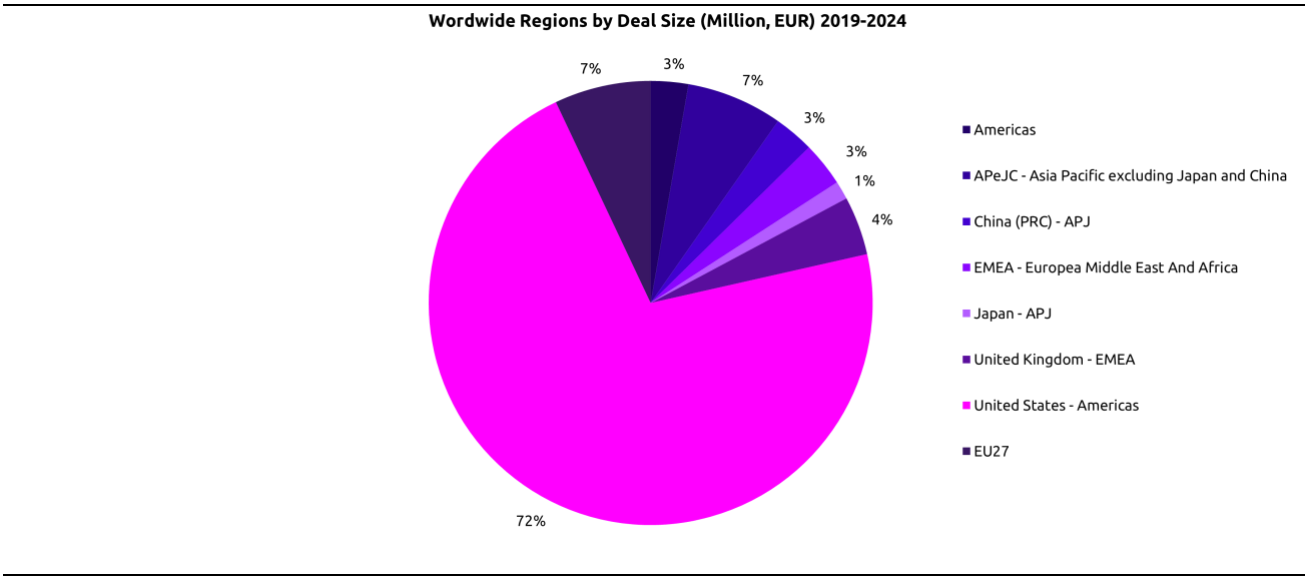


Figure 76: Macro-Regional Distribution of Digital Health Investment by Deal Volume, 2019–2024

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 77 presents the distribution of global digital health investments by number of deals across macro-regions from 2019 to 2024. While **Figure 76** highlights a strong concentration of capital, deal activity is more geographically distributed. The United States continue to lead with 51% of total deals, but the EU27 accounts for 15%, a notably higher share than its portion of total investment volume. Other active regions include the U.K. (7%), China (3%), and the Asia-Pacific region excluding Japan and China (APeJC) with 10%. This suggests that although investment capital is heavily concentrated, particularly in the U.S., early- and mid-stage deal activity is more globally distributed. Regions such as the EU27 and APeJC continue to play a meaningful role in shaping the global innovation pipeline through a steady flow of smaller-scale investments.

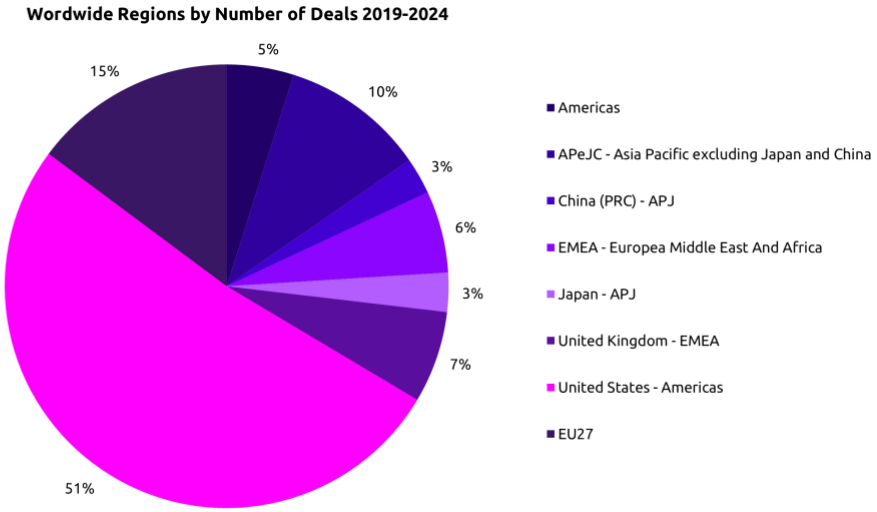


Figure 77: Macro-Regional Distribution of Digital Health Investment by Number of Deals, 2019–2024.

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 77 presents the distribution of global digital health investments by number of deals across macro-regions from 2019 to 2024. While **Figure 76** highlights a strong concentration of capital, deal activity is more geographically distributed. The United States continue to lead with 51% of total deals, but the EU27 accounts for 15%, a notably higher share than its portion of total investment volume. Other active regions include the U.K. (7%), China (3%), and the Asia-Pacific region excluding Japan and China (APeJC) with 10%. This suggests that although investment capital is heavily concentrated, particularly in the U.S., early- and mid-stage deal activity is more globally distributed. Regions such as the EU27 and APeJC continue to play a meaningful role in shaping the global innovation pipeline through a steady flow of smaller-scale investments.

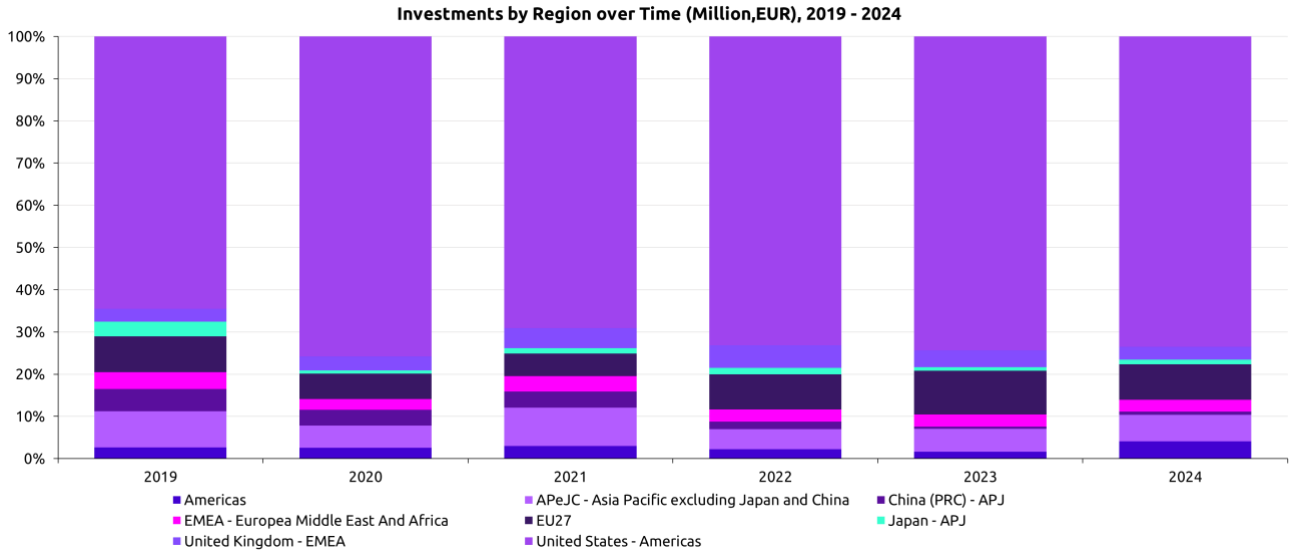


Figure 78: Digital Health Investments by Macro-Region: Annual Deal Volume (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

Figure 79 presents the annual share of global digital health deals by macro-region between 2019 and 2024. The United States again consistently accounted for more than 60% of global deal count, peaking during the pandemic but maintaining dominance throughout the period. The EU27's share remained steady, ranging between 10% and 12%, indicating a stable level of investment activity even as overall market dynamics shifted. Other regions—such as China, the U.K., and APeJC—exhibited modest year-to-year fluctuations but

did not significantly expand or contract their relative presence. Compared to **Figure 78**, which highlights extreme capital concentration, **Figure 79** suggests a broader geographic participation in investment activity, although the EU27's position remains secondary to larger and more capital-rich ecosystems.

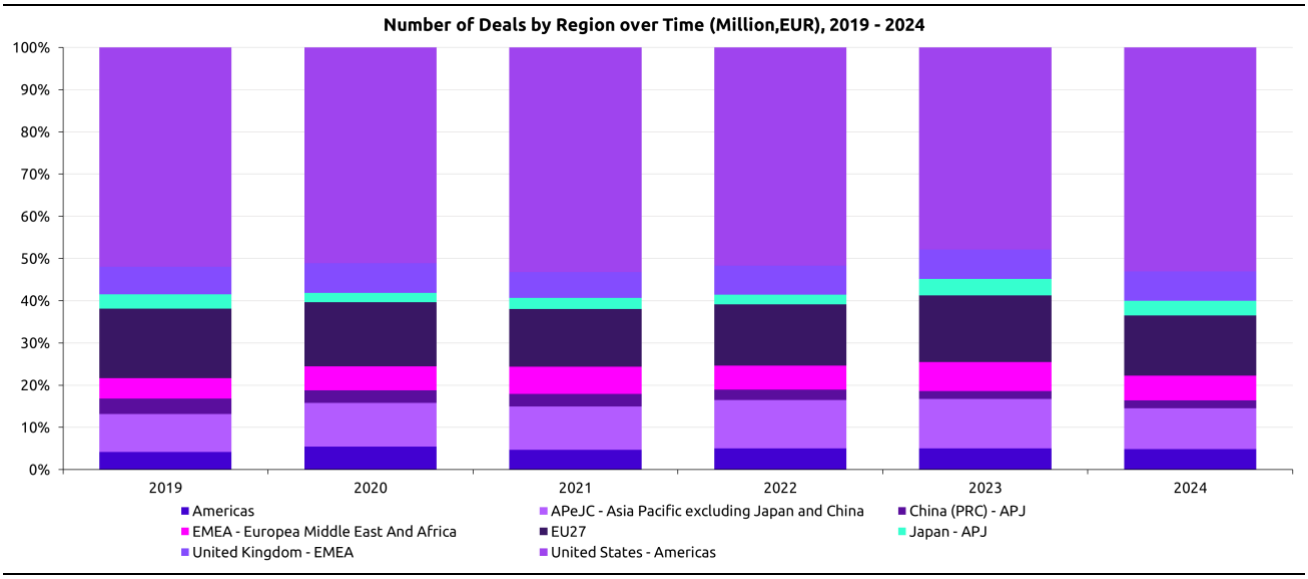


Figure 79: Digital Health Investments by Macro-Region: Annual Deal Count Share (2019–2024)

Source: Consortium Analysis on Pitchbook Data Extracted in February 2025, March 2025

The macro-regional perspective reinforces the broader patterns identified in the Financial section. The United States region consistently dominated both deal volume and deal count, with a particularly high concentration of capital during the pandemic peak. In contrast, the EU27 maintained a stable but secondary position, capturing a relatively small share of global investment across all indicators. While deal activity in the EU27 was proportionally stronger than its share of capital, this signals a concentration in smaller, earlier-stage transactions. The data also shows that **macro-regional rankings remained largely unchanged over time**, suggesting **persistent structural disparities in capital access and ecosystem maturity**. These findings might also highlight the need for coordinated action at the EU level to unlock investment potential, support scale-up funding, and improve Europe's strategic positioning within the global digital health landscape.

6.2 Digital Health maturity across macro regions

The digital health landscape is increasingly defined by rapid advancements in technology adoption, evolving regulatory frameworks, and the integration of artificial intelligence (AI) and advanced computing capabilities into healthcare systems. To benchmark the EU27 globally, this section presents a structured comparative analysis of four key non-EU countries: the United States, the United Kingdom, China (PRC), and Japan.

6.2.1 Methodology and sources for Digital health maturity across regions analysis

These countries were selected for their market relevance, investment intensity, and institutional maturity in digital health. The analysis draws from three core sources: the WHO's *Global Digital Health Monitor (GDHM) 2023*[117], the OECD's *Health at a Glance 2023*[118], and the Economist Impact's *Digital Health Barometer 2023*[119].

Each country profile is structured around two interrelated dimensions aligned with the strategic objectives of the EU Digital Health Technology Observatory:

- Technology Adoption Trends – maturity of digital tools, infrastructure readiness, and implementation scope
- Regulatory and Policy Frameworks – legal and institutional readiness, including data infrastructure, data privacy and AI governance

This analysis is further enriched by proprietary IDC survey data collected across the selected countries.

Digital Health Maturity Across Macro Regions: Key Takeaways

- **United States: Innovation Powerhouse, Strategic Fragmentation:** The U.S. leads in private-sector digital innovation. It scores Phase 5 in governance, legislation, and infrastructure (GDHM 2023) and boasts 91% EMR adoption in primary care (OECD 2023). Yet, it ranks Phase 0 in strategy, workforce, and interoperability, highlighting a fragmented ecosystem and lack of national cohesion.
- **United Kingdom: Strong Foundations, Underleveraged Potential:** With top GDHM scores in interoperability, infrastructure, and policy, and 100% EMR adoption in primary care (OECD 2023), the UK has built a technically mature ecosystem. However, scores of 0 in workforce, investment strategy, and services reveal challenges in scale-up and digital workforce readiness.
- **China: Centralised Leadership, Execution Gaps:** China demonstrates leadership with high GDHM scores in governance (Phase 5) and infrastructure (Phase 4), backed by robust AI and data laws adopted centrally. However, scores of 0 in strategy, services, workforce, and interoperability point to systemic capacity and execution gaps
- **Japan: Cautious Progress, Solid Institutional Base:** Japan scores consistently across all seven GDHM categories (Phases 2–3), reflecting steady progress. With only 42% EMR adoption in primary care (OECD 2023), it lags in uptake, but its high digital infrastructure and trust-centric AI governance position it well for gradual ecosystem scaling.
- **EU27: Regulatory Leadership, Execution Deficit:** in comparison with the countries analysed the EU27 stands out for unified policy instruments and regulations like the EHDS and AI Act, a stable innovation base, and strong public investment momentum. Yet, it trails peers in scale-up funding, advanced technology integration, and digital workforce readiness, limiting its global competitiveness.

[117] World Health Organization - WHO (2023), Global Digital Health Monitor. This is the new Global Digital Health Monitor, hosted by WHO. This beta version will replace the existing platform once the data on this site has been reviewed and validated by participating member states. In the meantime, you can still access the current Global Digital Health Monitor platform at: https://digitalhealthmonitor.org/ . At the time of writing, this website can be still utilised to generate detailed more detail country scorecards in .pdf or .xls format

[118] Organization for Economic Co-operation and Development - OECD (2023), Health at a Glance 2023: OECD Indicators

[119] The Economist Impact (2023), Advancing the Frontier of Health and Technology Integration: the 2023 Digital Health Barometer – Sponsored by Roche

6.2.2 United States

The United States presents a digitally mature and policy-led landscape, but one that remains operationally fragmented, as illustrated by the data in **Figure 80**. According to GHDM[120] the United States score Phase 5, the highest level of maturity, in leadership and governance, policy, legislation and compliance, and infrastructure, reflecting strong institutional capacity, robust legal mechanisms, and advanced system readiness. These include national provisions for data protection, privacy, consent, and critically, AI governance in health applications, as part of the Legislation, Policy, and Compliance category according to the *GDHM* methodology.

However, the country remains at Phase 0 across the remaining four components: strategy and investment, workforce, standards and interoperability, and services and applications. This suggests an absence of a unified national strategy, limited structured investment planning, a lack of formal digital health training, and limited alignment of digital tools with population health needs.

The *Digital Health Barometer 2023* reinforces this contrast. It places the U.S. in the top tier globally for digital innovation and private-sector intensity, particularly in AI and frontier technologies. However, it also notes significant inequities in implementation, regional disparities, and a fragmented landscape for population-level digital health integration.

Overall, while the governance framework for digital health is advanced, the broader ecosystem seems to lack cohesion. This dual-speed profile underscore the United States' position as both a technological leader and an institutional laggard in comprehensive digital health transformation.

United States of America	
Cateogry	**Phase**
Leadership and Governance	5
Strategy and Investment	0
Legislation, Policy, and Compliance	5
Workforce	0
Standards and interoperability	0
Infrastructure	5
Services and Applications	0
Overall Phase	**5**

Figure 80: United States Global Digital Health Monitor (*GDHM*) Phase Scores 2023

Source: Consortium Analysis of GDHM data (https://data.who.int/dashboards/gdhm/data?m49=800&year=2023), April 2025. A score of 0 indicates that the indicators for that category were either entirely absent or not fully reported.

The *Health at a Glance 2023* report reaffirms the United States' leading position in the adoption of core digital health technologies, particularly Electronic Health Records (EHRs), which are also referred to as Electronic Medical Records (EMRs) in the U.S. context and within the OECD report. In 2021, EMR usage in primary care was approximately 91%, among the highest across OECD countries. However, the U.S. performs less consistently in health information exchange: the reported availability of patient records during consultations may be considerably lower, pointing to persistent challenges in interoperability despite

[120] For the countries analysed in this section, the Consortium reported scores based on the seven foundational pillars of the WHO Global Digital Health Monitor (GDHM). The GDHM comprises 23 indicators aligned with the WHO/ITU National eHealth Strategy Toolkit, covering: leadership and governance; strategy and investment; legislation, policy and compliance; workforce; standards and interoperability; infrastructure; and services and applications. The GDHM has been officially adopted as the global monitoring platform for digital health ecosystems in WHO Member States. It serves as a critical instrument for standardising, monitoring, and advancing digital health progress worldwide. For details on the methodology, refer to the publication *The State of Digital Health 2023 – Global Digital Health Monitor*

widespread EMR adoption and federal regulations mandating interoperability. Key mandates include the CMS Interoperability and Patient Access Final Rule (CMS-9115-F)[121] and the CMS Interoperability and Prior Authorization Final Rule (CMS-0057-F)[122], along with the Office of the National Coordinator for Health IT's (ONC) Cures Act Final Rule and the Health Data, Technology, and Interoperability (HTI-2) Final Rule[123].

In terms of telehealth, the U.S. experienced a significant spike in uptake during the COVID-19 pandemic, even though OCED data do not report this. While telehealth use has since stabilized, it remains above pre-pandemic levels. Nevertheless, access might be uneven across provider types and regions, with telemedicine more prevalent in urban and well-resourced health systems. Digital infrastructure metrics reveal strong broadband coverage and high internet access rates, supporting digital service delivery. However, disparities persist, particularly in rural areas, aligning with the *Digital Health Barometer 2023* findings suggesting a variable implementation capacity. The waivers that enabled broad use of telehealth services during the pandemic have been extended again. Medicare telehealth waivers that were set to expire on March 31, 2025, have been extended six months to September 30, 2025. Regulatory uncertainty surrounding the telehealth waivers is another inhibiting factor when it comes to widespread adoption and implementation of telehealth services.

Regarding the health workforce, the U.S. reports relatively high levels of health IT use among professionals, yet the integration of digital skills into formal training remains limited. No comprehensive metric on digital workforce investment is available in the OECD dataset, but data collected suggest a skills and training gap in the clinical sector.

Overall, OECD indicators reinforce the *GDHM*'s depiction of the U.S. as digitally advanced in tools and infrastructure but fragmented in strategic coherence and interoperability at the national level.

Examples of Relevant Regulations and National Data Initiatives

In the United States, health data privacy is primarily governed by the Health Insurance Portability and Accountability Act (HIPAA)[124]. This framework protects protected health information (PHI) by regulating how it is used and disclosed by healthcare providers, insurers, and clearinghouses. Key provisions include patient rights to access and amend records, the minimum necessary use principle, and security safeguards for electronic data. In response to escalating cyber threats, the Department of Health and Human Services (HHS) proposed significant amendments to the HIPAA Security Rule in December 2024[125]. Proposed changes include:

- Mandatory encryption of patient data
- Implementation of multifactor authentication
- Regular security risk assessments
- Enhanced documentation of compliance efforts.

While HIPAA sets a federal baseline, many states impose additional protections, resulting in a complex regulatory landscape where the most stringent regulatory requirements prevail. For example, state privacy regulations may preclude certain information such as HIV status from being disclosed even if HIPAA allows for it.

The U.S. regulatory landscape for AI, including in healthcare, is fragmented and evolving, marked by differing state-level policies and ongoing debates around liability, transparency, and algorithmic bias. While the Food and Drug Administration (FDA) plays a central role in overseeing AI in health, broader federal regulation remains under development. The U.S. currently relies on existing laws and agency guidelines, with plans to introduce dedicated AI legislation and a federal regulatory authority. Until then, vendors and providers must

[121] CMS Interoperability and Patient Access Final Rule (CMS-9115-F)
[122] CMS Interoperability and Prior Authorization Final Rule (CMS-0057-F)
[123] Cures Act Final Rule and the Health Data, Technology, and Interoperability (HTI-2) Final Rule
[124] Health Insurance Portability and Accountability Act (HIPPA) of 1996
[125] U.S. Departement of health and human services (2025)

navigate a complex patchwork of state and local laws, a stark contrast to the EU's more unified and precautionary approach under the AI Act and European Health Data Space (EHDS).

The FDA regulates many AI-driven medical devices and software as medical devices (SaMD), particularly those that support clinical decision-making or perform diagnostic functions. Through its Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device (SaMD) Action Plan[126], the FDA aims to guide the development of SaMD using AI. The plan prioritises risk-based oversight, transparency, and real-world performance monitoring. Most AI-enabled devices are reviewed under existing pathways, with the FDA advancing a predetermined change control plan model to manage adaptive AI updates post-market[127]. It has also recently issued a guidance addressing the challenges posed by machine learning adaptive algorithms by developing a Total Product Life Cycle (TPLC) approach to ensure ongoing safety and effectiveness[128].

Recent developments in U.S. AI regulation included the Biden Administration's issuance of Executive Order 14110 in October 2023, which outlined comprehensive guidelines for the safe, ethical, and transparent development of AI—particularly in healthcare—aligned with broader initiatives like the AI Bill of Rights. However, this federal approach shifted in January 2025 when President Trump revoked the order, signalling a potential move toward deregulation and a greater focus on accelerating innovation.

Additionally, the Office of the National Coordinator for Health Information Technology (ONC) which oversees interoperability and standards relevant to AI integration into electronic health records (EHRs), released the HTI-1 Final Rule in January 2024[129], introducing new certification criteria for AI-driven decision support tools. Key requirements include:

- Disclosure of AI system logic and data sources
- Risk management strategies for algorithmic bias
- Alignment with the United States Core Data for Interoperability (USCDI) Version 3, effective January 2026.

To strengthen public health data infrastructure, the U.S. launched the National Implementation Center (NIC) program[130] under the Public Health Accreditation Board (PHAB). The NIC supports the Centers for Disease Control and Prevention (CDC) Data Modernization Initiative, aiming to improve interoperability, workforce capacity, and situational awareness. The programme promotes standards-based data exchange between healthcare and public health agencies, addressing long-standing fragmentation in U.S. data systems.

6.2.3United Kingdom

The United Kingdom shows a unique digital maturity profile, characterised by strong performance in specific sectors alongside broader systemic fragmentation. According to data shown in **Figure 81** the U.K. achieves Phase 5, the highest level of maturity, in leadership and governance, standards and interoperability, and infrastructure. It also scores Phase 4 in policy, legislation, and compliance, indicating a near-complete legal framework for digital health, including provisions for data privacy, consent, and AI governance mechanisms. These results confirm the U.K.'s strong institutional foundation for digital transformation and regulatory coordination.

However, three key components – strategy and investment, workforce, and services and applications – have been scored at 0, reflecting an unclear status for what concerns active national planning, capacity building, and aligned service deployment under the *GDHM* framework. This discrepancy might suggest that while the U.K. has advanced enablers in place, these might not currently be underpinned by a nationally coordinated investment and implementation strategy.

[126] FDA Releases Artificial Intelligence/Machine Learning Action Plan, 2021
[127] FDA (2025)
[128] FDA (2025)
[129] HTI-1 Final Rule (2024)
[130] Public Health Infrastructure Partners Launch National Implementation Center Program to Support Data Modernization, 2024

The *Digital Health Barometer 2023* supports this view, noting the U.K.'s strength in technical infrastructure and interoperability alongside concerns about policy execution gaps and the scaling of innovations. The report indicates high expectations for the NHS's digital health initiatives but flags inconsistent rollout and uptake across regions and patient groups.

Taken together, the U.K.'s profile might indicate a high-capacity digital ecosystem that might be underleveraged due to limited strategic and workforce alignment. Despite regulatory maturity, including AI readiness, the operational foundation for systemic scale-up seem to remain incomplete.

United Kingdom	
Cateogry	**Phase**
Leadership and Governance	5
Strategy and Investment	0
Legislation, Policy, and Compliance	4
Workforce	0
Standards and interoperability	0
Infrastructure	5
Services and Applications	0
Overall Phase	**5**

Figure 81: United Kingdom Global Digital Health Monitor (*GDHM*) Phase Scores, 2023

Source: Consortium Analysis of GDHM data (https://data.who.int/dashboards/gdhm/data?m49=800&year=2023), April 2025. A score of 0 indicates that the indicators for that category were either entirely absent or not fully reported.

The United Kingdom stands out for its complete adoption of EMRs in primary care. According to OECD's *Health at a Glance 2023*, 100% of general practices in the U.K. used EMRs as of 2021, placing the country among the most digitally mature health systems in this domain. However, while EMR deployment might be universal, the OECD notes persistent challenges across countries in ensuring effective health information exchange, and it does not provide a country-specific indicator for U.K. interoperability performance.

In the realm of telehealth, teleconsultation usage increased sharply during the COVID-19 pandemic, as it did across many OECD countries. Although disaggregated data for the U.K. was not available, OECD supports that remote consultations were scaled nationally, with use stabilising after the peak crisis period. The average across 20 reporting countries reached 19% of all consultations by 2021, suggesting that the U.K. remains above pre-pandemic levels. In terms of technical infrastructure, according to the OECD report, the U.K. demonstrate strong broadband and connectivity performance, supporting digital service delivery, which is consistent with the U.K.'s top-tier score in the *GDHM* for infrastructure.

On the workforce side, OECD provides no dedicated indicators on national digital health training or workforce investment. This aligns with the U.K.'s *GDHM* score of 0 in this area, suggesting the possible absence of a coordinated digital workforce development strategy.

Overall, OECD findings support the GDHM's assessment of the U.K. as a digitally equipped system with advanced infrastructure, but facing limitations in implementation, workforce alignment, and system-wide integration.

Examples of Relevant Regulations and National Data Initiatives

In the United Kingdom, healthcare data privacy and sharing are primarily governed by the UK General Data Protection Regulation (UK GDPR)[131] and the Data Protection Act 2018[132]. These laws apply to all personal data, but establish additional safeguards for special category data, including health information. To lawfully

[131] UK GDPR, Regulation (EU) 2016/679 of the European Parliament and of the Council
[132] Data Protection Act 2018

process health data, organisations must meet a legal basis under Article 6 and an additional condition under Article 9 of the UK GDPR. This framework places a strong emphasis on transparency, accountability, and data minimisation, ensuring that sensitive patient data is handled responsibly across contexts such as direct care, research, and digital health applications.

Regulatory oversight of AI in healthcare is led by a coordinated but evolving framework involving multiple agencies, most notably the Medicines and Healthcare products Regulatory Agency (MHRA), which oversees AI-driven medical devices. AI technologies that qualify as medical devices fall under the UK Medical Devices Regulation 2002[133] originally derived from EU legislation but now evolving post-Brexit. Such tools require a UKCA (UK Conformity Assessed) marking to be legally marketed, demonstrating compliance with UK-specific safety and performance standards[134]. In response to rapid AI development, the MHRA launched the Software and AI as a Medical Device (SaMD/AIaMD) change programme in 2021. This initiative aims to modernise the regulatory framework by 2025, with a focus on adaptive algorithms, transparency, and real-world validation[135]. The UK government's pro-innovation regulatory strategy, set out in its 2023 AI Regulation White Paper, favours a context-specific, principles-based approach over a single overarching AI law. In healthcare, this means balancing safety, transparency, and data protection (anchored in UK GDPR) while supporting innovation through adaptive guidance and initiatives like the MHRA's 2024 AI Airlock sandbox. This programme enables real-world testing of AI as a Medical Device (AIaMD) product, bringing together regulators, the NHS, and approved bodies to address emerging challenges and inform future policy[136]. Recently the UK government has accepted 15 recommendations from the Regulatory Horizons Council[137], emphasizing a "legislatively light" approach that prioritizes standards and guidance over rigid laws. While this strategy fosters innovation, challenges persist, including fragmented adoption across the NHS and capacity constraints in regulatory and clinical settings[138].

On the data infrastructure front, a major recent initiative is the Federated Data Platform (FDP) launched by NHS England[139]. The FDP is designed to reduce data silos and improve the accessibility and utility of both operational and patient-level data across NHS organisations. Built on a data fabric architecture, the platform integrates health-specific data connectors and semantic models to enable more coordinated, data-driven care. It supports NHS England's strategic goals of prevention, integration, and personalisation, and is intended to enhance patient outcomes and operational efficiency. The platform connects data from NHS Trusts and Integrated Care Systems (ICSs), though GP data is explicitly excluded. Importantly, all data remains under NHS control, with each participating organisation retaining full data controller responsibilities, ensuring that the federated approach respects local autonomy while enabling secure, large-scale data sharing.

6.2.4China (People's Republic of China - PRC)

China exhibits a sharply polarised digital health maturity profile, according to the WHO's *Global Digital Health Monitor (GDHM) 2023* and **Figure 82**. It achieves Phase 5 in leadership and governance, reflecting strong national-level coordination, strategic prioritisation, and institutional mechanisms for overseeing digital health. Scores of Phase 4 in both legislation, policy and compliance and infrastructure further indicate the presence of robust regulatory instruments and well-developed system infrastructure to support digital initiatives.

However, the remaining four domains – strategy and investment, workforce, standards and interoperability, and services and applications – have not being scored. This denotes the absence of a national investment plan, a formal digital health workforce development pathway, recognised interoperability frameworks, and population-wide digital health services aligned with national health objectives.

[133] The Medical Devices Regulation, 2002
[134] Guidance, Regulating medical devices in the UK
[135] Guidance, Software and AI as a Medical Device Change Programme
[136] Medicines and Healthcare products Regulatory Agency (2024)
[137] Department of Health & Social Care (2025)
[138] Health Tech Newspaper (2025)
[139] NHS England, NHS Federated Data Platform

China is therefore characterised by strong central leadership and regulatory clarity but lacks corresponding implementation mechanisms. The country was not included in the *Digital Health Barometer 2023*, and no supplementary qualitative data were available for validation. As a result, China's digital health maturity progress appears concentrated at the policy and institutional level, with notable gaps in execution, workforce integration, and service delivery capacity.

People's Republic of China	
Cateogry	**Phase**
Leadership and Governance	5
Strategy and Investment	0
Legislation, Policy, and Compliance	4
Workforce	0
Standards and interoperability	0
Infrastructure	4
Services and Applications	0
Overall Phase	**5**

Figure 82: China (PRC) Global Digital Health Monitor (*GDHM*) Phase Scores, 2023

Source: Consortium Analysis of GDHM data (https://data.who.int/dashboards/gdhm/data?m49=800&year=2023), April 2025. A score of 0 indicates that the indicators for that category were either entirely absent or not fully reported.

Data presented in the OECD's *Health at a Glance 2023* report offers only limited country-specific metrics for China's digital health ecosystem. However, the available evidence aligns with the WHO's *GDHM* 2023 assessment of high-level infrastructure maturity alongside limited implementation.
China does not appear in the OECD's 2021 survey on EMR adoption in primary care, which covered 25 OECD member countries. As such, no verified data might be available regarding the national deployment of electronic medical records in China's health system.

Similarly, teleconsultation usage data for China might be not included in the OECD report. While the report supports those countries with advanced infrastructure (including China) experienced increased uptake of digital tools during the COVID-19 pandemic, no quantitative evidence specific to China might be presented. China's digital infrastructure readiness might be acknowledged through general references to emerging economies with expanding broadband and mobile connectivity. However, OECD broadband indicators do not list China among the featured countries. As a result, China's *GDHM* score of Phase 4 for infrastructure cannot be substantiated through OECD validation.

The report also contains no indicators on digital workforce training or ICT investment for China. This absence might be consistent with China's *GDHM* score of 0 for workforce.

In summary, the OECD report does not provide country-level digital health metrics for China. This lack of data limits cross-validation but supports the *GDHM* portrayal of China as an emerging digital health actor with strong infrastructure and significant implementation gaps.

Examples of Relevant Regulations and National Data Initiatives

China's data protection framework is built upon several key legislative pillars that govern personal information and data security in the healthcare sector. The three main pillars of the personal information protection framework in the PRC are the Personal Information Protection Law (PIPL), the Cybersecurity Law (CSL), and the Data Security Law (DSL). The Personal Information Protection Law (PIPL, 2021)[140] classifies personal health information as "sensitive data," requiring explicit patient consent for its collection, processing, and transfer across borders. Healthcare entities must also comply with strict security obligations,

[140] Personal Information Protection Law of the People's Republic of China, 2021

including data minimisation, purpose limitation, and robust incident response mechanisms. Complementing this, the Data Security Law (DSL, 2021)[141] mandates a system of data classification based on importance and sensitivity. Health data is frequently categorised as "important" or "core" data. The DSL enforces data localisation, requiring that such data be stored within China's borders, and mandates security assessments for any cross-border data transfers involving health-related information. Cybersecurity Law requires network operators, including healthcare providers, to safeguard personal information and critical data. It emphasizes the protection of "Critical Information Infrastructure," which encompasses health institutions, thereby imposing additional security obligations.

In terms of AI governance for medical technologies, the National Medical Products Administration (NMPA) serves as the lead regulatory authority for the approval of AI-based medical devices. These devices are classified by risk. To support consistent evaluation and oversight, the NMPA and its Center for Medical Device Evaluation (CMDE) have issued a series of AI-specific technical documents. Among them, the "Guidance for the Classification Defining of AI-Based Medical Software Products"[142] plays a foundational role. This document provides criteria for distinguishing AI-based software used in healthcare, based on its intended clinical purpose – whether for diagnosis, treatment, monitoring, or disease prevention. It establishes the basis for determining regulatory classification and review pathways, ensuring that AI medical tools are aligned with their risk profile and clinical impact.

China's National Technical Committee 260 on Cybersecurity has introduced the AI Safety Governance Framework as part of its Global AI Governance Initiative[143], with significant implications for healthcare. The framework adopts a "people-centered" and "AI for good" philosophy, promoting a comprehensive, full-lifecycle approach to AI governance that spans development, deployment, and oversight. It advocates a tiered, risk-based model, imposing stricter controls on high-risk applications such as those in healthcare. Key measures include enhancing traceability of AI services and application (AI supply chain), strengthening protections for personal health data, ensuring transparency and explainability in AI systems, and fostering research and development. The framework also stresses the need for cross-sector collaboration, robust response mechanisms to AI-related incidents, AI safety education, and social oversight. In doing so, China seeks to create a resilient and trustworthy AI ecosystem, capable of supporting innovation in critical domains like health.

6.2.5 Japan

Japan presents a balanced digital health maturity profile, with all seven *GDHM* categories scoring between Phase 2 and Phase 3, and an overall system classification of Phase 3, as shown in **Figure 83**. This reflects a stable but moderately developed ecosystem, with active institutional engagement and partial operationalisation across policy, service, and infrastructure dimensions.

Leadership and governance, legislation, policy and compliance, standards and interoperability, and services and applications may be all rated at Phase 3, indicating the presence of national digital health authorities, established regulatory frameworks, and limited but functional digital service offerings. The Phase 3 rating in interoperability suggests ongoing initiatives to adopt and align data standards across systems, though not yet nationwide or fully institutionalised.

Strategy and investment, workforce, and infrastructure may be all rated at Phase 2, suggesting that Japan has developed digital health plans and capacity-building efforts, but these may be either not universally adopted or lack consistent implementation. The workforce score indicates that while digital skills may be partially embedded in the health sector, structured training programmes remain underdeveloped.

Japan was not included in the *Digital Health Barometer 2023*, so no additional validation might be available from this source. Overall, *GDHM* data describe Japan as a steadily advancing digital health system with strong institutional foundations and active service deployment, though not yet fully integrated or scaled across the national system.

[141] Data Security Law of the People's Republic of China, 2021
[142] Guidance for the Classification Defining of AI-Based Medical Software Products, 2021
[143] DLA Piper (2024)

Japan	
Cateogry	**Phase**
Leadership and Governance	3
Strategy and Investment	2
Legislation, Policy, and Compliance	3
Workforce	2
Standards and interoperability	3
Infrastructure	3
Services and Applications	2
Overall Phase	**3**

Figure 83: Japan Global Digital Health Monitor (*GDHM*) Phase Scores, 2023

Source: Consortium Analysis of GDHM data (https://data.who.int/dashboards/gdhm/data?m49=800&year=2023), April 2025. A score of 0 indicates that the indicators for that category were either entirely absent or not fully reported.

OECD data supports several aspects of Japan's mid-range digital maturity profile, while also confirming significant limitations in core infrastructure and digital service implementation. In the *Health at a Glance 2023* report, Japan might be listed might be listed to have a 42% of primary care practices reported using EMRs in 2021, placing it well below the OECD average and highlighting a major gap in foundational digital technology adoption.

Japan does not appear in OECD data on teleconsultation uptake, and no national figures may be available for remote care usage. This absence limits validation of Japan's *GDHM* Phase 3 score for services and applications, although the report notes that countries with developed systems did scale telehealth temporarily during the pandemic. OECD infrastructure indicators show that Japan maintains one of the highest rates of mobile and fixed broadband subscriptions, exceeding 180 subscriptions per 100 inhabitants. This might validate Japan's *GDHM* score of Phase 2 for infrastructure, denoting consistent access but incomplete integration across care settings.

No OECD indicators may be available for digital health workforce training or investment in ICT-specific competencies. This omission might be consistent with Japan's *GDHM* score of Phase 2 in the workforce domain, reflecting limited institutional focus.

Overall, OECD data supports Japan's underperformance in EMR adoption and absence from telehealth reporting, while validating strong infrastructure readiness. This reinforces the *GDHM*'s portrayal of a moderately mature digital system.

Examples of Relevant Regulations and National Data Initiatives

Japan's primary legislation governing data privacy is the Act on the Protection of Personal Information (APPI)[144]. The law applies to any entity handling personal data of Japanese citizens, regardless of whether it operates domestically or internationally. Under the APPI, personal data cannot be disclosed to third parties without prior, explicit consent – except under specific legal exemptions. This includes healthcare settings, where health data qualifies as sensitive information. Individuals also have the right to request the disclosure of how their personal information is used, to correct inaccuracies, or to request deletion when appropriate.

The approval of AI-based medical devices in the country is governed by the Pharmaceuticals and Medical Devices Act (PMD Act[145]). The Pharmaceuticals and Medical Devices Agency (PMDA), under the Ministry of Health, Labour and Welfare (MHLW), is responsible for reviewing and approving these devices. AI tools

[144] Act on the Protection of Personal Information, 2003
[145] Act on Pharmaceuticals and Medical Devices (PMD Act), 2015

intended for diagnosis, treatment, or disease prevention are classified based on risk and require appropriate regulatory submissions.

Japan's Ministry of Economy, Trade and Industry (METI) and the Ministry of Internal Affairs and Communications (MIC) have jointly released the "AI Guidelines for Business Ver. 1.0" to address rapid technological advancements, including the rise of generative AI. This unified framework consolidates three prior guidelines: the AI R&D Guidelines (2017), AI Utilization Guidelines (2019), and Governance Guidelines for Implementation of AI Principles Ver. 1.1 (2022). The development process involved extensive expert consultations and public feedback, aiming to provide a comprehensive, user-friendly guide for a broad spectrum of AI business operators. The guidelines emphasize a risk-based approach to AI governance, encouraging businesses to proactively identify and mitigate potential risks associated with AI deployment. Key principles include human-centricity, safety, fairness, transparency, accountability, and the protection of privacy and security. By fostering collaboration among stakeholders and aligning with international standards, the framework seeks to balance innovation promotion with risk reduction throughout the AI lifecycle. This initiative supports Japan's vision of a trustworthy and sustainable AI ecosystem, particularly relevant for sectors like healthcare where ethical considerations are paramount[146].

Japan is also advancing a next-generation data infrastructure built around data spaces – technical and governance frameworks that support trusted data sharing across institutions[147]. These data spaces are underpinned by key principles such as data sovereignty, interoperability, fairness, and openness, and are supported technically by federated architectures. These developments aim to balance trust, efficiency, and privacy in healthcare data environments and are aligned with Japan's cautious yet innovation-oriented approach to digital health.

6.2.6A fragmented global landscape with diverging strengths and strategic lessons for the EU27

This comparative review of digital health maturity across major non-EU regions reveals a fragmented global landscape marked by contrasting strengths and persistent systemic gaps:

- The **United States** stands out as the global leader in **capital, innovation, and AI adoption**, underpinned by strong infrastructure and a dynamic private sector and frontier-tech ecosystem. However, it suffers from **fragmented governance,** weak interoperability, and persistent **inequities in access**, which limit coherent **implementation**, highlighting the limits of a market-led approach without cohesive national strategy.
- The **United Kingdom** combines **robust regulatory alignment**, especially in data governance and medical AI, with **advanced interoperability standards**. Yet, it falls short in **workforce planning, national investment coordination, and consistent implementation**, which risks under-leveraging its mature and strong digital infrastructure foundations.
- **China** has made impressive gains in **centralised governance, legal frameworks,** for health data and AI regulation, establishing it as a strategically assertive actor. However, its execution capacity can be impacted by **gaps in digital health workforce development**, and **service-level integration**.
- **Japan** represents a case of **measured, incremental digital transformation**, scoring consistently across most domains. Its **EMR adoption and service deployment remain low**, but strong infrastructure and a focus on trustworthy AI position it well for gradual ecosystems scaling.

In contrast, the **EU27** shows a distinct profile: a **comprehensive regulatory and policy model** (notably in key data and technology areas through EHDS and the AI Act), a **stable base of early-stage innovation**, and significant public investments. Yet, the EU continues to **lag behind on scale-up capital**, **advanced technology integration**, and **cross-border pan-European digital cohesion**.

[146] Ministry of Economy, Trade and Industry (2024)
[147] International Data Spaces Association, The next generation data infrastructure in Japan, 2024

To strengthen its global standing, the EU27 should close the gap between **regulatory ambition and market execution**, by accelerating the deployment of interoperable infrastructure, scaling investment readiness, and developing a digitally skilled health workforce. Doing so would not only accelerate innovation but also reinforce Europe's ambition to build a **sovereign, secure, and globally competitive digital health ecosystem.** The global examples offer not only contrasts but also strategic insights into how institutional design, investment policy, and operational alignment shape digital health maturity at scale.

6.3 Additional insights on the global Digital Health market: findings from market mapping and IDC research

To address data limitations in the sources used in this analysis – the WHO's *Global Digital Health Monitor* (2023), OECD's *Health at a Glance* (2023), and the *Digital Health Barometer* (2023) – this section integrates additional insights from the Market Mapping and from IDC's proprietary research and syndicated surveys.

Additional Insights on the Global Digital Health Market: Key Takeaways

- **U.S. Vendors Dominance:** The United States remains the global hub for digital health vendors, hosting 354 companies, nearly double the EU27 total (196). Its vendor portfolios show a strong presence in health data platforms (99), EHRs (86), and clinical workflow tools (75), complemented by significant investments in patient-facing tools like telehealth and communication services.
- **Broader Functional and Commercial Focus**: 57% of non-EU27 vendors focus on health data and workflow tools (compared to 67% of EU27 vendors), while a higher share target administrative/operational systems (25% vs. 18%) and genomics technologies (4% vs. 2%). This suggests a more diversified and commercially oriented footprint beyond core clinical tools.
- **Stronger Patient and Connected Care Orientation**: Non-EU27 vendors show greater focus on patient-facing and connected health solutions, including 99 health data platforms, 75 clinical workflow optimisation tools, and strong representation in patient access tools, telehealth platforms, and remote monitoring, suggesting stronger alignment with consumer-centric, digitally enabled care models.
- **EHR Investment Remains Strong Globally**: Similarly to the EU27, all four comparator countries (US, UK, China, Japan) show high EHR adoption. Yet, while 57% of Japanese providers are still investing in EHRs, only 2–3% of US and UK providers plan first-time adoption signalling a shift to optimisation in mature systems.
- **Enterprise Imaging Momentum**: The UK (67%) and Japan (60%) lead in active imaging investment, while China (23%) shows the highest rate of planned adoption, indicative of rapid scaling and infrastructure build-out.
- **Virtual Care Scale-Up Diverges by Region**: The US (54%), UK (50%), and China (50%) continue to invest heavily in telehealth. In contrast, Japan (47%) leads in planned future adoption, showing a catch-up trajectory.
- **AI-Enabled Clinical Documentation**: China leads with 80% combined adoption/investment, while Japan has the highest prospective growth (30% plan to adopt), highlighting divergent paces of AI integration.
- **Cybersecurity Investment Drivers Vary:**
  - US: Focus on multi-pronged resilience with investments in compliance (39%), patient safety (41%), and connected devices (37%)
  - UK: Reacting to NHS incidents focusing on cyberattacks (43%), patient safety (43%), and device exposure (47%)
  - China: Strategically driven compliance (57%) and IT complexity (57%) dominate investments
  - Japan: Presents the most reactive approach with cyberattacks (47%) top the list, while regulatory compliance lags (20%)

Comparative Analysis of Non-EU27 Digital Health Vendors: Insights into Global Regions' Ecosystems

The data analysed here focus on digital health vendors headquartered outside the EU27 and draw from the same validated dataset used in the core market mapping (see Digital Health market mapping and segmentation). Regions are grouped according to global regions and countries as defined in **Annex A2** – Methodology for Market Mapping and Segmentation, with selected countries highlighted for their relevance. This complementary analysis offers a comparative perspective on the structure and focus of non-EU27 vendor ecosystems. It aims to provide additional context and support the identification of potential market gaps, cross-border innovation flows, and strategic opportunities for the EU digital health sector.

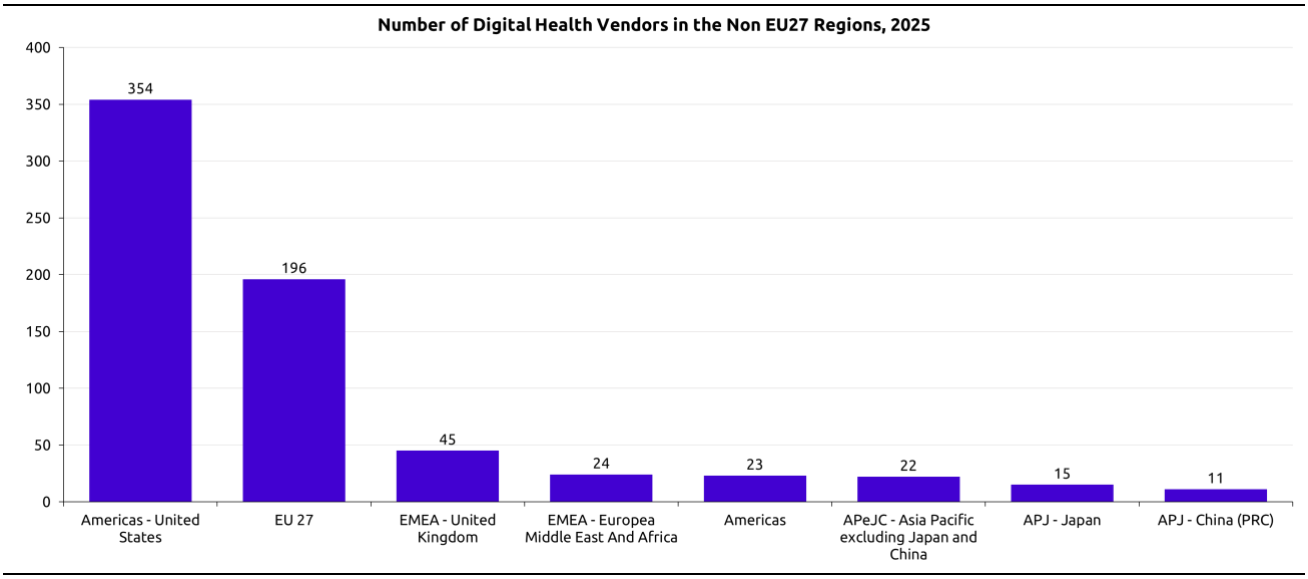


Figure 84: Distribution of Non EU27 Vendors Across Global Regions (2025)

Source: Consortium's data elaboration and analysis, March 2025

Figure 84 presents the regional distribution of digital health vendors headquartered outside the EU27. The United States alone accounts for 354 vendors, confirming the dominant global role it already played in **Figure 8**. Together with other countries in the Americas, the region hosts a combined total of 377 vendors. This is nearly two times the total number recorded in the EU27, that is 196 (here presented with the purple column for reference, also refer to **Figure 10**), reinforcing the structural imbalance in global vendor distribution. In contrast, the United Kingdom contributes 45 vendors, and regions such as the Middle East & Africa (24), Asia-Pacific excluding China and Japan (22), Japan (15), and China (11) account for smaller but notable vendor ecosystems. These figures reflect a distributed but less dense innovation landscape outside the US, with countries like Japan and the UK still maintaining visible but secondary roles.

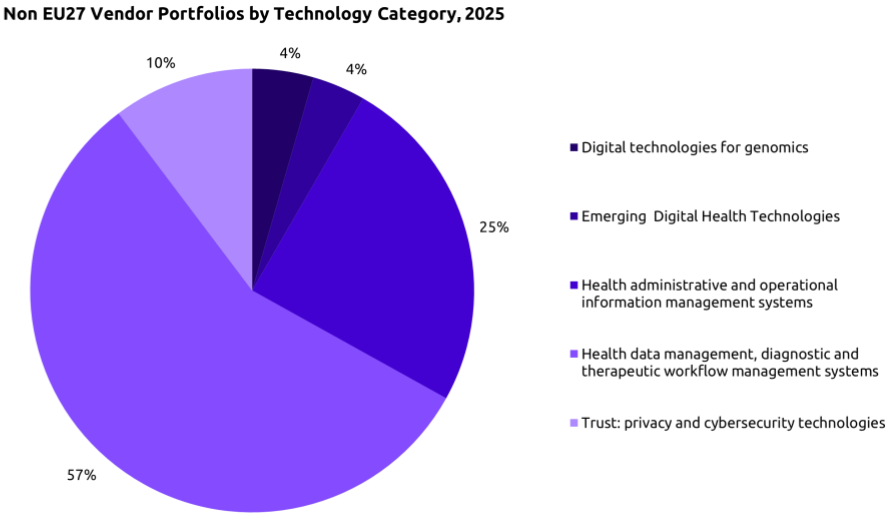


Figure 85: Distribution of Non EU27 Vendors by Technology Category (2025)

Source: Consortium's data elaboration and analysis, March 2025

Figure 85 shows the technology categories vendors headquartered outside the EU27 are focusing on, using the same classification described in the **Annexes B1** and **B2**. The majority of non-EU27 vendors (57%) are active in health data management, diagnostic, and therapeutic workflow systems, a slightly lower share compared to EU27 vendors (67%). However, a higher share (25%) compared to the EU27 (18%) focuses on health administrative and operational systems, suggesting a broader functional footprint. Of note is the share of vendors active in genomics in particular (4%), which, although modest, is double that recorded for EU27-based companies (2%). Trust-enabling technologies, while lower in relative share (10%), remain a visible component of non-EU27 portfolios and provide further context to the insights previously discussed in the box describing strategic dependencies in the Digital Health market mapping - analysis (For comparison with the EU27 Vendors please refer to **Figure 18**).

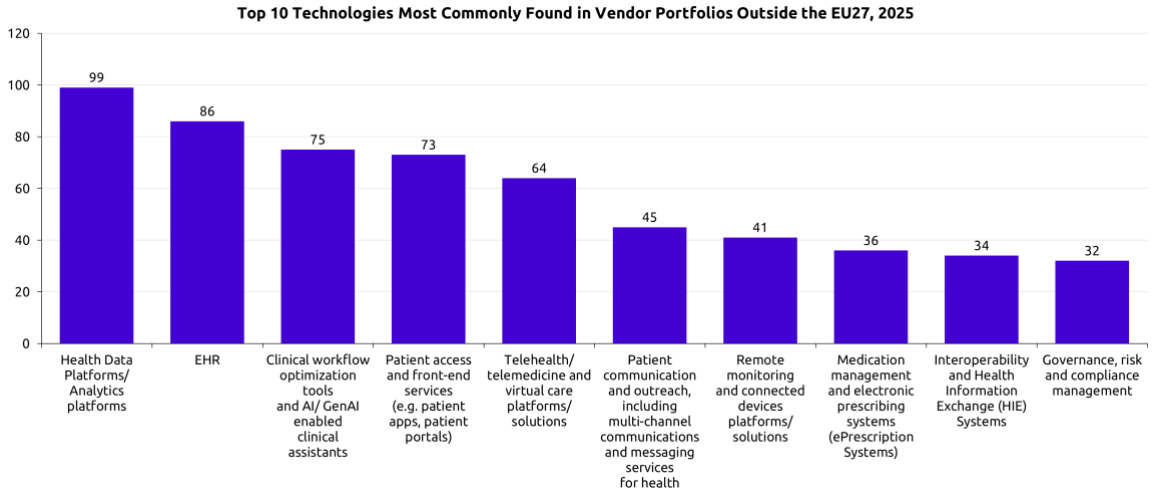


Figure 86: Top 10 Technologies Most Commonly Found in Vendor Portfolios Outside the EU27 (2025)

Note: Numbers reported in the figure refers to number of solutions identified in the Mapping

Source: Consortium's data elaboration and analysis, March 2025

Figure 86 offers a more granular view of the most common technologies in non-EU27 vendor portfolios. Health data platforms/analytics tools (99), EHRs (86), and clinical workflow optimisation tools (75), which are also prominent in EU27vendors portfolios (**Figure 12**). However, a notable divergence emerges in the presence of patient-facing technologies. Patient access tools (e.g. apps, portals), telehealth platforms, and

patient communication services feature in the top 5, unlike in **Figure 12**, where these were less prominent among EU27 vendors' offerings. This suggests a more developed orientation toward consumer/patient-centric and digitally mediated care outside the EU27. Also important is the relatively strong showing of connected health technologies, with remote monitoring platforms and ePrescription systems among the top ten. This suggests that vendors based outside the EU27 may be more aligned with care models that emphasise active patient engagement compared to those based within the EU27.

Taken together, these figures offer several important comparative insights. First, they reaffirm the dominant role of the United States in the global digital health landscape, not only in terms of vendor volume but also in the breadth of technological offerings. Second, the data suggest that non-EU27 vendors are more prominently represented in patient-facing technologies, connected care models, and innovation-driven domains such as telehealth and AI, in contrast to the operational and workflow-oriented focus observed among EU27 vendors. In addition, the portfolio segmentation indicates a more balanced distribution between foundational IT systems and emerging solutions among non-EU27 vendors. This stands in contrast to the EU27 landscape, where portfolios remain heavily concentrated in core clinical and administrative technologies (For comparison with EU27 based vendors please refer to **Figure 10**, **Figure 11,** and **Figure 12** in the Digital Health market mapping - analysis section).

Global Healthcare Providers' Digital Health Priorities: A Comparative Demand-Side Analysis

To enhance the comparative analysis with more granular demand-side insights, the Consortium leveraged IDC's proprietary global surveys of healthcare providers, conducted across major world regions and selected comparator countries. Timed to align with the Observatory's surveys of healthcare providers and digital health vendors, this complementary analysis ensures contextual consistency while addressing key information gaps by examining digital health priorities and adoption trends from the provider perspective. The analysis spans critical areas such as EHR systems, digital imaging, telehealth and virtual care, AI-enabled clinical documentation, and cybersecurity investment drivers. By offering a deeper view into implementation dynamics and system-level priorities, this perspective enriches understanding of global market dynamics and how digital health innovation is progressing across diverse regions and healthcare systems.

Figure 87 presents the top priorities of healthcare providers for the next two years across China, Japan, the United Kingdom, and the United States, based on IDC syndicated survey data. While all four countries report a mix of strategic, clinical, and technical objectives, their **top three priorities differ in both emphasis and composition**, suggesting variation in national digital health trajectories.

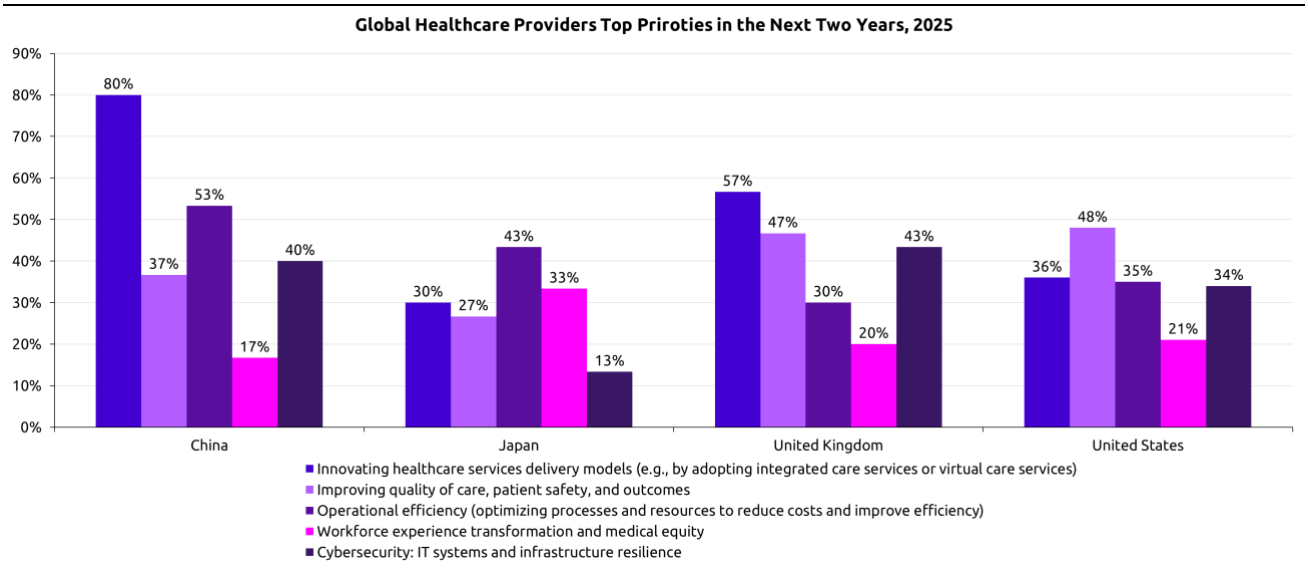


Figure 87: Global Healthcare Providers Top Priorities in the Next Two Years, 2025

Source: IDC Industry Intelligence – Health Providers Survey 2025, IDC, April 2025. Sample: CATI, Worldwide Healthcare Provider. Total Sample Size n=766 (China, Japan, United Kingdom, Unites States n=30)

The **United States** highlights **quality of care** (48%), **service innovation** (36%), and **operational efficiency** (35%) as top concerns. Here, **cybersecurity (34%)** also ranks closely behind, possibly signalling widespread attention to system resilience in a fragmented care landscape.

In the **United Kingdom**, the leading priorities are **service innovation** (57%), **quality of care** (47%), and **cybersecurity** (43%). This combination suggests a dual focus on transformation and risk management, potentially shaped by NHS digital infrastructure challenges and recent cybersecurity incidents.

In **China**, the dominant focus is on **innovating healthcare service delivery models** (80%), followed by **quality of care** (53%) and **cybersecurity** (40%). This configuration may reflect an ambitious transition toward virtual or integrated care, underpinned by recent regulatory and infrastructure advancements.

Japan's top priorities are **quality of care** (43%), **operational efficiency** (33%), and **service innovation** (30%). Notably, Japan places less emphasis on cybersecurity and workforce transformation, which may mirror moderate maturity in these areas as shown in *GDHM* scores. More detailed information on the varying cybersecurity investment drivers across countries are analysed in **Figure 92**.

These country-specific configurations underscore the need for tailored digital health strategies. While certain themes are common — notably care quality and service innovation — the underlying priorities appear to diverge, reflecting structural, regulatory, and operational realities unique to each system.

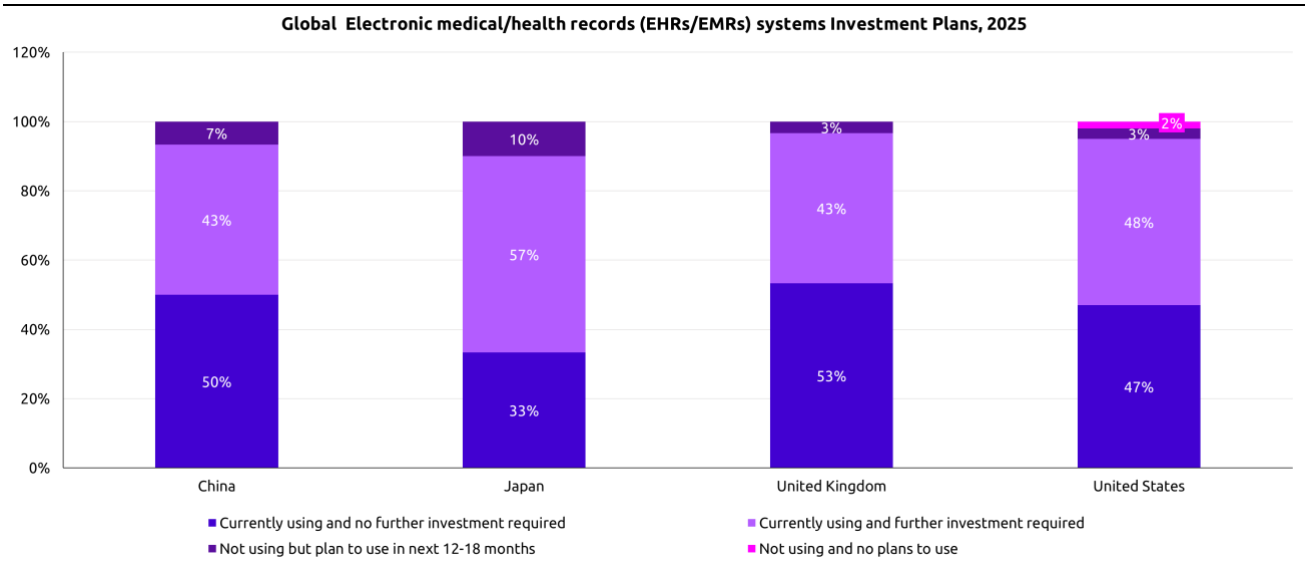


Figure 88: Global Electronic Medical/Health Records (EHRs/EMRs) system Investment Plans, 2025

Source: IDC Industry Intelligence – Health Providers Survey 2025, IDC, April 2025. Sample: CATI, Worldwide Healthcare Provider. Total Sample Size n=766 (China, Japan, United Kingdom, Unites States n=30)

Figure 88 compares national investment strategies in electronic health or medical records (EHRs/EMRs) across four countries. While all show **high levels of current use, the balance between stable use, continued investment, and planned adoption varies**, reflecting different stages of digital maturity and system renewal. Global benchmarks, including OECD and *GDHM* assessments, indicate broad EHR/EMR adoption in the United States and United Kingdom. However, the IDC data in **Figure 88** suggests that **investment intensity remains high across all four countries, even though for different reasons**. In the U.S. and U.K., investment may reflect platform optimisation or system upgrades, whereas in Japan and China, it may indicate ongoing rollout or late-stage adoption.

At the country level, the **United States** presents a balanced profile: 47% of providers report stable use with no further investment planned, while 48% are actively investing. This may point to routine system upgrades or vendor transitions. First-time adoption is minimal (2%), in line with near-universal baseline coverage. In the **United Kingdom**, 53% of providers indicate stable adoption without further investment, and 43%

continue to invest. The small share planning first-time adoption (3%) likely reflects marginal or late-stage implementations in edge settings. **China** shows that 50% of providers use EHRs with no further investment planned, while 43% are still investing, suggesting widespread adoption, but with many systems possibly undergoing scale-up or replacement. Only 7% report intent to adopt within 12–18 months. **Japan** diverges from this pattern: only 33% report stable use, while 57% are investing further, the highest proportion among the four countries. An additional 10% anticipate first-time adoption, indicating that gaps in coverage and infrastructure may still be actively addressed.

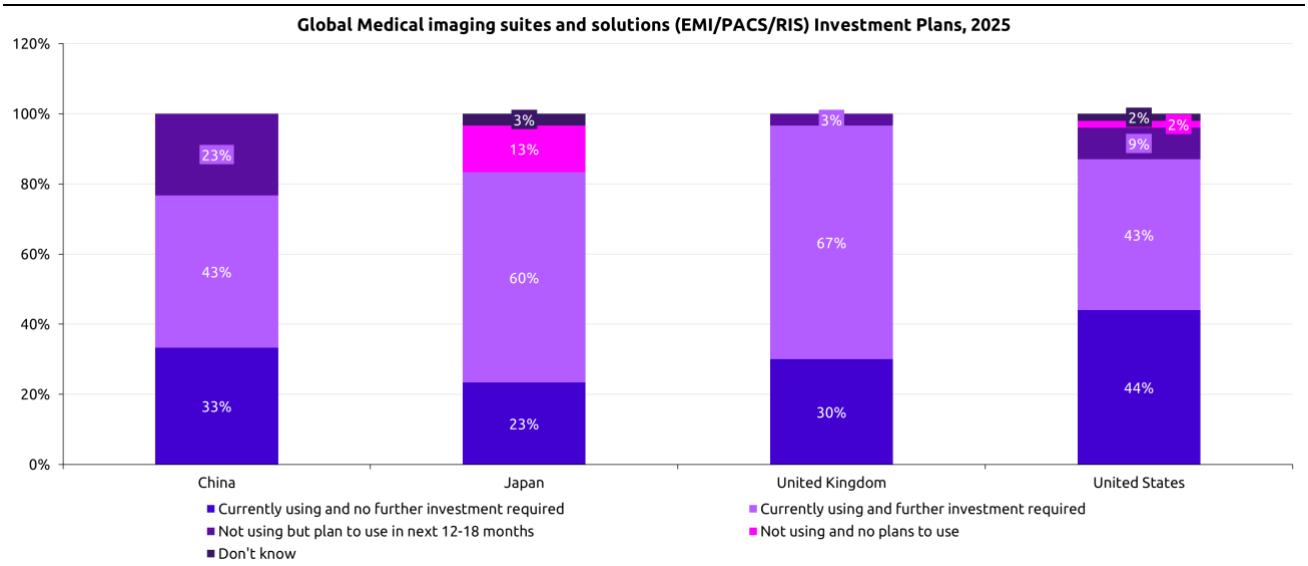


Figure 89: Global Digital Solutions for Medical Imaging Investment Plans, 2025

Source: IDC Industry Intelligence – Health Providers Survey 2025, IDC, April 2025. Sample: CATI, Worldwide Healthcare Provider. Total Sample Size n=766 (China, Japan, United Kingdom, Unites States n=30)

Figure 89 compares investment plans for enterprise medical imaging (EMI), picture archiving and communication systems (PACS), and radiology information systems (RIS) across four countries. The data show that while **these technologies are widely used, the extent of further investment and readiness for replacement varies notably by country**.

In the **United States**, most providers (87%) report current use, divided between those maintaining systems (44%) and those investing further (43%). Only 9% plan future adoption, and just 2% report no plans to adopt, confirming near-universal imaging infrastructure. The even split between stability and reinvestment might point to a dynamic vendor landscape or staged upgrades. In the **United Kingdom**, 67% of providers report active investment in imaging solutions – the highest among all four countries. Only 30% report stable use with no further upgrades planned. This might reflect a need to modernise legacy systems or scale up capacity following NHS infrastructure reforms. A small portion (3%) remain outside active adoption cycles. **China** presents a mixed profile: 33% report stable use, while 43% are investing further. A substantial 23% plan to adopt these technologies in the near term – the highest share among the four countries. This may signal rapid catch-up or scaling of diagnostic infrastructure as imaging becomes more central to care delivery models. In **Japan**, 60% of providers also report ongoing investment – significantly higher than those indicating stable use (23%). This suggests that while imaging solutions are in place, many may be undergoing functional replacement or expansion. Notably, 13% of providers report no current usage but expect adoption in the next 12–18 months – a higher planning rate than for EHRs, possibly indicating lagging digital imaging coverage. Taken together, the data suggest that **while imaging platforms are widely present**, **the renewal cycle and adoption readiness vary**, with the U.K. and Japan showing high investment activity, and China potentially entering a rapid deployment phase.

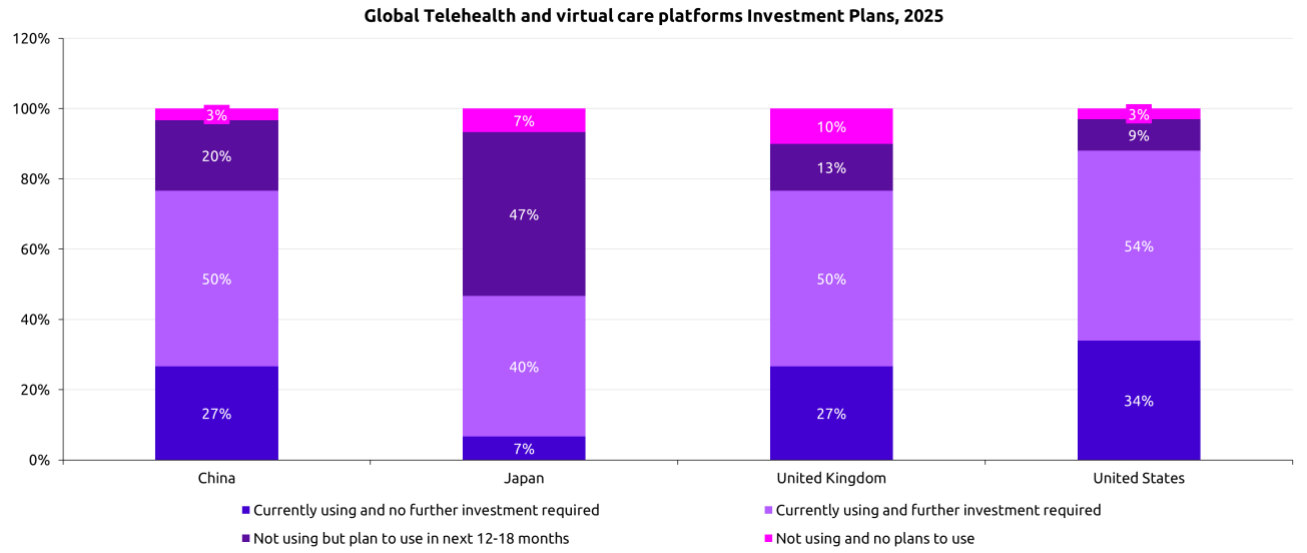


Figure 90: Global Telehealth and Virtual Care Platforms Investment Plans, 2025

Source: IDC Industry Intelligence – Health Providers Survey 2025, IDC, April 2025. Sample: CATI, Worldwide Healthcare Provider. Total Sample Size n=766 (China, Japan, United Kingdom, Unites States n=30)

Figure 90 presents investment intentions in telehealth and virtual care platforms across four countries. While **usage is already widespread, the balance between further investment, full adoption, and platform consolidation varies**, offering insight into each country's implementation dynamics.

In the **United States**, telehealth appears both mature and active: 34% report stable use with no further investment, while a slightly higher 54% continue to invest – the highest share among the four countries. This may reflect iterative expansion, platform diversification, or integration with remote monitoring tools. These findings align with OECD data indicating sustained telehealth activity post-COVID, although the U.S. was not disaggregated in adoption figures. In the **United Kingdom**, the pattern is nearly identical: 27% report stable use, and 50% are actively investing. A further 13% plan to adopt in the next 12–18 months, suggesting that while the NHS has rolled out foundational virtual care capabilities, many providers are still scaling or upgrading services. OECD data confirm that the U.K. scaled remote care rapidly during the pandemic, and this IDC data suggests that institutionalization is ongoing. China also shows a combined 77% active usage, split between 27% stable and 50% investing. A notable 20% still plan to adopt, suggesting the system may still be expanding telehealth access to underserved areas – which is consistent with the country's prioritization of care model innovation (as seen in **Figure 87**). **Japan** presents the most fragmented picture: only 7% report stable use, while 40% are still investing and 47% plan to adopt within the next 12–18 months – the highest prospective growth rate among the four. This reinforces earlier OECD findings that telehealth adoption has lagged in Japan, despite a strong infrastructure foundation.

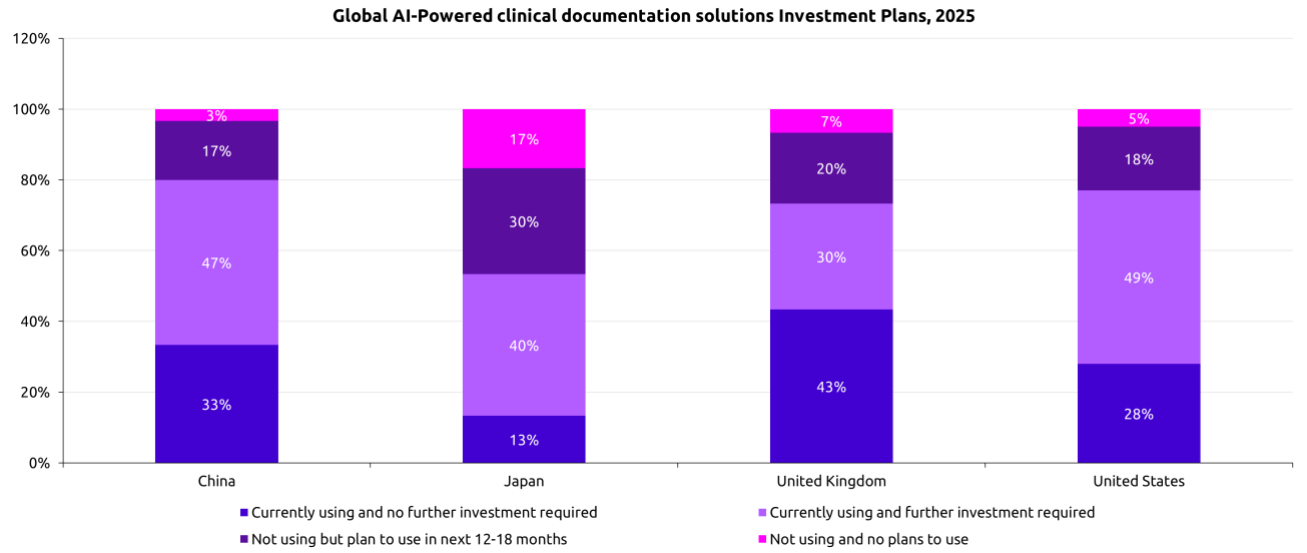


Figure 91: Global AI-powered clinical documentation solutions Investment Plans, 2025

Source: IDC Industry Intelligence – Health Providers Survey 2025, IDC, April 2025. Sample: CATI, Worldwide Healthcare Provider. Total Sample Size n=766 (China, Japan, United Kingdom, Unites States n=30)

Figure 91 highlights national investment trends in AI-enabled clinical documentation tools, a rapidly evolving domain at the intersection of automation, clinical workflow optimisation, and health data governance. The results suggest **varying levels of maturity and planning intensity across countries**. In the **United States**, 49% of providers are currently using and still investing in AI documentation tools, with an additional 28% reporting stable use. This positions the U.S. as a clear leader in adoption and scale-up. However, 18% still plan to adopt, and 5% report no intent to use these solutions, indicating that full integration is still incomplete, possibly due to workflow complexity or clinical risk concerns. The **United Kingdom** shows a similar pattern: 30% of providers are actively investing, and 43% report stable use. Around 20% still plan to adopt, and 7% report no plans. These figures suggest that while adoption is advancing, AI documentation may still be concentrated in specific regions or use cases within the NHS. **China** reports 33% stable use and 47% active investment – the highest combined usage rate (80%) among all countries. This might reflect national priorities around clinical automation and health data standardisation, though it contrasts with *GDHM* findings showing limited service-level deployment. Notably, 17% still plan to adopt, implying that some implementation gaps persist. In **Japan**, just 13% of providers report stable use, while 40% are investing and 30% plan to adopt. The combined 70% non-stable user group is the highest among the four countries. This may point to slower adoption cycles, regulatory caution, or limited workforce readiness for AI-enabled solutions, aligning with Japan's *GDHM* Phase 2 rating for workforce and infrastructure.

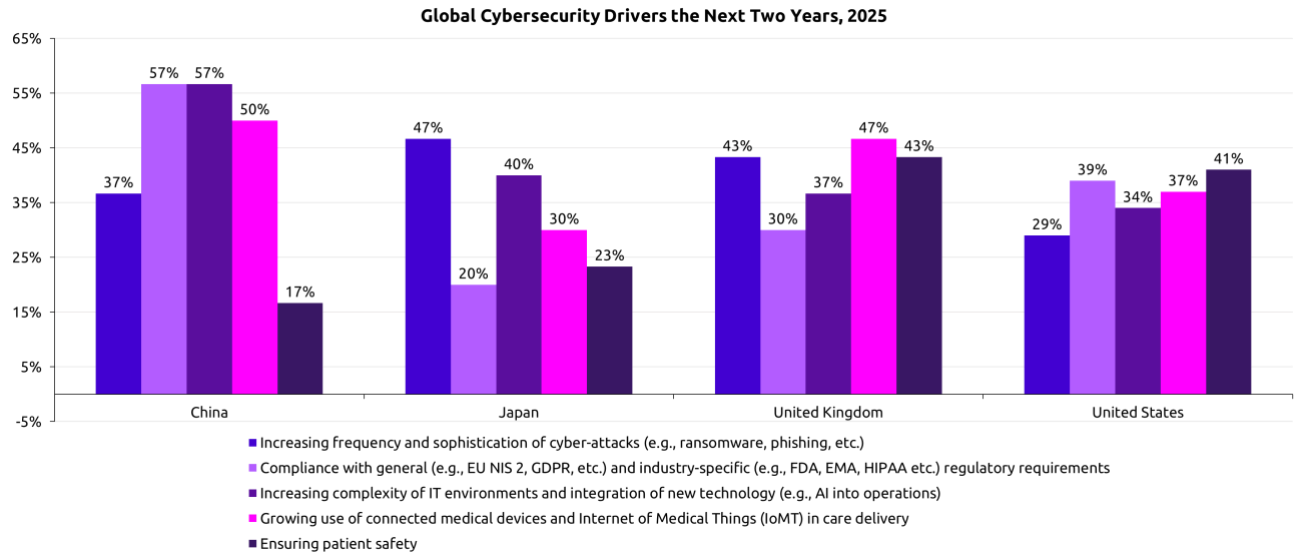


Figure 92: Global Cybersecurity Drivers in the Next Two Years, 2025

Source: IDC Industry Intelligence – Health Providers Survey 2025, IDC, April 2025. Sample: CATI, Worldwide Healthcare Provider. Total Sample Size n=766 (China, Japan, United Kingdom, Unites States n=30)

Finally, **Figure 92** explores the specific drivers motivating healthcare providers' investments in cybersecurity across four countries. While **cybersecurity was identified as a top three priority in Figure 87** for the U.K., U.S., and China, this breakdown reveals **why**, and how, priorities diverge in terms of regulatory pressure, threat response, and technology integration.

The **United States** shows a more even distribution: patient safety (41%), connected devices (37%), and compliance (39%) are nearly equal in importance. Cyber-attacks (29%) rank lower than in peer countries, which may suggest that risk is already internalised and normalised, rather than a newly emergent driver. This reflects a **more mature, multi-pronged cybersecurity posture**, as previously indicated by its high ongoing investment in **Figure 87**. In the **United Kingdom**, connected device usage (47%), patient safety (43%), and cyber-attacks (43%) are the top drivers. Compliance is less dominant (30%). This supports **Figure 87**, where **cybersecurity** ranked as a top three **strategic priority,** here shown to be **motivated by both clinical risk and infrastructure exposure**, likely influenced by high-profile NHS incidents and broader digital maturity. In **China**, three drivers are equally prominent: compliance requirements (57%), increasing complexity of IT environments (57%), and the growing use of connected medical devices (50%). Interestingly, only 37% cite cyber-attacks directly, and just 17% list patient safety, suggesting that **cybersecurity** is perceived primarily as a **strategic and regulatory requirement**, rather than a clinical or crisis-driven concern. This aligns with **Figure 87**, where cybersecurity was ranked third (40%) behind care innovation and quality. Interestingly, **Japan** shows a different pattern. Here, cyber-attacks (47%) are the leading concern, followed by IT complexity (40%) and connected devices (30%). Regulatory compliance (20%) and patient safety (23%) rank much lower, possibly reflecting more limited enforcement regimes. This suggests that Japan's **cybersecurity posture** may still be **reactive rather than policy-driven**, consistent with the prioritization in **Figure 87** and its low *GDHM* scores in strategy and investment.

6.4 Global Digital Health market size and growth trajectories

Global Digital Health Market Size and Growth Trajectories: Key Takeaways

The EU27 market is projected to expand from €15.1 billion to €61.2 billion (15.1% CAGR), but strategic action is needed to match global frontrunners in investment scale. In particular, market forecasts show:

- **U.S. Market Dominance:** The United States maintains a leading position in global digital health investment, with spending expected to rise from €33 billion in 2025 to €146 billion by 2035 (a CAGR of 16%) driven by innovation intensity, mature infrastructure, and private sector momentum.
- **Emerging Asian Momentum:** China and the APeJC region (excluding Japan and PRC) are becoming major growth engines. China is projected to grow from €14.2 billion to €58.5 billion (15% CAGR), while APeJC is set to nearly quintuple, reaching €25 billion by 2035 (13% CAGR), reflecting growing digital adoption and government-led scaling.
- **UK Trajectories:** The UK is forecast to grow from €4.5 billion to €16.3 billion by 2035, supported by NHS-led initiatives and regulatory innovation.

Estimated global investment and market expansion trajectories confirm the accelerating value of digital health technologies across all major global regions[148] and the EU 27 (See **Figure 93** and **Table 10**).

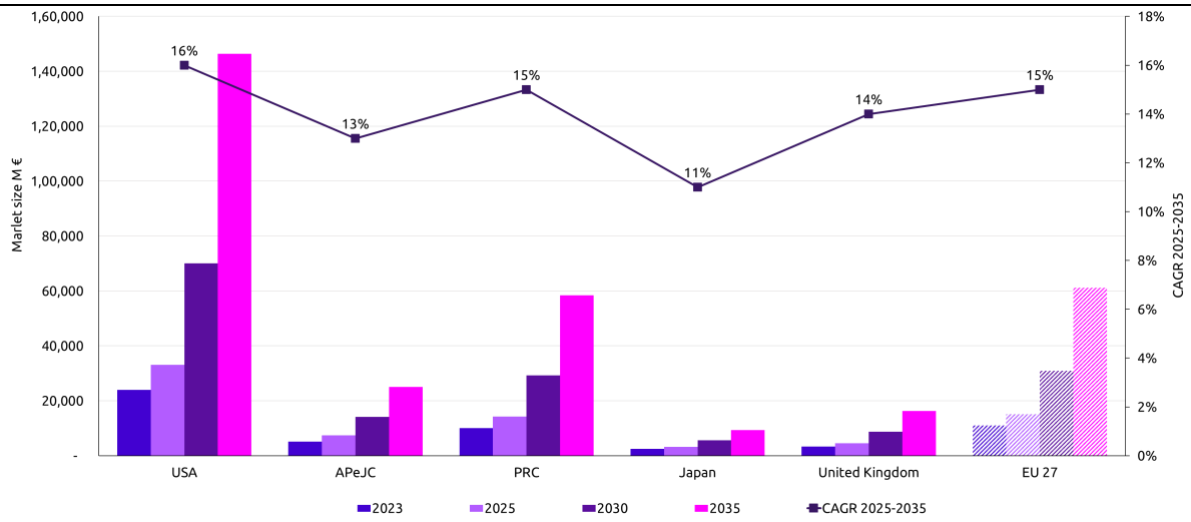


Figure 93: Global Digital Health Market Size Forecast

Source: Consortium, 2025

The United States maintains a dominant position, with digital health spending projected to grow from €33 billion in 2025 to over €146 billion by 2035, more than quadrupling its market value and reflecting a sustained compound annual growth rate (CAGR) of approximately 16% over the decade.

China follows closely with a robust CAGR of 15%, driven by strong centralised investment, infrastructure development, and large-scale deployment of telehealth solutions. Japan continues its steady digital health expansion, characterised by moderate but consistent growth. The Asia-Pacific region excluding Japan and China (APeJC) is forecast to nearly quintuple in value, reaching approximately €25 billion by 2035. While

[148] For the methodology used on global market estimates please refer to Methodology and data sources for market sizing and growth forecast section

starting from a comparatively smaller base, its CAGR of 13% signals growing momentum, underpinned by rapid adoption, but with heterogeneous maturity levels across the region.

Meanwhile, the United Kingdom, despite ongoing structural and funding challenges, shows a positive long-term trajectory. Its growth is fuelled by strong digital infrastructure, strategic public sector initiatives such as NHS-led pilots, digital therapeutics programmes, and regulatory innovation (e.g., the MHRA's evolving AI framework).

These trends reveal some asymmetries in market maturity and growth potential across global regions, echoing findings from financial trend analysis. While the U.S. remains the clear leader in scale, China and the APeJC region are emerging as powerful centres of innovation and investment. These developments are shaped by variations in policy ambition, investment intensity, and digital infrastructure readiness.

For the EU, these insights highlight the importance of reinforcing its position within the global digital health landscape. To enhance competitiveness and increase its attractiveness as a total addressable market for innovation-driven vendors, the EU should strengthen policy coherence, expand targeted investments, and accelerate progress on cross-border interoperability and regulatory alignment.

Table 10: Market sizing and forecast by selected global regions and countries

Country/Region	Digital Health Technology Total Spend in € Millions			
	2023	2025	2030	2035
USA	23,950	33,040	70,079	146,391
APeJC*	5,168	7,406	14,136	24,994
PRC	10,062	14,249	29,297	58,454
Japan	2,494	3,263	5,583	9,322
UK	3,389	4,493	8,759	16,292
EU 27	*11,047*	*15,052*	*30,946*	*61,218*
**Asia Pacific excluding Japan and People's Republic of China (APeJC) includes Australia, New Zealand, India and rest of Asia*				

Source: Consortium, 2025

6.5 Accelerating Innovation: The State of Play in Performance Intensive Computing and Supercomputers

Performance-Intensive Computing and Supercomputers in Digital Health: Key Takeaways

- **PIC as a Strategic Enabler for Digital Health.** Performance-Intensive Computing (PIC) underpins AI, genomics, and real-world data analytics, enabling advanced applications like virtual twins and personalised care. PIC architectures are evolving across compute power (e.g., GPU acceleration), infrastructure (e.g., AI-specific systems), and deployment models (e.g., cloud and as-a-service platforms). Refer to Figure 94 for details.
- **Europe's Expanding Supercomputing Ecosystem.** Despite the EU27 collectively hosting 32% of global TOP500 supercomputers and 28% of total performance, its capabilities remain independently distributed across Member States, unlike the more centralised infrastructure in countries like the U.S., which limits the region's ability to achieve the same scale and computational intensity.
- **Supercomputing in EU Health Research.** EuroHPC has deployed 11 supercomputers across the EU (with two more planned–and has supported 40 health and life sciences-related research projects to date. These span key domains such as biomedical modelling, genomics and molecular dynamics, infectious diseases, neuroscience, precision medicine, and radiotherapy. Flagship initiatives like FoundRA on Italy's Leonardo system are pioneering scalable, sovereign AI models in medical imaging.
- **Strategic Role of EU AI Factories and Gigafactories**. Over the 2021-2027 period, the Commission's and Member States' and Associated Countries' overall investments in supercomputing infrastructures and AI Factories in the EU will reach €10B through the EuroHPC Joint Undertaking. The EuroHPC JU successfully launched 13 AI Factories which will be operational by 2026. The Commission will also invest €20B in AI Gigafactories through the InvestAI facility. These infrastructures are key to scaling sovereign AI innovation, improving access for SMEs, and reducing dependency on non-EU providers.
- **Global Innovation Leadership Beyond the EU.** The U.S. leads in both public (e.g. NIH Biowulf) and private HPC (e.g. Mayo Clinic wafer-scale AI), while the U.K.'s ARCHER2, Japan's Fugaku, and China's Tianhe-2 supercomputers support frontier work in digital twins, cancer genomics, and drug discovery. These capabilities accelerate health breakthroughs via unparalleled data processing power.

The global demand for computational power is accelerating rapidly, driven by the imperative to extract timely, actionable insights from increasingly vast and complex datasets. As data volumes grow exponentially, organisations must process information at ever-greater speed to preserve its relevance and value. In this context, **Performance-Intensive Computing (PIC)** emerges as a critical enabler, defined as the capacity to execute large-scale, mathematically intensive operations at high speed[149]. This capability underpins a range of **advanced composite workloads**, such as artificial intelligence (AI), high-performance computing (HPC) for modelling and simulation, and big data analytics (BDA).

These composite workloads consist of multiple, interrelated tasks, sometimes overlapping, and are tailored to serve specific sectoral needs. In the digital health domain, a prime example is the application of virtual twins: dynamic, real-time models that continuously synchronise with a broad range of health data to simulate patient or system behaviours. Such innovations are redefining clinical decision-making, enabling more personalised, predictive, and efficient care delivery. In this context, PIC is not merely a technological asset – it is **strategic for digital health transformation**, enabling healthcare systems to harness AI, genomics, and real-world data at scale. Its development and deployment are essential to achieving digital health ambitions.

[149] IDC's Worldwide Performance-Intensive Computing (HPC, AI, and Analytics) Infrastructure and Services Taxonomy, 2025 (#US53125225, January 2025)

To support such complex applications, performance-intensive computing is evolving along three architectural dimensions, as shown in **Figure 94**.

- **Compute Power**: Traditional processors (CPUs) are being supplemented, and in many cases replaced, by accelerated computing, using hardware like graphics processing units (GPUs) or even emerging quantum processors. These enable faster, parallel processing of massive data volumes.
- **Infrastructure Design**: Systems are shifting from general-purpose setups, which handle a wide range of tasks, to fit-for-purpose infrastructure tailored for specific use cases, such as AI training or genomics analysis.
- **Deployment Models**: Organisations are moving away from fixed, on-premises systems to cloud-based and 'as-a-service' deployments, offering flexibility, scalability, and faster time-to-compute.

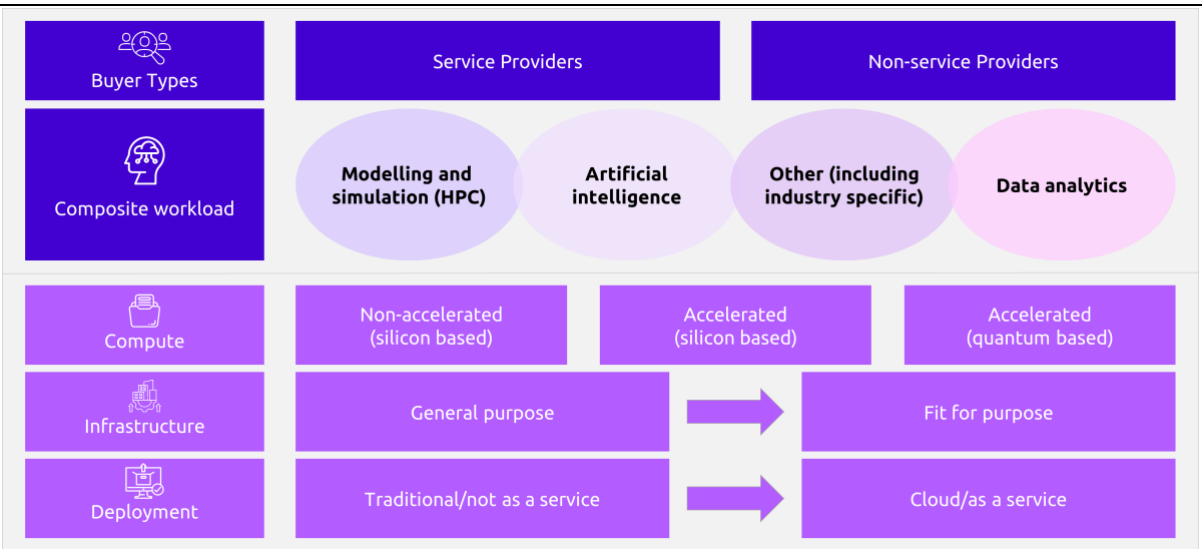


Figure 94: Performance-Intensive Computing (PIC) at a Glance

Source: IDC's Worldwide Performance-Intensive Computing (HPC, AI, and Analytics) Infrastructure and Services Taxonomy, 2025 (#US53125225, January 2025)

Performance-intensive computing does not prescribe a single architecture, but it is increasingly shaped by these trends in compute, infrastructure, and deployment. Even high-end CPUs are adapting with higher core counts, improved memory and Input output (I/O) bandwidth to stay relevant. At the same time, performance-intensive workloads are beginning to push beyond classical computing, incorporating elements quantum technologies to drive breakthroughs in physics, chemistry, engineering, healthcare and life sciences.

At the most advanced level, these capabilities converge in "**supercomputers"[150],** highly advanced machines designed to execute vast numbers of calculations simultaneously, typically measured in floating-point operations per second (FLOPS). Supercomputers often consist of thousands of processors working in parallel and are used to solve problems that exceed the capabilities of conventional computing, ranging from large-scale simulations in climate research to quantum mechanics and complex physical systems. In parallel, the rise of "**AI factorie**s"[151] is transforming how artificial intelligence is integrated across industries. AI factories are high-capacity computing hubs that leverage supercomputing infrastructure to develop, train, and scale AI models, including generative AI. Designed to process massive volumes of data, these environments are enabling innovation across a wide range of fields, including health, life sciences, physics, chemistry, and engineering.

[150] The European High Performance Computing Joint Undertaking (EuroHPC JU), EuroHPC Supercomputers
[151] The European High Performance Computing Joint Undertaking (EuroHPC JU), EuroHPC AI Factories

In the EU AI Continent Action Plan[152], AI factories and supercomputing are recognised as critical infrastructure to accelerate public sector innovation and industrial adoption of AI. The AI Continent Action Plan positions AI Factories as dynamic, collaborative ecosystems where government, academia, and industry come together to co-create cutting-edge AI solutions. These hubs leverage EuroHPC supercomputers to efficiently train large-scale AI models and are designed to enhance the EU's AI infrastructure by integrating advanced computing, rich data resources, training environments, and skilled talent. With a strong focus on applications across strategic sectors, including health and life sciences, AI Factories aim to democratise access to high-performance computing for SMEs, startups, and EU-funded projects through a unified EuroHPC access point. Complementing this initiative, the plan envisions AI Gigafactories as flagship infrastructures central to Europe's AI leadership. These facilities are designed to develop and train the next generation of frontier AI models, such as multimodal systems and Artificial General Intelligence (AGI), at an unprecedented scale, using over 100,000 AI processors. Combining immense computing power with sustainable design principles, including high energy and water efficiency and circularity, Gigafactories will drive high-impact innovation across science and industry. Inspired by the collaborative ambition of institutions like CERN, they aim to position the EU at the forefront of advanced AI while securing resilient supply chains and reducing strategic dependencies. The Action Plan allocates €10 billion for the deployment of at least 13 AI Factories by 2026. For Gigafactories, up to €20 billion will be mobilised through the InvestAI facility to support the launch of up to five installations across the Union.

The global distribution of supercomputing infrastructure.

By drawing on data from the TOP500 organization[153] – which has ranked the world's most powerful computing systems since 1993 using the "*Linpack benchmark*", measuring a system's ability to solve dense linear equations – it is possible to assess the global distribution of supercomputing infrastructure. While the TOP500 does not formally define a "supercomputer", its methodology provides a consistent reference point for evaluating computational capacity. This, in turn, offers a basis for comparing regional capabilities. According to the latest statistics released by the TOP500 organization[154], the global landscape of supercomputing infrastructure remains highly concentrated, as illustrated in **Figure 95**. A limited number of countries account for most the world's top-ranked supercomputers.

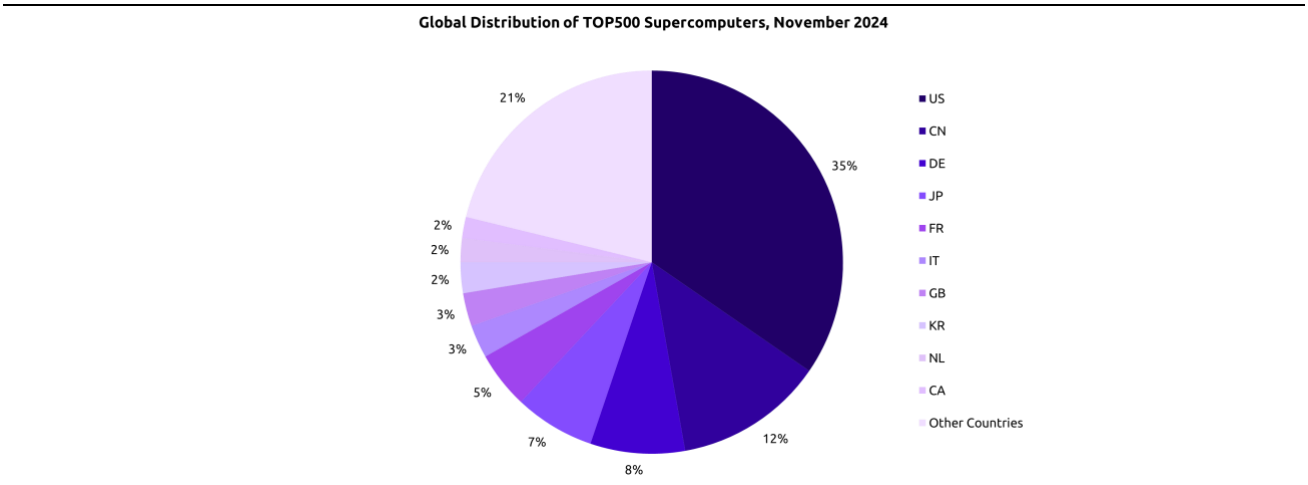


Figure 95: Global Distribution of TOP500 Supercomputers by Number of Systems, November 2024

Source: Consortium Analysis on TOP500.org data, April 2025

The United States leads with 35% of all systems, underscoring its dominant role in global computational capacity across critical domains such as artificial intelligence, climate modelling, and biomedical research. China follows with 12%, while several other technologically advanced nations hold smaller shares: Germany

[152] European Commission (2025)
[153] TOP500.org
[154] TOP500.org, List Statistics

(8%), Japan (7%), France (5%), and both Italy and the United Kingdom (3% each). Additional contributors include South Korea, the Netherlands, and Canada, each hosting 2% of the TOP500 systems.

Of particular note, 21% of all listed supercomputers now fall under the "Other Countries" category. This indicates a clear trend toward broader global dispersion of HPC capabilities, driven by emerging innovation hubs, strengthened academic and research networks, and targeted government investments in computational infrastructure.

The 64th edition of the TOP500 list also highlights notable system-level rankings. Leading the chart is the *El Capitan* supercomputer, located at a governmental laboratory in California, U.S.A. Among European entries, the highest-ranked is *HPC6*, a newly deployed system at private company's research centre in Italy, which debuts at an impressive fifth position, as shown in **Figure 96.**

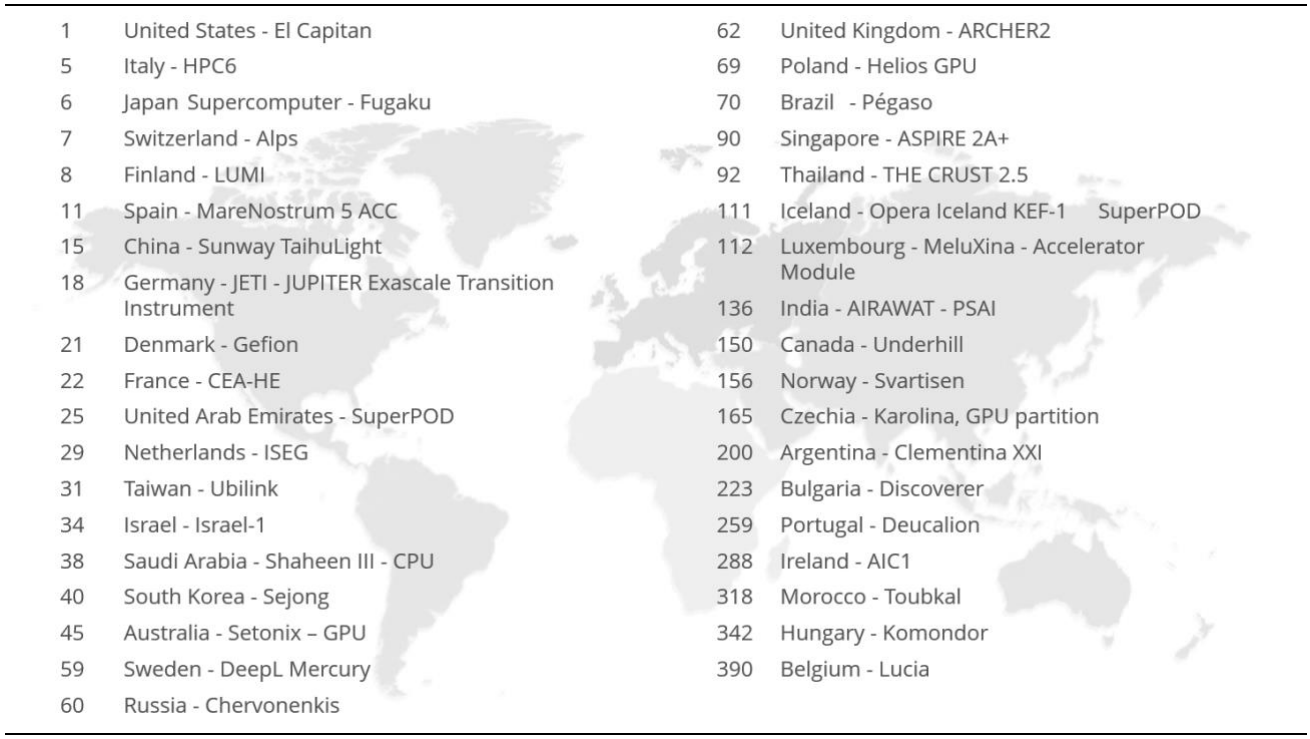


Figure 96: Largest Supercomputer per Country and Its Global Rank in November 2024

Source: Consortium Analysis on TOP500.org data, April 2025. See also Supercomputing Regional Analysis, 2019 and 2024: Europe Pushes China to Third Place (#US52773324, December 2024)

Using the same data and applying the same regional lens as before, **Figure 97** shows that the Americas, driven primarily by the United States (35%), hold the largest share of global supercomputing systems, followed closely by the EU27 with 32%. While the EU's collective presence is strong, its capacity is distributed across multiple Member States, unlike the concentrated US footprint. China (12%), Japan (7%), and the rest of Asia-Pacific (7%) form the core of Asia's contribution, while the United Kingdom (3%) maintains a modest independent share.

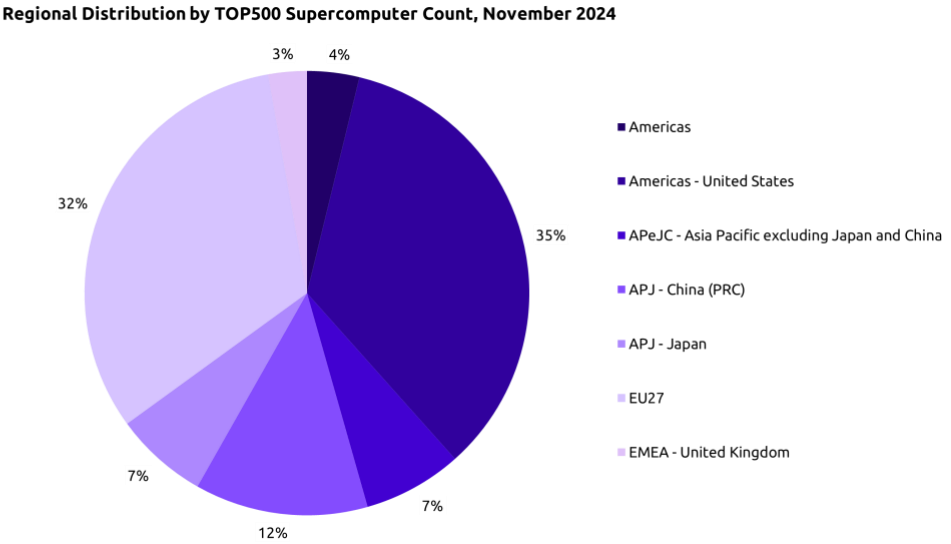


Figure 97: Regional Distribution of TOP500 Supercomputers by Number of Systems, November 2024

Source: Consortium Analysis on TOP500.org data, April 2025

Figure 98 shows the regional distribution of computing power (measured in GigaFLOPS) across the TOP500 supercomputers. The United States still dominates, accounting for 55% of global supercomputing performance, far surpassing its share by system count. This suggests the U.S. systems are not only numerous but also significantly more powerful.

The EU27, while hosting 28% of the systems' performance, trails in terms of raw computing capacity. Other regions – including China (8%), Japan (4%), and Asia-Pacific excluding Japan and China (3%) – hold comparatively smaller shares. The United Kingdom represents just 1%, underscoring its limited standalone impact post-Brexit.

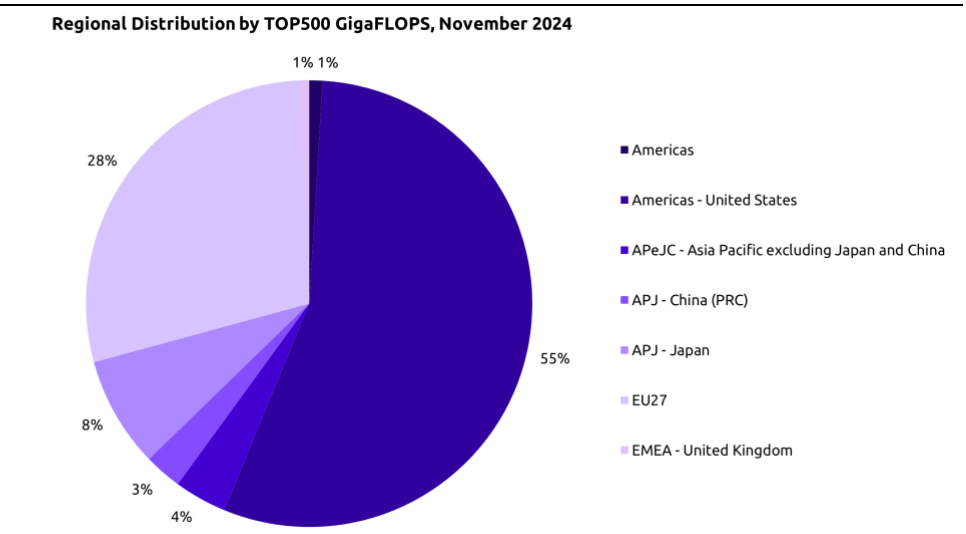


Figure 98: Regional Distribution of TOP500 Supercomputers by Performance, November 2024

Source: Consortium Analysis on TOP500.org data, April 2025

While the EU27 collectively accounts for a substantial share (28%) of global supercomputing performance, the region's capacity remains distributed across Member States. This fragmented landscape may limit Europe's ability to match the scale, coherence, and computational intensity achieved by single-nation leaders such as the United States, which alone commands 55% of the world's installed supercomputing power.

Taken together, the figures underscore the growing **importance of not only hosting a large number of systems but also investing in performance-intensive computing infrastructure** capable of supporting the most demanding workloads. The global distribution of supercomputer capacity provides a valuable **indication of where countries are prioritizing strategic investments in computational infrastructure,** essential for enabling performance-intensive applications in health. For instance, under the European High Performance Computing Joint Undertaking (EuroHPC JU), the EuroCC project[155] has established a network of 33 National Competence Centres (NCCs) to bridge HPC skills gaps and promote cooperation across Europe. These centres serve as hubs for expertise, connecting industry and academia with relevant national and international HPC resources, mapping HPC competences, and centralising training opportunities. Through this initiative, NCCs support a range of innovative medical applications including personalised paediatric dosimetry, enhanced heart valve prosthesis design, AI-assisted diagnostics, and surgical planning with digital twins, driving forward the uptake of HPC in healthcare[156].

The Use of Supercomputers for Health-Related Research in the EU27

According to the European High Performance Computing Joint Undertaking (EuroHPC JU) website, the initiative has acquired 10 cutting-edge supercomputers across the EU27, with two more currently being procured. By April 2025[157], a total of 35 projects have been awarded access to these systems under the domain of "*Biochemistry, Bioinformatics, Life Sciences, Physiology, and Medicine*". These projects exemplify the expanding role of supercomputers in advancing data-driven, simulation-intensive health research across a range of scientific and clinical disciplines. The awarded projects can be grouped into six thematic categories, based on their primary research objectives and computational approaches:

Table 11: Thematic Breakdown of Awarded Health-Related Projects

Category	Number of Projects	Description
1. Biomedical Modelling and Simulation	13	Projects simulating organs, tissues, or systems (e.g. heart, brain, cancer).
2. Genomics, Multi-omics and Molecular Dynamics	8	Studies focused on gene sequencing, protein structure, and molecular pathways.
3. Infectious Diseases and Epidemiology	5	Modelling of viral dynamics, pathogen spread, and host-pathogen interactions.
4. Neuroscience and Neuroimaging	4	Brain simulations, neurodynamics, and imaging-based network modelling.
5. Clinical Decision Support and Precision Medicine	3	Projects linking patient-specific simulations to personalised care planning.
6. Radiotherapy and Medical Imaging	2	HPC-enabled modelling for proton therapy and advanced imaging applications.

Source: Consortium Analysis on EuroHPC JU website, April 2025[158].

These findings confirm that performance-intensive computing is being leveraged for organ-scale modelling, molecular biology, infectious disease control, and individualised medicine. They also highlight the EU's

[155] HPC in Europe portal (2025)
[156] Koch M, Arlandini C, Antonopoulos G, et al. HPC+ in the medical field: Overview and current examples. *Technol Health Care*. 2023;31(4):1509-1523. doi:10.3233/THC-229015
[157] The European High Performance Computing Joint Undertaking (EuroHPC JU), Awarded Projects
[158] Full list of awarded projects

growing capacity to use HPC not only for fundamental research but also for clinical translation and decision-making support, bridging the gap between scientific computing and health system innovation.

In the medical imagining domain is interesting to analyse the "*FoundRa: Foundation model for Radiology*" project[159], scheduled to run on *Leonardo* supercomputer in Italy from November 2024 to November 2025. *FoundRA* aims to develop a **foundation model for medical imaging**, specifically trained on large-scale **radiological datasets**. The goal is to establish a general-purpose model that can be adapted to a wide range of diagnostic and clinical tasks across different imaging modalities (e.g. CT, MRI, X-ray). The project leverages large-scale self-supervised learning, a method that enables AI models to learn patterns and representations from unlabeled data. This significantly reduces the dependence on costly and time-consuming manual annotations in medical imaging.

FoundRa is computationally intensive, requiring massive GPU resources and high memory bandwidth, resources provided through EuroHPC JU supercomputing infrastructure. Training foundation models on high-resolution, multi-source imaging data demands extensive parallelization and distributed training, only feasible on HPC platforms.

The *FoundRa* project has the potential to transform radiological practice across the EU by enabling scalable, multi-task imaging models that can be adapted to diverse clinical needs. Its data-efficient design allows for fine-tuning at the level of individual hospitals or patient groups, supporting more precise and context-specific diagnostics. Importantly, it also strengthens the EU's strategic position in sovereign AI development for healthcare, reducing dependence on non-European foundation models.

Comparative Analysis in The Use of Supercomputers for Health-Related Research Outside the EU27

Outside the European Union, several countries have made significant advances in applying performance-intensive computing to healthcare and life sciences, demonstrating how supercomputing capacity can directly accelerate innovation in cancer research, genomics, personalised medicine, and drug discovery.

As the global leader in performance-intensive computing, the United States effectively combines national research infrastructures with private-sector platforms to drive healthcare innovation. In the public domain, the *Biowulf* supercomputing cluster at the National Institutes of Health (NIH)[160] provides secure, large-scale computing resources to thousands of biomedical researchers. It supports applications ranging from genomics and structural biology to AI-powered diagnostics. For example, *Biowulf* was used in a study to train a model that accurately classified MRI series types from over 1,600 multi-parametric MRI (mpMRI) studies, supporting automation in modern radiology workflows.

In the private sector, the Mayo Clinic has partnered with a private company to advance the use of AI in clinical practice through wafer-scale computing[161]. This next-generation architecture, built around a single, ultra-large processor, allows for the rapid processing of vast and complex health datasets. It is expected to significantly accelerate the development of AI tools for cancer diagnostics, treatment planning, and patient outcome prediction, enabling faster and more precise clinical decision-making.

In the United Kingdom, the *ARCHER2* supercomputer is being used to develop high-fidelity cardiac virtual twins—virtual models of individual patients' hearts[162]. Led by researchers at King's College London, the project simulates electrical activity and mechanics of the heart using real clinical data.

The work represents a major step toward clinical-grade digital twins in cardiology, showing how public supercomputing investments can directly support next-generation personalised healthcare.
The goal is to predict arrhythmias and personalise treatment decisions, especially for patients at risk of sudden cardiac death. *ARCHER2* enables simulations of thousands of heartbeats at a time, each requiring

[159] EuroHPC JU, FoundRa: Foundation model for Radiology, 2024
[160] National Institutes of Health (NIH) HPC Biowulf cluster. See Haque F., and others "*Development and validation of pan-cancer lesion segmentation AI-model for whole-body 18F-FDG PET/CT in diverse clinical cohorts. Comput Biol Med. 2025 Mar 23*
[161] Mayo Clinic engages Cerebras to deliver potent computing power, scale AI transformation, 2024
[162] UK's National Supercomputing Service, ARCHER2, Cardiac digital twin to improve patient therapy

hours of compute on hundreds of cores. This level of modelling would not be feasible without national performing intensive computing resources.

In Japan, the *Fugaku* supercomputer, at RIKEN Center for Computational Science has been central to breakthroughs in oncology and personalised medicine. For example, researchers at Institute of Science Tokyo used *Fuga*ku's computational power to analyse over 20,000 variables in a single day, identifying new mechanisms of drug resistance in cancer cells from over 1,000 trillion possibilities. In another use case[163]. Similarly, the *SHIROKANE* supercomputer, operated by Human Genome Center of the Institute of Medical Science University of Tokyo (IMSUT)[164], has enabled large-scale genomic data analysis—playing a critical role in cancer genomic medicine by helping to identify patient-specific mutations and inform precision treatments.

In China, instead, the *Tianhe-2* supercomputer is being applied to drug discovery. Researchers at Sun Yat-sen University used its high-throughput screening platform to identify 2MBC, a compound with potential to treat diabetic complications by accelerating blood clot formation[165]. This showcases the ability of HPC to dramatically shorten the timeline from compound screening to therapeutic insight.

Together, these examples highlight how nations with substantial performance-intensive computing infrastructure are strategically deploying it to support clinical and pharmaceutical research—enabling advances in personalised care, drug development, and diagnostic precision that are difficult to achieve without comparable computational capacity.

[163] Institute of Science Tokyo, Fujitsu and Tokyo Medical and Dental University leverage world's fastest supercomputer and AI technology for scientific discovery to shed light on drug resistance in cancer treatment, 2022
[164] Human Genome Center of the Institute of Medical Science University of Tokyo (IMSUT), SHIROKANE Supercomputer and the Genomon Project
[165] Xinhua, China's supercomputer aids in combating diabetic complications, 2024

7 An Overview of the Observatory Analytical Scoring Framework

Within the Observatory for Digital Health Technologies in Europe, a structured scoring framework has been developed to assess the maturity, readiness, and growth potential of digital health across the EU27.

By consolidating diverse evidence streams, including provider and vendor surveys, vendor mapping, financial trends, and market forecasts, into a single composite indicator system, the framework transforms this data into clear and comparable measures of market evolution, adoption dynamics, and investment priorities.

Designed to address the long-standing fragmentation of evidence on the digital health market, it offers a transparent and repeatable methodology that enables systematic benchmarking of regions, technologies, and adoption patterns.

The model is structured around three macro-dimensions – **Market Mapping & Segmentation (MMS)**, **Market Dynamics Analysis (MDA)**, and **Market Growth Potential (MGP)** – with results aggregated into a **Final Market Maturity Score**.

This provides policymakers and healthcare leaders with a common reference point and actionable insights on where digital health is advancing, where bottlenecks persist, and where targeted intervention will deliver the greatest impact. Sub-indicators further highlight key policy levers, such as interoperability, skills, regulatory enablement, and investment readiness, guiding effective use of EU and national instruments.

An **interactive visualisation tool** operationalises the framework, allowing users to explore results, compare EU27 regions, and track progress over time. In doing so, the framework converts heterogeneous evidence into **policy-ready signals** that support benchmarking, prioritisation, and monitoring of Europe's digital health transformation.[166]

[166] For a comprehensive methodological description, including the structure of the composite indicators, scoring approach, and data sources, refer to the "Observatory Scoring Framework: Definition and Methodology" document.

Part B: Economic impact analysis of five digital health technologies in Europe

1 Introduction

The digital transformation of healthcare presents significant opportunities to improve efficiency, reduce costs, and enhance the quality of care. Part B of this report presents an economic analysis of implementing specific digital health technologies in Europe and the costs savings they can bring healthcare systems in the EU-27.

The analysis covers five digital health technologies and is structured around five use cases that represent potential applications (solutions) of the technology type. The digital health technologies investigated in this analysis and their corresponding use cases are summarised in **Table 12**.

Table 12: Summary of the types of digital health technology and uses cases selected for analysis

#	Technology type	Definition of technology type	Selected use case	Description of use case
1	Electronic Health Records (EHR)	EHR systems are collections of electronic health data related to a natural person collected in the health system, processed for healthcare purposes as defined by the EHDS Regulation[167]. These records generally include a patient's medical background, diagnoses, treatments, prescribed medications, allergies, and immunisation history, along with laboratory results and radiology images[168].	Optimise clinical decisions with a decision support systems tool[169]	A decision support systems tool is a type of system that assists clinicians and patients by providing patient-specific information that is filtered or presented at appropriate times to enhance healthcare delivery. Such systems analyse the rich data from EHR systems with AI[170] and can provide alerts and reminders, recommendations for direct action, and present information in an organised manner.
2	Medical imaging	Medical imaging refers to the representation of the inside of the body to help with clinical analysis and medical interventions. It reveals internal structures and aids in diagnosing and treating disease. Common imaging modalities include X-ray, CT, MRI, and ultrasound. To enhance the value of these medical images, advanced computational techniques, including algorithms and artificial intelligence, are used to process, interpret, and extract meaningful insights from medical images. The goal of medical imaging is to support healthcare professionals in prevention,	Automated medical image analysis (AI-driven) along the care pathway[171]	Artificial Intelligence (AI) is transforming medical imaging by performing cognitive functions like perceiving, reasoning, and learning. AI's value lies in its ability to assist humans in medical imaging, such as through the early detection of disease, improved diagnostic accuracy, and greater workflow efficiency.

[167] EHDS (2025)
[168] Finnegan, H., & Mountford, N. (2025)
[169] Garcelon, N., Burgun, A., Salomon, R., & Neuraz, A. (2020)
[170] Musen, M. A., Middleton, B., & Greenes, R. A. (2021)
[171] Buaka, E.S. & Moid, M.Z.I., (2024)

#	Technology type	Definition of technology type	Selected use case	Description of use case
		diagnosing diseases, monitoring treatment progress, identifying abnormalities, and improving patient outcomes.		
3	Digital twins	Virtual human twins are digital models designed to replicate and predict the behaviour of a human's health or disease state including interactions with other diseases. These digital models of patients can provide insights for monitoring, diagnosis, and personalised treatment strategies[172].	Virtual human twins for disease management of the brain and heart[173]	Digital twins in disease management refer to the use of digital models that simulate individual patient data and potential treatment strategies. This approach enables a better understanding of disease progression and supports the optimisation of treatment plans through predictive insights. This use case is limited to the management of conditions related to the neurological (a brain twin) and cardiac (a heart twin) systems.
4	Telemedicine	Telemedicine is an umbrella term for related virtual care and remote patient monitoring. According to the European Commission it is 'the provision of healthcare services, using ICT, in situations where the health professional and the patient (or two health professionals) are not in the same location. It involves secure transmission of medical data and information, through text, sound, images or other forms needed for the prevention, diagnosis, treatment and follow-up of patients'[174, 175].	Providing mental health services with a mental health platform[176,177]	This use case involves a telemedicine platform designed to provide mental health services. The platform offers remote consultations, therapy sessions, and continuous monitoring of patients' mental health. Key features include video consultations, digital health records, tools for tracking therapy progress and outcomes, GenAI driven chatbots. It can make mental health care more accessible.
5	Digital technologies for genomics	Digital technologies in genomics involve using advanced computational tools to analyse and manage genetic data. This includes sequencing software, bioinformatics platforms, data storage solutions, and	Personalise treatments with advanced genetic sequencing [179]	Next Generation Sequencing (NGS) allows for the rapid and accurate sequencing of entire genomes. By understanding an individual's genetic makeup, NGS allows for tailored treatment plans, improving the

[172] Meijer, C., Uh, H-W., el Bouhaddani, S. (2023)
[173] Katsoulakis, E., Wang, Q., Wu, H. et al. (2024)
[174] Raposo V. L. (2016)
[175] European Commission (2008)
[176] Valencia-Arias, A., Gallegos, A., Aliaga Bravo, V. D. C., Luna Victoria Mori, F., Uribe-Bedoya, H., & Palacios-Moya, L. (2024)
[177] Adeghe, E. P., Okolo, C. A., & Ojeyinka, O. T. (2024)
[179] Udegbe, F. et al. (2024)

#	Technology type	Definition of technology type	Selected use case	Description of use case
		machine learning algorithms to identify genetic patterns and variations[178].		effectiveness of therapies and reducing adverse effects.

This Part begins by detailing the methodology used for the economic impact analysis (**Methodology**). Following this, the results of the economic impact analysis are presented for each of the five use cases (**Chapter 3**: Economic analysis per use case). Finally, the insights from the analyses are consolidated into conclusions and recommendations in **Part C** of this report.

[178] Bombard, Y., Ginsburg, G.S., Sturm, A.C., Zhou, A.Y., & Lemke, A.A. (2022)

2 Methodology

This section describes the approach taken to evaluate the economic impact of digital health technologies through specific use cases. Using a cost-benefit analysis, the study aims to calculate the **potential cost savings for the EU's healthcare systems in the next 5 to 10 years**. In brief, the cost-benefit analysis was performed by comparing the costs and benefits of the current operational state – referred to as the baseline scenario (i.e., the situation without the digital health technology) – with a full and partial implementation scenario of the digital health technology. The healthcare provider perspective was used to determine what costs and benefits are in-scope of the analysis. Under this perspective, costs and benefits that occur when implementing, running and managing the use case within a healthcare provider are included. In other words, this study does not focus on health and societal outcomes, quality of care, nor on costs incurred by the patient.

In summary, the approach includes (**step 1**) selecting and defining five use cases within five broader technology categories, (**step 2**) identifying the benefits (value drivers) of each use case for each scenario, (**step 3**) quantifying and monetising these benefits as well as the costs for a reference country, (**step 4**) extrapolating the quantification and monetisation to each Member State, (**step 5**) forecasting the results to a five and ten year time horizon and discounting the costs and benefits for get the net present value, and finally (**step 6**) testing the uncertainty of the model and the underlying assumptions in a sensitivity analysis.

This study employs multiple data collection methods, including desk research and consultation with experts. Consultation with experts comprised an expert workshop and several in-depth interviews per use case to identify and quantify costs and benefits. In addition, sessions with experts were held to validate the model and the findings. Monetary values are indexed to the present year (being 2025). For statistical data sources, the most recent data available was used. In the absence of a specific data source related to the calculation steps of the value drivers, assumptions based on the research team's judgement and contextual understanding were applied to come to more realistic estimates. Such assumptions are noted where relevant at each calculation.

A summary of the six steps of analysing a use case is provided below, and an elaborated description of the methodology can be found in **Annex C** (for step 1) and **Annex D** (for step 2–6).

Step 1: Selecting the digital health technologies and their respective use cases

To establish a general scope of study, five types of digital health technologies were defined based on policy priorities of the European Commission and desk research about emerging healthcare technologies. These are (1) electronic health records (EHR), (2) medical imaging, (3) digital twins, (4) telemedicine, and (5) digital technologies for genomics. Within each technology types, use cases were identified to establish specific applications in healthcare that are measurable for study. Although these use cases represent specific applications (i.e. practical uses of the technology) within the broader technology type, the use cases do not refer to solutions offered by any particular vendor. Short descriptions of each technology type and the selected use cases are provided in **Table 12**.

The selection of use cases was done using a two-stage approach:

i. First, a long list of potentially relevant use cases was curated based on desk research, with a specific focus on which use cases have strong promise for cost savings. This first stage entailed performing (a) a keyword-based strategy to search for relevant scientific articles, (b) a screening of the articles' titles and abstracts to determine their relevance, and (c) an in-depth analysis of relevant articles and extraction of use cases. To capture a relevant range of articles and potential use cases, the search queries were formulated based on three driving questions:
   - Technology-based search: '*What are the most prominent use cases described for each technology type?*'
   - Disease-based search: *"Which diseases are the costliest to treat in the EU and why?"* (being respiratory, cardiovascular, cancer, diabetes and neurodegenerative diseases) [180]

[180] Global Burden of Disease Study 2021 (2024)

  - Function-based search: *"Which healthcare functions are most costly or inefficient in the EU and why?"*

ii. Second, a final selection of use cases was made. This was done by weighing various factors such as the potential impact on cost savings, potential scalability of a use case, the availability of information for further analysis, and several predefined criteria that were set to ensure a diversity of use cases that are relevant in this study's context (i.e. comprehensive coverage of the healthcare sector, at least one use case addressing preventive care, and EU policy priorities[181,182]). This led to a selection of one use case per digital health technology, which are emerging and have the potential to save costs.

In order to study the use cases properly, scenarios were defined because the digital transformation in European healthcare systems is not a binary process. These scenarios will be used to analyse how digital health technologies are impacting the current operational state (i.e. the existing baseline scenario). The details of the different implementation scenarios are defined in step 2, based on input for an expert workshop. The general characteristics of these scenarios are:

1. **Full implementation scenario**: the digital health technology is fully implemented, leading to the maximum potential costs savings for the healthcare system from the healthcare provider perspective.
2. **Partial implementation scenario**: the digital health technology is fully implemented but the full benefits of the use case cannot be realised, reflecting a more constrained reality, where various obstacles, such as financial limitations, technical challenges, regulatory requirements, ethical considerations, and human factors, impede the maximum potential cost savings for the healthcare system.

Step 2: Identifying the benefits for each scenario

To identify the benefits, a benefit logic was developed for each of the five use cases. This logic focused on how specific benefits arise and how they derive from implementing various digital health technologies. Desk research and an expert workshop were used to populate the benefit logic for each use case. Benefits were identified by contrasting the baseline scenario (current operational state) to the full implementation scenarios. The benefits are conceptualised as value drivers, which are activities conducted in the baseline scenario that are then performed in a more cost-effective manner with the use case. The value drivers are thus the causes of the cost savings. For the partial scenario, some value drivers from the full scenario were deemed as inapplicable or unlikely to fully materialise.

Step 3: Quantifying and monetising the costs and benefits for each scenario in a reference country

The identified benefits as well as the costs of implementing and operating the use case must be quantified and monetised. This was done by comparing the implementation scenario to the baseline scenario. The main casual pathways and the main value driver per pathway were chosen for analysis. For each value driver, a baseline value was calculated, representing the total cost of performing the activity in the reference country in the absence of the use case. Experts were consulted through interviews to estimate the cost savings the use case could bring to each value driver. Specifically, experts estimated a percentage saving per value driver (termed in this report the "savings rate"). To estimate the cost savings in the partial scenario, the cost savings in the full scenario were multiplied by the extent to which each value driver will likely be realised in the partial scenario (termed in this report the "presence rate"). These costs savings were calculated at the country level based on pricing data from the Netherlands. However, the "savings rates" and "presence rates" are not specific to the Netherlands. Therefore, the reference country does not precisely represent a specified country; it is a fictional reference point for subsequent extrapolation to each of the 27 Member States.

Costs were estimated in two categories: one-off costs, representing the costs of implementing the use case, and recurring costs, representing the annual costs of operating the use case. Cost estimates were derived using a combination of desk research and expert interviews: either through direct estimation of costs, indirect estimation using a benchmark, or validation of desk research findings. Vendors apply different

[181] European Commission (n.d.).
[182] European Virtual Human Twins Initiative (n.d.).

pricing strategies, and the experts provided pricing estimates based on a pricing model that differs between use cases.

Step 4: Extrapolating the costs and benefits to the EU-27 and aggregating the data to the EU-level

The monetised cost savings and implementation costs from the reference country must be converted into estimates specific to each of the 27 Member States. In this process, it is important to account for essential differences between countries in relation to the use case and in relation to the reference data (of the Netherlands). In terms of extrapolating the cost savings, this was done by grouping Member States into clusters based on shared characteristics, with each cluster assigned a weighting index to reflect their relative potential to benefit from the use case. The reference country's estimate was also adjusted accordingly. In addition, the estimates were adjusted by scaling factors relevant to the use case. These are proxy indicators reflecting differences between countries, such as healthcare expenditure or service volume as well as differences in currency and relative prices.

Cost estimates were similarly scaled based on the reference country using the number of relevant healthcare providers per country and adjusted for differences in currency and relative prices. This results in the costs and benefits for the full market potential of the use case per country. The sum of this result is the EU-aggregate.

Step 5: Forecasting the costs and benefits over 10 years and calculating the net present value

The extrapolation of the results to five and ten years was done by modelling how the use case and its adoption by the healthcare providers are expected to evolve over time. The adoption curve was modelled based on the IDC Healthcare Provider Survey[183] see **Figure 1**, in which respondents were grouped into regional clusters and asked about their plans to adopt each of the use cases (for telemedicine and digital technologies for genomics, the survey asked about the technology type and not a specific use case). These adoption values for each regional cluster were used to adjust the estimated benefits and costs per country per year. In addition, forecasted values were adjusted to account for increases in healthcare demand based on the compound annual growth rate (CAGR) of healthcare expenditure per country for each projected year. Future costs and benefits were also discounted to correct for inflation, time preference and the risk of the investment in the use case. The net Present Value (NPV) is obtained by calculating the difference between the present value of benefits and the present value of costs (benefits minus costs), and reflects the financial attractiveness of an investment.

Step 6: Conducting a sensitivity analysis

To assess the robustness of the cost-benefit analysis, a sensitivity analysis was conducted using Monte Carlo simulations. The analysis assessed three core parameters from the reference country: (a) the savings rate used to estimate cost savings, (b) implementation costs, and (c) operational costs. Each was tested independently in separate simulations (each with one million iterations), based on defined ranges collected during expert interviews. The simulations produced distributions for the cost savings per value driver, the gross savings under partial and full implementation scenarios (based on the sum of the cost savings per value driver), and both the implementation and recurring costs.

To identify the most influential value drivers of the estimated cost savings, the variance of each value driver's distribution was calculated, and its contribution to the model's overall uncertainty was assessed by comparing its variance to the total variance of gross savings.

In addition, lower- and upper-bound estimates were calculated for gross savings, implementation costs, and recurring costs in the reference country using a two-standard-deviation range ("two sigma") around the mean of the distributions. These bounds were then used to recalculate lower- and upper-bound estimates of the cumulative net present cost avoidance for the EU-27 under partial and full implementation scenarios in year 0, 5, and 10.

[183] IDC Healthcare Provider Survey: conducted by IDC for Part A: European digital health market observatory

3 Economic analysis per use case

The sections below present the findings of the economic analysis conducted for each use case. With the goal of calculating the net cost avoidance savings (monetary benefit) across the EU, the costs of implementing and operating the use case are compared to the gross cost savings enabled by the use case for specific value drivers (activities). The costs of performing the use case-specific value drivers (activities) are calculated for a **baseline scenario** where the use case is not implemented. To determine the potential cost savings of the use case, the baseline costs of the value drivers are compared to the cost of performing the activity in a **full scenario** where the use case is implemented and fully effective. The analysis also uses a **partial scenario** where the use case is fully implemented in a technical sense, but various barriers and challenges prevent the cost savings from being fully and effectively realised.

Each section below first presents **(a)** the gross cost savings of the use case (i.e. the costs of the value drivers in the baseline versus the full and partial scenarios), calculated with pricing data from one country as a reference case. This is followed by **(b)** the gross cost savings extrapolated from the reference case to each of the EU-27 based on adjustment factors and **(c)** forecasted over ten years based on technology adoption rates in each Member State and other adjustment factors. Then, the one-off and recurring costs of operationalising the use case are similarly presented for **(d)** the reference case, **(e)** the Member States of the EU-27, and **(f)** forecasted over ten years. Based on the gross cost saving for the value drivers and the cost of the use case itself, **(g)** the net cost avoidance of implementing and operating the use case are presented. Finally, **(h)** the assumptions of the model are investigated in a sensitivity analysis, and **(i)** conclusions are drawn.

The economic analyses per use case are presented in the following order:

1. Optimise clinical decisions with a decision support system
2. Automated medical image analysis (AI-driven) along the care pathway
3. Virtual human twins for disease management of the brain and heart
4. Providing mental health services with a mental health platform
5. Personalise treatments with advanced genetic sequencing.

4 Use Case 1: Clinical decision support system

Electronic health records (EHR) – digital systems for collecting, storing, and managing patient health information – are becoming increasingly important in the operation of hospitals such as by supporting clinical decision-making, continuity of care, and data-driven healthcare delivery. In this context, various technological solutions that use EHR systems as foundational data sources are being developed.

The selected use case for this analysis is a clinical decision support system (CDSS) that utilises data from EHRs, enhanced by artificial intelligence. The analysis establishes a **full implementation scenario** in which AI-driven decision support delivers real-time, personalised alerts and actionable recommendations to clinicians about patients. Patient outcomes improve through predictive analytics, data integration, and proactive care coordination, and this also saves time and financial resources.

The analysis assumes a **baseline scenario** where no decision support systems are implemented in hospitals. In this baseline scenario, health data such as laboratory results and the patient's medical history are stored within EHR systems but are not actively leveraged for decision-making by healthcare professionals.

Key Takeaways

- **Economic impact**: Clinical decision support systems (CDSS) offer a strong economic case for cost avoidance across EU healthcare systems. The implementation of the use case is projected to yield a cumulative net cost avoidance of €252 billion (full scenario) and €71 billion (partial scenario) over ten years.
- **Implementation scenarios**: The full implementation scenario's cumulative net cost avoidance rises steeply and consistently over time. The cumulative net cost avoidance in the partial implementation scenario does increases over time, but at much a slower rate than in the full scenario. The partial scenario delivers only 28% of the full scenario's net benefit.
- **Sensitivity analysis**: The sensitivity analysis indicates that the value drivers 'shorter hospital stays' and 'fewer procedures' are associated with the highest levels of uncertainty in the model's output.
- **System-level impact**: When benchmarked against projected EU healthcare expenditure, the full implementation of CDSS could reduce total healthcare expenditure in the EU by approximately 1.0% after ten years, while the partial scenario may achieve a reduction of around 0.3%

Please refer to section 4.2.6 for the discussion and conclusions of this analysis and Part C for the overall conclusions and limitations.

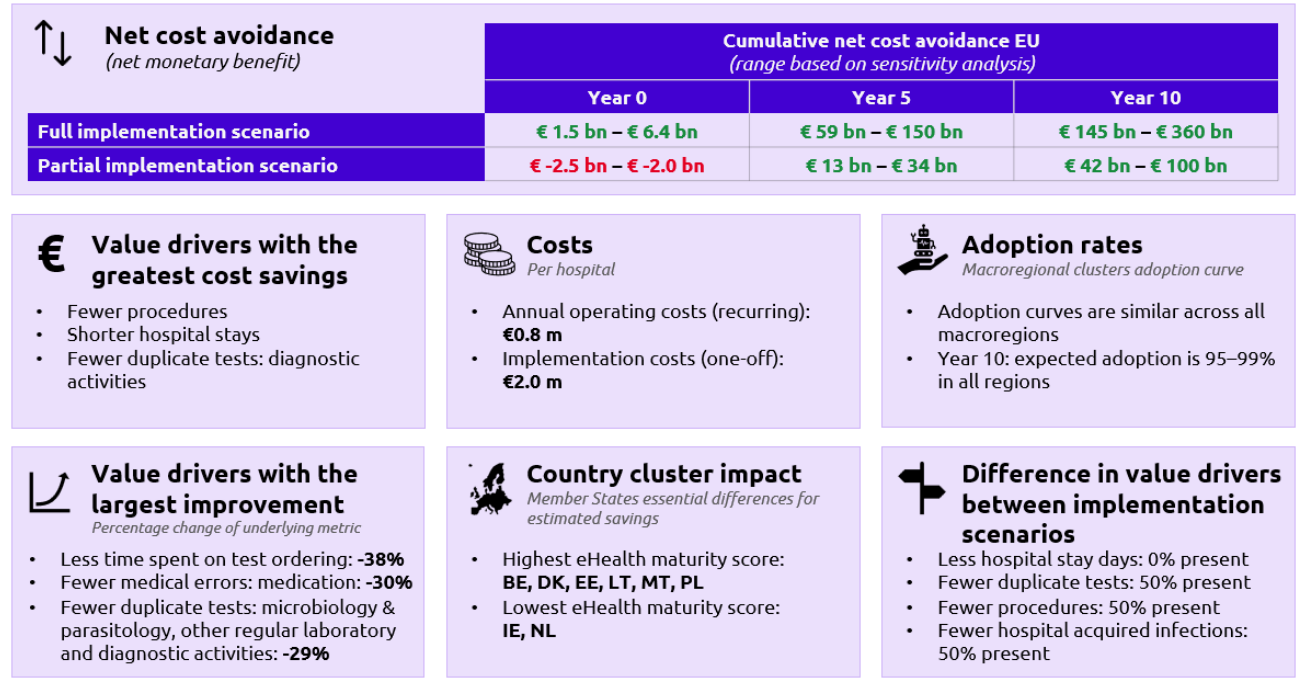


Figure 99: Overview of key findings for the use case 'clinical decision support systems'

4.1 ANALYSIS OF THE GROSS COST SAVINGS

4.1.1(a) Quantification and monetisation of the value drivers and resulting cost savings from implementing the use case, using pricing data of a reference country

To identify the underlying causes of cost savings offered by the use case (i.e. the activities the use case helps improve), a list of value drivers was defined and is presented in **column A of Table 13** (refer to **Annex E1** for the list of experts that provided input for the data collection and **Annex E2** for the simplified benefits logic diagram that resulted from their input).

These value drivers lead to the benefit of cost savings through various underlying mechanisms. For example, a patient spending a shorter time in hospital (value driver) or avoiding unnecessary medications (value driver), thanks to better clinical decisions enabled by the use case, gives rise to cost savings due to a reduced use of resources by the healthcare system.

The metrics used to quantify the value drivers are listed in **column B of Table 13.** These metrics are converted into monetary terms based on annual pricing data from the reference country for this use case, the Netherlands, for the subset of medical conditions applicable to the use case. The results of these calculations are presented in **column C of Table 13** and represent the cost of performing the activities described by the value drivers in the absence of the use case (baseline scenario). Refer to **Annex E3** for the sources of these data and the calculations for each value driver.

To quantify the effect the use case has on the value drivers, a mean savings rate was estimated for the full implementation scenario, in which the use case is assumed to be fully effective (see **column D of Table 13** and refer to **Annex E4** for the calculation of the savings rate).

By multiplying the savings rate per value driver (**column D**) with the baseline cost of the value driver (**column C**), the benefit in terms of cost savings is given for each value driver (see **column E of Table 13**) for the fictional reference case. The analysis shows that the greatest cost savings for this use case are attributable to fewer days spent in hospital (value driver #12) and to fewer procedures (value driver #14).

To calculate the cost savings of the value drivers for a scenario in which the use case is partially effective, the value drivers were annotated as likely to be 'absent' (0%), 'partially realised' (assumed at 50%), or 'fully realised' (100%) in a partial scenario. These presence rates are presented in **column F of Table 13** and are based on input from the workshop (**Annex E2**). By multiplying the cost savings of the value driver in the full scenario (**column E**) with the presence rate of that value driver in the partial scenario (**column F**), the cost savings of each value driver in the partial scenario is calculated (see **column G of Table 13**) for the fictional reference case.

Table 13: Quantified and monetised costs of the value drivers in the baseline scenario, the cost savings (benefit) of the full implementation scenario, and the cost savings (benefit) of the partial scenario using annual pricing data from the reference country

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
	What is the activity that the use case helps improve?	*How is the activity measured?*	*How much does it cost to do the activity without the use case?*	*How much less will the activity cost with the use case fully implemented and effective compared to the baseline?*	*How much money is saved per activity with the use case fully effective in its implementation?*	*To what degree will the cost savings be present if the use case is partially effective compared to the full scenario?*	*How much money is saved per activity with the use case partially effective in its implementation?*
1	Less time spent on documentation	Minutes per appointment	€ 566 m	25 %	€ 142 m	100 %	€ 142 m
2	Less time spent on chart review	Minutes per appointment	€ 779 m	20 %	€ 156 m	100 %	€ 156 m
3	Less time spent on ordering tests	Minutes per appointment	€ 401 m	38 %	€ 150 m	100 %	€ 150 m
4	Fewer duplicate tests: clinical chemistry & haematology	Total diagnosis costs	€ 173 m	4 %	€ 6.5 m	50 %	€ 3.2 m
5	Fewer duplicate tests: thrombosis care	Total diagnosis costs	€ 63 m	4 %	€ 2.4 m	50 %	€ 1.2 m
6	Fewer duplicate tests: microbiology & parasitology	Total diagnosis costs	€ 61 m	29 %	€ 18 m	50 %	€ 8.8 m

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
7	Fewer duplicate tests: imaging diagnostics	Total diagnosis costs	€ 1 043 m	4 %	€ 39 m	50 %	€ 20 m
8	Fewer duplicate tests: other regular laboratory tests	Total diagnosis costs	€ 171 m	29 %	€ 49 m	50 %	€ 25 m
9	Fewer duplicate tests: diagnostic activities	Total diagnosis costs	€ 1 105 m	29 %	€ 318 m	50 %	€ 159 m
10	Fewer duplicate tests: pathology	Total diagnosis costs	€ 27 m	4 %	€ 1.0 m	50 %	€ 0.5 m
11	Fewer hospital acquired infections (HAIs)	HAI costs	€ 423 m	28 %	€ 116 m	50 %	€ 58 m
12	Shorter hospital stays	Hospital stay days	€ 4 393 m	15 %	€ 659 m	0 %	€ 0 m
13	Less wasted medication	Wasted medication	€ 16 m	24 %	€ 3.8 m	100 %	€ 3.8 m
14	Fewer procedures	Total procedure costs	€ 3 218 m	21 %	€ 684 m	50 %	€ 342 m
15	Fewer medical errors: diagnostics	Medical claims	€ 22 m	21 %	€ 7.0 m	100 %	€ 7.0 m
16	Fewer medical errors: operation	Medical claims	€ 27 m	21 %	€ 5.7 m	100 %	€ 5.7 m

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
17	Fewer medical errors: treatment	Medical claims	€ 7.6 m	21 %	€ 1.6 m	100 %	€ 1.6 m
18	Fewer medical errors: maternity	Medical claims	€ 8.2 m	21 %	€ 1.7 m	100 %	€ 1.7 m
19	Fewer medical errors: medication	Medical claims	€ 6.5 m	30 %	€ 2.0 m	100 %	€ 2.0 m
20	Fewer medical errors: nursing	Medical claims	€ 1.3 m	21 %	€ 286 103	100 %	€ 0.4 m
Total cost savings for the fictional reference case					**€ 2.4 bn**	**—**	**€ 1.1 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The metrics either relate directly to the value driver (e.g. shorter hospital stays can be measured directly in days) or are closely correlated to it (e.g. fewer medical errors can be measured indirectly through the number of medical procedures).
- [b] To be comparable, the metrics are scaled to the order of the country, meaning they represent the cost for all hospitals in a country's healthcare system. See Annex E3 for the calculations of each value driver.
- [c] The magnitude of the savings was determined through interviews with experts. Experts were asked to provide estimated ranges, both conservative and optimistic, regarding the improvements the use case could bring to the value drivers. The midpoint of this estimated range was taken as the savings rate. See Annex E4 for the calculations.
- [d] Calculated with the formula: Baseline scenario [EUR] × savings rate [%]
- [e] The likelihood of a value driver being present in the partial scenario was determined through an expert workshop. Refer to the benefits logic in Annex E2.
- [f] Calculated with the formula: Cost savings in full scenario [EUR] × presence rate [%]

4.1.2(b) Extrapolating the benefits to the EU-27

The result of quantifying and monetising the value drivers of the use case in the previous section is the estimated cost savings for a full and partial implementation scenario in a fictional reference case. To convert these reference values to values specific to each Member State, several adjustment factors must be applied to the pricing data and the savings rate used in the reference case.

To account for essential differences in the extent to which countries may achieve the estimated savings rate for this use case, countries are clustered into four groups based on their eHealth maturity score[184], an index that measures maturity in terms of granting citizens access to health data. This indicator was selected since realising the benefits of this use case depends on access to comprehensive patient data.

A weighting is assigned to each cluster based on the median maturity score of the countries in the cluster relative to the median maturity score of all Member States. The calculations are presented in **Table 14**. This calculation is performed on the premise that countries with lower levels of digital maturity have less ability to embrace the new technology and are thus limited in their ability to reap the potential benefits of the use cases when they adopt it in year 0.

Table 14: Calculation of the cluster weighting

A: Cluster name	B: Cluster definition	C: Member States in the cluster	D: Cluster weighting [factor] [a]
Trendsetters (High)	Maturity score ≥90%	Belgium, Denmark, Estonia, Lithuania, Malta, Poland	$\frac{98\ \%}{86\ \%} = 1.14$
Fast-trackers (Moderate high)	80% ≤ maturity score < 90%	Austria, Bulgaria, Croatia, Finland, France, Germany, Hungary, Italy, Latvia, Portugal, Slovenia, Spain	$\frac{87\ \%}{86\ \%} = 1.01$
Followers (Moderate low)	60% ≤ maturity score < 80%	Cyprus, Czechia, Greece, Luxembourg, Romania, Slovakia, Sweden	$\frac{75\ \%}{86\ \%} = 0.87$
Beginners (Low)	Maturity score < 60%	Ireland, Netherlands	$\frac{45\ \%}{86\ \%} = 0.52$

Notes:

- The cluster factor is displayed rounded to two decimals. Calculations are performed using the unrounded values.
- [a] Calculated with the formula:
  median eHealth maturity of countries in the cluster [%] ÷ median eHealth maturity of all countries [%]

In addition to difference related to the use case, countries have general difference in their healthcare expenditures, which reflects differences in prices, population size, and demographic characteristic, among other variables. For this analysis, healthcare expenditure is calculated as a factor compared to the reference country (the Netherlands' pricing data) (see **column C** of **Table 15** and **Annex E5** for the underlying calculation).

By multiplying the cost savings of the fictional reference case (**Table 13**) by the cluster weighting and the health expenditure factor of each Member State, an estimate of the cost savings in each Member State is produced, which assumes that the use case is implemented in all hospitals (100% adoption). This calculation is presented in **Table 15**.

[184] Digital Decade eHealth indicator study (2025)

Table 15: Calculation of the total cost savings for the full and partial implementation scenarios per Member State in one year assuming 100% adoption of the use case

A: Member State	B: Cluster weighting [factor][a]	C: Healthcare expenditure relative to the Netherlands [factor][b]	D: Cost savings: full scenario in all hospitals [EUR][c]	E: Cost savings: partial scenario in all hospitals [EUR][d]
Austria	1.01	0.52	€ 1 232 m	€ 567 m
Belgium	1.14	0.62	€ 1 658 m	€ 763 m
Bulgaria	1.01	0.07	€ 162 m	€ 75 m
Croatia	1.01	0.05	€ 122 m	€ 56 m
Cyprus	0.87	0.03	€ 52 m	€ 24 m
Czechia	0.87	0.25	€ 517 m	€ 238 m
Denmark	1.14	0.37	€ 1 003 m	€ 461 m
Estonia	1.14	0.03	€ 70 m	€ 32 m
Finland	1.01	0.27	€ 640 m	€ 294 m
France	1.01	3.24	€ 7 741 m	€ 3 561 m
Germany	1.01	5.05	€ 12 063 m	€ 5 549 m
Greece	0.87	0.18	€ 384 m	€ 172 m
Hungary	1.01	0.12	€ 279 m	€ 128 m
Ireland	0.52	0.32	€ 396 m	€ 182 m
Italy	1.01	1.81	€ 4 338 m	€ 1 995 m
Latvia	1.01	0.03	€ 72 m	€ 33 m
Lithuania	1.14	0.05	€ 136 m	€ 62 m
Luxembourg	0.87	0.04	€ 92 m	€ 42 m
Malta	1.14	0.02	€ 46 m	€ 21 m
Netherlands	0.52	1.00	€ 1 236 m	€ 569 m
Poland	1.14	0.43	€ 1 164 m	€ 536 m
Portugal	1.01	0.26	€ 626 m	€ 288 m
Romania	0.87	0.17	€ 348 m	€ 160 m
Slovakia	0.87	0.09	€ 180 m	€ 83 m
Slovenia	1.01	0.06	€ 135 m	€ 62 m
Spain	1.01	1.35	€ 3 237 m	€ 1 489 m
Sweden	0.87	0.61	€ 1 258 m	€ 579 m
Total cost savings for the EU-27 with 100% adoption			**€ 39 bn**	**€ 18 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.

A: Member State	B: Cluster weighting [factor][a]	C: Healthcare expenditure relative to the Netherlands [factor][b]	D: Cost savings: full scenario in all hospitals [EUR][c]	E: Cost savings: partial scenario in all hospitals [EUR][d]

- [a] See Table 14 for the underlying calculation.
- [b] See Annex E5 for the underlying calculation. The Netherlands = 1.
- [c] Calculated with the formula: Reference case savings in full scenario [EUR] × cluster factor × expenditure factor. See Table 13 for the calculation of the reference case savings in the full scenario.
- [d] Calculated with the formula: Reference case savings in partial scenario [EUR] × cluster factor × expenditure factor. See Table 13 for the calculation of the reference case savings in the partial scenario.

4.1.3(c) Forecasting the benefits to the EU-27 over time

The result of extrapolating the cost savings from the fictional reference case to each Member State in the previous section is an estimate of the full market potential (100% adoption) for gross cost savings of the use case. To adjust the estimated savings based on the expected degree of adoption of the use case, adoption rates per regional cluster of Member States were calculated for the current year and forecasted for the next ten years (see **Figure 100** and **Annex E6**) based on the results of the healthcare provider survey (see **Figure 1**). Furthermore, to account for changes in health expenditure over time, the average health expenditure growth (compound annual growth rate) per Member State was calculated for the period 2014 – 2022 (see **column F of Table 16**) and forecasted for the next ten years. By multiplying the cost savings calculated in a case of 100% adoption (**Table 15**) by the estimated adoption rates (of the macro-region) and the growth of health expenditure, the estimated cost savings per country per year is calculated. By dividing by a discount rate, the estimated future savings are normalised to the present-day value of money. Adding up the annual values over 5 years and 10 years gives the cumulative cost savings in present-day money. The calculation for the full implementation scenario is presented in **Table 16** and for the partial implementation scenario in **Table 17.**

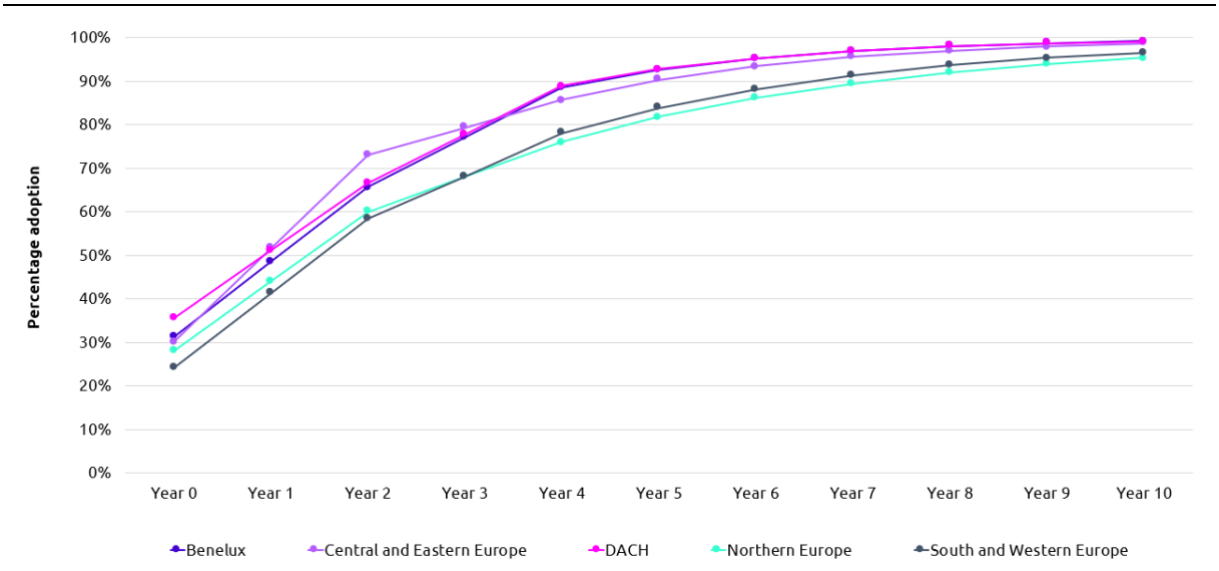


Figure 100: Adoption curve for clinical decision support systems based on the healthcare provider survey (see Figure 1) for years 0 to 4 and an extrapolated trend curve for years 5 to 10 (see Annex E6).

Table 16: Forecasted cost savings for the full implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€ 1 232 m	36%	€ 438 m	4.71%	€ 5 078 m	€ 11 071 m
Belgium	Benelux	€ 1 658 m	31%	€ 521 m	4.25%	€ 6 691 m	€ 14 758 m
Bulgaria	Central and Eastern Europe	€ 162 m	30%	€ 49 m	8.98%	€ 665 m	€ 1 446 m
Croatia	Central and Eastern Europe	€ 122 m	30%	€ 37 m	6.83%	€ 499 m	€ 1 085 m
Cyprus	South and Western Europe	€ 52 m	24%	€ 13 m	9.28%	€ 185 m	€ 428 m
Czechia	Central and Eastern Europe	€ 517 m	30%	€ 156 m	9.24%	€ 2 119 m	€ 4 608 m
Denmark	Northern Europe	€ 1 003 m	28%	€ 281 m	3.50%	€ 3 584 m	€ 8 150 m
Estonia	Central and Eastern Europe	€ 70 m	30%	€ 21 m	8.93%	€ 288 m	€ 626 m
Finland	Northern Europe	€ 640 m	28%	€ 179 m	3.14%	€ 2 287 m	€ 5 201 m
France	South and Western Europe	€ 7 741 m	24%	€ 1 877 m	2.99%	€ 27 364 m	€ 63 236 m
Germany	DACH	€ 12 063 m	36%	€ 4 289 m	5.32%	€ 49 734 m	€ 108 424 m
Greece	South and Western Europe	€ 384 m	24%	€ 91 m	2.89%	€ 1 231 m	€ 3 053 m
Hungary	Central and Eastern Europe	€ 279 m	30%	€ 84 m	5.27%	€ 1 142 m	€ 2 484 m
Ireland	Northern Europe	€ 396 m	28%	€111 m	6.62%	€ 1 414 m	€ 3 215 m
Italy	South and Western Europe	€ 4 338 m	24%	€ 1 052 m	2.49%	€ 15 334 m	€ 35 436 m
Latvia	Central and Eastern Europe	€ 72 m	30%	€ 22 m	10.77%	€ 296 m	€ 643 m

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Lithuania	Central and Eastern Europe	€ 136 m	30%	€ 41 m	10.07%	€ 556 m	€ 1 209 m
Luxembourg	Benelux	€ 92 m	31%	€ 29 m	5.96%	€ 370 m	€ 815 m
Malta	South and Western Europe	€ 46 m	24%	€ 11 m	9.65%	€ 163 m	€ 377 m
Netherlands	Benelux	€ 1 236 m	31%	€ 389 m	3.96%	€ 4 989 m	€ 11 004 m
Poland	Central and Eastern Europe	€ 1 164 m	30%	€ 351 m	6.30%	€ 4 770 m	€ 10 371 m
Portugal	South and Western Europe	€ 626 m	24%	€ 152 m	5.79%	€ 2 214 m	€ 5 116 m
Romania	Central and Eastern Europe	€ 348 m	30%	€ 105 m	10.10%	€ 1 424 m	€ 3 097 m
Slovakia	Central and Eastern Europe	€ 180 m	30%	€ 54 m	6.15%	€ 739 m	€ 1 607 m
Slovenia	Central and Eastern Europe	€ 135 m	30%	€ 41 m	6.95%	€ 554 m	€ 1 205 m
Spain	South and Western Europe	€ 3 237 m	24%	€ 785 m	4.27%	€ 11 442 m	€ 26 441 m
Sweden	Northern Europe	€ 1 258 m	28%	€ 352 m	2.63%	€ 4 945 m	€ 10 223 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 12 bn**	**—**	**€ 150 bn**	**€335 bn**

Notes:

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1).
- [b] See Table 15 for the underlying calculation.
- [c] See Figure 100 and Annex E6 for the underlying calculations.
- [d] Calculated for year 0 with the formula: Cost savings with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year 0 $= (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Cost savings in year 0 + (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n.
  Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

Table 17: Forecasted cost savings for the partial implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€ 567 m	36%	€ 201 m	4.71%	€ 2 336 m	€ 5 092 m
Belgium	Benelux	€ 763 m	31%	€ 240 m	4.25%	€ 3 078 m	€ 6 788 m
Bulgaria	Central and Eastern Europe	€ 75 m	30%	€ 23 m	8.98%	€ 306 m	€ 655 m
Croatia	Central and Eastern Europe	€ 56 m	30%	€ 17 m	6.83%	€ 229 m	€ 499 m
Cyprus	South and Western Europe	€ 24 m	24%	€ 5.8 m	9.28%	€ 85 m	€ 197 m
Czechia	Central and Eastern Europe	€ 238 m	30%	€ 72 m	9.24%	€ 975 m	€ 2 120 m
Denmark	Northern Europe	€ 461 m	28%	€ 129 m	3.50%	€ 1 648 m	€ 3 749 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Estonia	Central and Eastern Europe	€ 32 m	30%	€ 9.8 m	8.93%	€ 132 m	€ 288 m
Finland	Northern Europe	€ 294 m	28%	€ 82 m	3.14%	€ 1 052 m	€ 2 392 m
France	South and Western Europe	€ 3 561 m	24%	€ 863 m	2.99%	€ 12 587 m	€ 29 088 m
Germany	DACH	€ 5 549 m	36%	€ 1 973 m	5.32%	€ 22 877 m	€ 49 874 m
Greece	South and Western Europe	€ 172 m	24%	€ 42 m	2.89%	€ 608 m	€ 1 404 m
Hungary	Central and Eastern Europe	€ 128 m	30%	€39 m	5.27%	€ 525 m	€ 1 143 m
Ireland	Northern Europe	€ 182 m	28%	€ 51 m	6.62%	€ 650 m	€ 1 479 m
Italy	South and Western Europe	€ 1 995 m	24%	€ 484 m	2.49%	€ 7 054 m	€ 16 300 m
Latvia	Central and Eastern Europe	€ 33 m	30%	€ 10 m	10.77%	€ 136 m	€ 296 m
Lithuania	Central and Eastern Europe	€ 62 m	30%	€ 19 m	10.07%	€ 256 m	€ 556 m
Luxembourg	Benelux	€ 42 m	31%	€ 13 m	5.96%	€ 170 m	€ 375 m
Malta	South and Western Europe	€ 21 m	24%	€ 5.2 m	9.65%	€ 75 m	€ 174 m
Netherlands	Benelux	€ 569 m	31%	€ 179 m	3.96%	€ 2 295 m	€ 5 062 m
Poland	Central and Eastern Europe	€ 536 m	30%	€ 162 m	6.30%	€ 2 194 m	€ 4 771 m
Portugal	South and Western Europe	€ 288 m	24%	€ 70 m	5.79%	€ 1 018 m	€ 2 353 m
Romania	Central and Eastern Europe	€ 160 m	30%	€ 48 m	10.10%	€ 655 m	€ 1 425 m
Slovakia	Central and Eastern Europe	€ 83 m	30%	€ 25 m	6.15%	€ 340 m	€ 739 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Slovenia	Central and Eastern Europe	€ 62 m	30%	€ 19 m	6.95%	€ 255 m	€ 554 m
Spain	South and Western Europe	€ 1 489 m	24%	€ 361 m	4.27%	€ 5 263 m	€ 12 163 m
Sweden	Northern Europe	€ 579 m	28%	€ 162 m	2.63%	€ 2 068 m	€ 4 702 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 5.3 bn**	**—**	**€ 69 bn**	**€ 154 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 15 for the underlying calculation.
- [c] See Figure 100 and Annex E6 for the underlying calculation.
- [d] Calculated for year 0 with the formula: Cost savings with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year $0 = 1$.
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Cost savings in year $0 +$ (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n.
  Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

4.2 ANALYSIS OF THE ONE-OFF AND RECURRING COSTS OF THE USE CASE

4.2.1(d) Quantification and monetisation of the costs of implementing and operating the use case based on pricing data of a reference country

To quantify the cost of implementing and operating the use case, both one-off and recurring costs were estimated. To derive the one-off costs of implementing the use case, the cost of a comparable digital health technology with available pricing data is used as a benchmark. For this use case of 'clinical decisions with a decision support system', the benchmark is the costs incurred by a single hospital in the reference country (the Netherlands) to implement an EHR system (see **column A of Table 18**). To estimate the cost of implementing the actual use case, a proportion was estimated compared to the benchmark case (see **column B of Table 18** and **Annex E7** for the calculation of the proportion). By multiplying the cost of the benchmark case and this proportion, the one-off costs of implementing the use case in one hospital in the reference country is calculated (see **column C of Table 18**). The costs incurred each year to operate and maintain the use case were estimated in a similar manner. A proportion was estimated compared to the benchmark case (see **column D of Table 18** and **Annex E7** for the calculation of the proportion). By multiplying the cost of the benchmark case and this proportion, the recurring costs of operating the use case in one hospital in the reference country is calculated (see **column E of Table 18**).

Table 18: Quantified and monetised costs of implementing (one-off) and operating (annual recurring) the use case relative to a benchmark case based on pricing data from the reference country

A: Annual cost of operating a comparable technology solution (benchmark case) in one hospital in the reference country [EUR][a]	B: Proportion of the benchmark costs for implementing the use case (midpoint of estimated range) [%][b]	C: Total one-off costs of implementing the use case in one hospital in the reference country [EUR][c]	D: Proportion of the benchmark costs for operating the use case (midpoint of estimated range) [%][d]	E: Total annual recurring costs of operating the use case in one hospital in the reference country [EUR][e]
€ 9.0 m	22%	€ 2.0 m	9%	€0.8 m

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The benchmark technology solution is an EHR system.
  - Sources of data: ICT & Health (2022) for the average total revenue per hospital and the proportion of ICT costs of hospital total revenue, M&I Partners (2024).
  - Assumption: proportion EHR costs of ICT costs is 50% based on claim that "almost 50% of software costs are related to primary care process in hospitals" from ICT & Health (2022).
  - Formula: Average total revenue per hospital × proportion of ICT costs of hospital total revenue × proportion EHR of ICT = EHR costs per hospital.
  - Calculation: €300 m × 6% × 50% = €9.0 m.
- [b] The proportion of the cost for implementing the use case compared to the benchmark was determined through interviews with experts. Experts were asked to provide estimated ranges, both conservative and optimistic. The midpoint of this estimated range was taken as the proportion. See Annex E7 for the calculations.

- [c] Calculated with the formula:
  Costs of the benchmark case [EUR] × proportion of the benchmark costs attributed to implementing the use case [%]
- [d] The proportion of the cost for operating the use case compared to the benchmark was determined through interviews with experts. Experts were asked to provide estimated ranges, both conservative and optimistic. The midpoint of this estimated range was taken as the proportion. See Annex E7 for the calculations.
- [e] Calculated with the formula:
  Costs of operating the use case [EUR] × proportion of the benchmark costs attributed to operating the use case [%]

4.2.2(e) Extrapolating the costs to the EU-27

The result of quantifying and monetising the one-off and recurring costs of the use case in the previous section is the estimated costs incurred by one hospital in the reference country. To convert the reference values to values specific to each Member State, the costs per hospital for both the one-off and recurring costs (**Table 18**) were multiplied by the number of hospitals in each Member State (see **column B of Table 19**) and by a factor of purchasing power parity in Euros (PPP) relative to the Netherlands (see **column C of Table 19** and **Annex D4**) to give the total implementation and operating costs for all hospitals in each Member State (100% adoption), corrected for pricing differences relative to the reference country. The calculation is presented in **Table 19.**

Table 19: Calculation of the total one-off (implementation) and annual recurring (operational) cost of the use case per Member State in one year assuming 100% adoption of the use case

A: Member State	B: Total number of hospitals per country[a]	C: Purchasing power parity (PPP) relative to the Netherlands [factor][b]	D: Total one-off implementation costs in all hospitals in year 0 *(100% adoption)* EUR][c]	E: Total recurring operation costs in all hospitals in year 0 *(100% adoption)* [EUR][d]
Austria	279	1.05	€ 576 m	€ 241 m
Belgium	187	0.89	€ 328 m	€ 137 m
Bulgaria	349	0.30	€ 209 m	€ 87 m
Croatia	65	0.46	€ 58 m	€ 24 m
Cyprus	84	0.72	€ 118 m	€ 49 m
Czechia	257	0.39	€ 194 m	€ 81 m
Denmark	258	1.04	€ 524 m	€ 219 m
Estonia	30	0.64	€ 37 m	€ 16 m
Finland	258	1.14	€ 576 m	€ 241 m
France	3111	0.73	€ 4 478 m	€ 1 874 m
Germany	3138	0.82	€ 5 039 m	€ 2 109 m
Greece	283	0.60	€ 331 m	€ 138 m
Hungary	174	0.29	€ 100 m	€ 42 m
Ireland	95	1.33	€ 247 m	€ 103 m
Italy	1135	0.85	€ 1 901 m	€ 796 m
Latvia	64	0.44	€ 55 m	€ 23 m

A: Member State	B: Total number of hospitals per country[a]	C: Purchasing power parity (PPP) relative to the Netherlands [factor][b]	D: Total one-off implementation costs in all hospitals in year 0 *(100% adoption)* EUR][c]	E: Total recurring operation costs in all hospitals in year 0 *(100% adoption)* [EUR][d]
Lithuania	94	0.46	€ 84 m	€ 35 m
Luxembourg	12	1.27	€ 30 m	€ 12 m
Malta	9	0.67	€ 12 m	€ 4.9 m
Netherlands	273	1.00	€ 535 m	€ 224 m
Poland	1096	0.49	€ 1 045 m	€ 438 m
Portugal	225	0.62	€ 273 m	€ 114 m
Romania	526	0.22	€ 225 m	€ 94 m
Slovakia	134	0.51	€ 134 m	€ 56 m
Slovenia	29	0.71	€ 41 m	€ 17 m
Spain	764	0.72	€ 1 079 m	€ 451 m
Sweden	81	1.15	€ 183 m	€ 77 m
Total costs for the EU-27 with 100% adoption			**€ 18 bn**	**€ 7.7 bn**

Notes:

- [a] Source: WHO (2014)
- [b] See Annex D4 for the underlying calculation. Netherlands = 1.
- [c] Calculated with the formula:
  one-off costs for one hospital in the reference country × total number of hospitals in the country × relative PPP. See Table 18 for the calculation of the one-off costs for one hospital in the reference country.
- [d] Calculated with the formula:
  recurring costs for one hospital in the reference country × total number of hospitals in the country × relative PPP. See Table 18 for the calculation of the recurring costs for one hospital in the reference country.

4.2.3(f) Forecasting the costs to the EU-27 over time

The result of extrapolating the costs from the reference country to each Member State in the previous section is an estimate of the full market cost (100% adoption) of the use case. To adjust the estimated costs based on the expected degree of adoption of the use case, adoption rates per regional cluster of Member States were calculated for the current year and forecasted for the next ten years (see **Figure 100** and **Annex E6**). Furthermore, to account for changes in health expenditure over time, the average health expenditure growth (compound annual growth rate) per Member State was calculated for the period 2014 – 2022 (see **column F of Table 20**) and forecasted for the next ten years.

Since once-off costs are incurred in the first year in which the use case is implemented, and each year incrementally more hospitals adopt the use case for the first time, the one-off costs were estimated by multiplying the costs calculated in a case of 100% adoption (**Table 19**) by the difference in adoption rates (of the macro-region) between the current and previous years (annual increment in adoption) and the growth of health expenditure for a given year.

Since recurring costs apply only to the proportion of hospitals who have adopted the use case, the recurring costs were estimated by multiplying the costs calculated in a case of 100% adoption (**Table 19**) by the estimated adoption rates (of the macro-region) and the growth of health expenditure for a given year.

By dividing by a discount rate, the estimated costs are normalised to the present-day value of money. Adding up the annual values over 5 years and 10 years gives the cumulative costs in present-day money. The calculation for the one-off costs is presented in **Table 20** and for the recurring costs in **Table 21**.

Table 20: Forecasted one-off costs (implementation) based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Austria	DACH	€ 576 m	36%	€ 205 m	4.71%	€ 530 m	€ 558 m
Belgium	Benelux	€ 328 m	31%	€ 103 m	4.25%	€ 301 m	€ 317 m
Bulgaria	Central and Eastern Europe	€ 209 m	30%	€ 63 m	8.98%	€ 187 m	€ 200 m
Croatia	Central and Eastern Europe	€ 58 m	30%	€ 18 m	6.83%	€ 52 m	€ 56 m
Cyprus	South and Western Europe	€ 118 m	24%	€ 29 m	9.28%	€ 98 m	€ 109 m
Czechia	Central and Eastern Europe	€ 194 m	30%	€ 59 m	9.24%	€ 174 m	€ 186 m
Denmark	Northern Europe	€ 524 m	28%	€ 147 m	3.50%	€ 423 m	€ 476 m
Estonia	Central and Eastern Europe	€ 37 m	30%	€ 11 m	8.93%	€ 33 m	€ 36 m
Finland	Northern Europe	€ 576 m	28%	€ 161 m	3.14%	€ 465 m	€ 524 m
France	South and Western Europe	€ 4 478 m	24%	€ 1 086 m	2.99%	€ 3 707 m	€ 4 132 m
Germany	DACH	€ 5 039 m	36%	€ 1 792 m	5.32%	€ 4 637 m	€ 4 880 m
Greece	South and Western Europe	€ 331 m	24%	€ 80 m	2.89%	€ 274 m	€ 305 m
Hungary	Central and Eastern Europe	€ 100 m	30%	€ 30 m	5.27%	€ 89 m	€ 96 m
Ireland	Northern Europe	€ 247 m	28%	€ 69 m	6.62%	€ 199 m	€ 224 m

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Italy	South and Western Europe	€ 1 901 m	24%	€ 461 m	2.49%	€ 1 574 m	€ 1 755 m
Latvia	Central and Eastern Europe	€ 55 m	30%	€ 17 m	10.77%	€ 50 m	€ 53 m
Lithuania	Central and Eastern Europe	€ 84 m	30%	€ 25 m	10.07%	€ 76 m	€ 81 m
Luxembourg	Benelux	€ 30 m	31%	€ 9.4 m	5.96%	€ 27	€ 29 m
Malta	South and Western Europe	€ 12 m	24%	€ 2.9 m	9.65%	€ 9.8 m	€ 11 m
Netherlands	Benelux	€ 535 m	31%	€ 168 m	3.96%	€ 491 m	€ 518 m
Poland	Central and Eastern Europe	€ 1 045 m	30%	€ 315 m	6.30%	€ 935 m	€ 1 001 m
Portugal	South and Western Europe	€ 273 m	24%	€ 66 m	5.79%	€ 226 m	€ 252 m
Romania	Central and Eastern Europe	€ 225 m	30%	€ 68 m	10.10%	€ 202 m	€ 216 m
Slovakia	Central and Eastern Europe	€ 134 m	30%	€ 41 m	6.15%	€ 120 m	€ 129 m
Slovenia	Central and Eastern Europe	€ 41 m	30%	€ 12 m	6.95%	€ 36 m	€ 39 m
Spain	South and Western Europe	€ 1 079 m	24%	€ 261 m	4.27%	€ 893 m	€ 995 m
Sweden	Northern Europe	€ 183 m	28%	€ 51 m	2.63%	€ 148 m	€ 166 m
Total cumulative one-off costs for the EU-27 (present-day money)				**€ 5.4 bn**	**—**	**€ 16 bn**	**€ 17 bn**

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1).
- [b] See Table 19 for the underlying calculation.
- [c] See Figure 100 and Annex E6 for the underlying calculation.
- [d] Calculated with the formula: Costs with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Costs in year 0 + (costs with 100% adoption × (adoption rate in year 1 [%] − adoption rate in year 0 [%]) × expenditure factor in year 1 ÷ discount rate in year 1) + … + (costs with 100% adoption × (adoption rate in year n [%] − adoption rate in year (n − 1) [%]) × expenditure factor in year n ÷ discount rate in year n. Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

Table 21: Forecasted recurring costs (operational) based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Austria	DACH	€ 241 m	36%	€ 86 m	4.71%	€ 993 m	€ 2166 m
Belgium	Benelux	€ 137 m	31%	€ 43 m	4.25%	€ 553 m	€ 1 220 m
Bulgaria	Central and Eastern Europe	€ 87 m	30%	€ 26 m	8.98%	€ 358 m	€ 778 m
Croatia	Central and Eastern Europe	€ 24 m	30%	€ 7.4 m	6.83%	€ 100 m	€ 218 m

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Cyprus	South and Western Europe	€ 49 m	24%	€ 12 m	9.28%	€ 175 m	€ 403 m
Czechia	Central and Eastern Europe	€ 81 m	30%	€ 25 m	9.24%	€ 333 m	€ 724 m
Denmark	Northern Europe	€ 219 m	28%	€ 61 m	3.50%	€ 784 m	€ 1 782 m
Estonia	Central and Eastern Europe	€ 16 m	30%	€ 4.7 m	8.93%	€ 64 m	€ 139 m
Finland	Northern Europe	€ 241 m	28%	€ 68 m	3.14%	€ 862 m	€ 1 960 m
France	South and Western Europe	€ 1 874 m	24%	€ 454 m	2.99%	€ 6 625 m	€ 15 310 m
Germany	DACH	€ 2 109 m	36%	€ 750 m	5.32%	€ 8 695 m	€ 18 956 m
Greece	South and Western Europe	€ 138 m	24%	€ 34 m	2.89%	€ 489 m	€ 1 131 m
Hungary	Central and Eastern Europe	€ 42 m	30%	€ 13 m	5.27%	€ 171 m	€ 373 m
Ireland	Northern Europe	€ 103 m	28%	€ 29 m	6.62%	€ 369 m	€ 839 m
Italy	South and Western Europe	€ 796 m	24%	€ 193 m	2.49%	€ 2 813 m	€ 6 501 m
Latvia	Central and Eastern Europe	€ 23 m	30%	€ 7.0 m	10.77%	€ 95 m	€ 207 m
Lithuania	Central and Eastern Europe	€ 35 m	30%	€ 11 m	10.07%	€ 145 m	€ 315 m

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Luxembourg	Benelux	€ 12 m	31%	€ 3.9 m	5.96%	€ 50 m	€ 111 m
Malta	South and Western Europe	€ 4.9 m	24%	€ 1.2 m	9.65%	€ 17 m	€ 40 m
Netherlands	Benelux	€ 224 m	31%	€ 70 m	3.96%	€ 904 m	€ 1 993 m
Poland	Central and Eastern Europe	€ 438 m	30%	€ 132 m	6.30%	€ 1 792 m	€ 3 897
Portugal	South and Western Europe	€ 114 m	24%	€ 28 m	5.79%	€ 404 m	€ 934 m
Romania	Central and Eastern Europe	€ 94 m	30%	€ 28 m	10.10%	€ 387 m	€ 841 m
Slovakia	Central and Eastern Europe	€ 56 m	30%	€ 17 m	6.15%	€ 230 m	€ 501 m
Slovenia	Central and Eastern Europe	€ 17 m	30%	€ 5.1 m	6.95%	€ 70 m	€ 151 m
Spain	South and Western Europe	€ 451 m	24%	€ 109 m	4.27%	€ 1 596 m	€ 3 687 m
Sweden	Northern Europe	€ 77 m	28%	€ 21 m	2.63%	€ 273 m	€ 622 m
Total cumulative recurring costs for the EU-27 (present-day money)				**€ 2.2 bn**	**—**	**€29 bn**	**€66 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 19 for the underlying calculation.
- [c] See Figure 100 and Annex E6 for the underlying calculation.
- [d] Calculated with the formula: Costs with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]

- [f] Calculated for other years with the formula:
  Costs in year $0 +$ (costs with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (costs with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n. Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

4.2.4(g) Analysis of the net cost avoidance (monetary benefit)

Having calculated in the previous sections the gross cost savings that the use case can bring to the value drivers as well as the costs of implementing and operating it, the net cost avoidance is calculated by subtracting the costs (both one-off and recurring) from the gross cost savings. The calculation is presented in **Table 22** for both the full and partial realisation of the use case's potential savings.

Table 22: Net present cost avoidance (net monetary benefit) in year 0, year 5 and year 10 (cumulative)

A: Member State	Full scenario			Partial scenario		
	B: Net cost avoidance in year 0 in a full scenario [EUR][a]	C: Net cumulative cost avoidance in year 5 in a full scenario [EUR][a]	D: Net cumulative cost avoidance in year 10 in a full scenario [EUR][a]	E: Net cost avoidance in year 0 in a partial scenario [EUR][b]	F: Net cumulative cost avoidance in year 5 in a partial scenario [EUR][b]	G: Net cumulative cost avoidance in year 10 in a partial scenario [EUR][b]
Austria	€ 148 m	€ 3 555 m	€ 8 347 m	€ - 89 m	€ 813 m	€ 2 369 m
Belgium	€ 375 m	€ 5 837 m	€ 13 221 m	€ 94 m	€ 2 224 m	€ 5 251 m
Bulgaria	€ - 40 m	€ 121 m	€ 469 m	€ - 67 m	€ - 238 m	€ - 312 m
Croatia	€ 12 m	€ 347 m	€ 811 m	€ - 8.1 m	€ 77 m	€ 225 m
Cyprus	€ - 28 m	€ - 87 m	€ - 84 m	€ - 35 m	€ - 187 m	€ - 315 m
Czechia	€ 73 m	€ 1 612 m	€ 3 698 m	€ - 11 m	€ 468 m	€ 1 209 m
Denmark	€ 73 m	€ 2 377 m	€ 5 892 m	€ - 79 m	€ 442 m	€ 1 491 m
Estonia	€ 5.2 m	€ 191 m	€ 451 m	€ - 6.3 m	€ 35 m	€ 113 m
Finland	€ - 50 m	€ 960 m	€ 2 717 m	€ - 146 m	€ - 275 m	€ - 91 m
France	€ 337 m	€ 17 032 m	€ 43 794 m	€ - 677 m	€ 2 255 m	€ 9 646 m
Germany	€ 1 747 m	€ 36 401 m	€ 84 588 m	€ - 569 m	€ 9 545 m	€ 26 038 m
Greece	€ - 23 m	€ 558 m	€ 1 617 m	€ - 72 m	€ - 155 m	€ - 32 m
Hungary	€ 41 m	€ 882 m	€ 2 016 m	€ - 4.1 m	€ 265 m	€ 674 m
Ireland	€ 13 m	€ 845 m	€ 2 151 m	€ - 47 m	€ 82 m	€ 415 m
Italy	€ 398 m	€ 10 947 m	€ 27 181 m	€ - 170 m	€ 2 667 m	€ 8 045 m
Latvia	€ - 2.0 m	€ 151 m	€ 383 m	€ - 14 m	€ - 8.7 m	€ 36 m
Lithuania	€ 4.8 m	€ 336 m	€ 814 m	€ - 17 m	€ 35 m	€ 161 m
Luxembourg	€ 15 m	€ 292 m	€ 675 m	€ - 63 378	€ 92 m	€ 235 m
Malta	€ 7.1 m	€ 136 m	€ 326 m	€ 1.1 m	€ 48 m	€ 122 m

A: Member State	Full scenario			Partial scenario		
	B: Net cost avoidance in year 0 in a full scenario [EUR][a]	C: Net cumulative cost avoidance in year 5 in a full scenario [EUR][a]	D: Net cumulative cost avoidance in year 10 in a full scenario [EUR][a]	E: Net cost avoidance in year 0 in a partial scenario [EUR][b]	F: Net cumulative cost avoidance in year 5 in a partial scenario [EUR][b]	G: Net cumulative cost avoidance in year 10 in a partial scenario [EUR][b]
Netherlands	€ 150 m	€ 3 594 m	€ 8 493 m	€ - 60 m	€ 900 m	€ 2 551 m
Poland	€- 96 m	€ 2 042 m	€ 5 473 m	€ - 286 m	€ -534 m	€ - 127 m
Portugal	€ 58 m	€ 1 584 m	€ 3 930 m	€ - 24 m	€ 388 m	€ 1 168 m
Romania	€ 8.4 m	€ 836 m	€ 2 041 m	€ - 48 m	€ 67 m	€ 368 m
Slovakia	€ - 3.1 m	€ 389 m	€ 978 m	€ - 32 m	€ - 11 m	€ 110 m
Slovenia	€ 23 m	€ 448 m	€ 1 015 m	€ 1.4 m	€ 149 m	€ 364 m
Spain	€ 414 m	€ 8 953 m	€ 21 758 m	€ - 10 m	€ 2 775 m	€ 7 480 m
Sweden	€ 280 m	€ 4 074 m	€ 9 435 m	€ 89 m	€ 1 647 m	€ 3 915 m
Cumulative net cost savings for the EU-27 (present-day money)	**€ 3.9 bn**	**€ 104 bn**	**€ 252 bn**	**€ - 2.3 bn**	**€ 24 bn**	**€ 71 bn**

Notes:

- [a] Calculated with the formula: Cumulative cost savings for the full scenario in year n – (cumulative one-off costs in year n + cumulative recurring costs in year n) using data from Table 16, Table 20, and Table 21, where n = year number.
- [b] Calculated with the formula: Cumulative cost savings for the partial scenario in year n – (cumulative one-off costs in year n + cumulative recurring costs in year n) using data from Table 17, Table 20, and Table 21, where n = year number.

4.2.5(h) Analysis of the model's sensitivity

Monte Carlo simulations were conducted to assess the robustness of the economic analysis. In the economic analysis, fixed input values were used for the calculations. In the Monte Carlo simulations, the input values used to quantify (1) the gross cost savings (see **Table 13** for the quantification of the value drivers), (2) the one-off costs, and (3) the recurring costs (see **Table 18** for the quantification of the one-off and recurring costs) in the reference country were randomly varied in three independent simulations, each using 1 million samples. Only the quantification equations used to calculate these three quantities were modelled in the simulation.

The range (distribution) of possible values for each value driver was determined based on the range of values estimated in **Annex E4**. The range of possible values for the cost components was determined based on the range of values estimated in **Annex E7**. The randomly sampled input values from these distributions were then used to estimate (1) the total gross cost savings, (2) the total implementation costs, and (3) the total recurring costs in the reference country in year 0.

The results of the simulation are summarised in **Table 23**. The distributions from the simulations capture the likely range and uncertainty of the values quantified for the reference country. The range of uncertainty is defined as two standard deviations from the mean of the distribution.

Table 23: Estimates of the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country in year 0 based on three Monte Carlo simulations (sample size = 1 million)

Parameters	A: Total cost savings (benefit) of the full implementation scenario in the reference country in a full scenario [EUR][a]	B: Total cost savings (benefit) of the partial implementation scenario in the reference country in a partial scenario [EUR][b]	C: Total one-off costs of implementing the use case in all hospitals in the reference country *(100% adoption)* [EUR][c]	D: Total annual recurring costs of operating the use case in all hospitals in the reference country *(100% adoption)* [EUR][d]
Lower estimate from simulation (−2 sigma)[e]	€ 1 431 m	€ 666 m	€ 392 m	€ 107 m
Calculation from economic analysis[f]	€ 2 363 m	€ 1 087 m	€ 535 m	€ 224 m
Upper estimate from simulation (+2 sigma)[e]	€ 3 650 m	€ 1 711 m	€ 678 m	€ 340 m
Standard deviation from simulation	€ 555 m	€ 261 m	€ 71 m	€ 58 m

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] Compare with column E in Table 13.
- [b] Compare with column G in Table 13.

- [c] Compare with column D of the reference country in Table 19.
- [d] Compare with column E of the reference country in Table 19.
- [e] The expected range of the estimated values is defined as two standard deviations ("2 sigma") from the mean of the distribution. The lower and upper estimates are calculated with the formula: $\text{mean} \pm (2 \times \text{standard deviation})$.
- [f] The single-point value calculated from the analysis is approximately equal to the mean of the simulations.

By quantifying the individual impact of each value driver on model variance, the analysis enables a clearer understanding of how sensitive the overall outcome is to changes in specific inputs. During the simulation of the gross cost savings, the outputs of each value driver were recorded (1 million samples per value driver). Based on the distribution of each value driver, the variance was calculated. To calculate the contribution of each value driver to the overall uncertainty (variance) of the model, the variance of each value driver was divided by the variance of the gross cost savings (total variance). The relative contribution of the value drivers to the benefit model's uncertainty is illustrated in **Figure 101**.

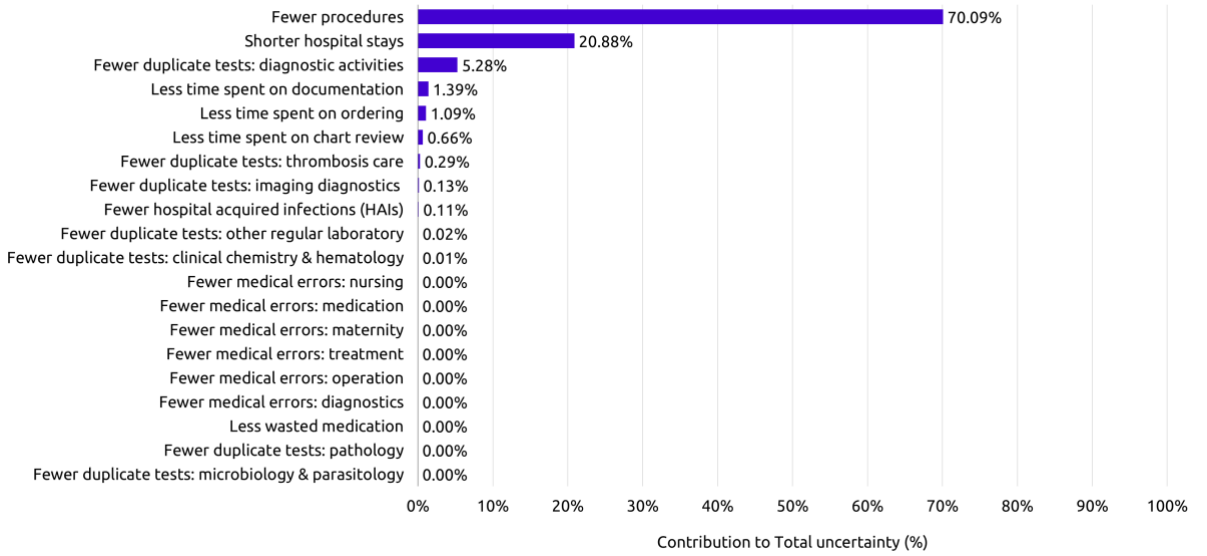


Figure 101: Relative contribution of each value driver to the uncertainty in the benefits model of the reference country

To understand the effect different likely estimates for the value drivers and costs in the reference country have on the final result of the economic analysis, the lower-bound and upper-bound estimated values from the simulations for the total gross cost savings, the total implementation costs, and the total recurring costs were used to recalculate the net cost avoidance in the EU-27. The three lower-bound estimates for the reference country were used in the analysis pipeline to calculate a lower-bound estimate of the net cost avoidance in the EU-27. The same was done with the three upper-bound estimates for the reference country to give an upper-bound estimate of the net cost avoidance in the EU-27. Together, these represent the likely range of the net cost avoidance in the EU-27 when implementing this use case. These results are summarised in **Table 24** and plotted in **Figure 102** (the vertical bars indicate the range of uncertainty of each data point, as derived from the upper and lower bounds produced by the simulation).

Table 24: Estimated uncertainty of the net cost avoidance (net monetary benefit) in year 0, year 5 and year 10 (cumulative) for the EU-27

Parameters	Full scenario			Partial scenario		
	A: Net cost avoidance in year 0 in a full scenario [EUR]	B: Net cumulative cost avoidance in year 5 in a full scenario [EUR]	C: Net cumulative cost avoidance in year 10 in a full scenario [EUR]	D: Net cost avoidance in year 0 in a partial scenario [EUR]	E: Net cumulative cost avoidance in year 5 in a partial scenario [EUR]	F: Net cumulative cost avoidance in year 10 in a partial scenario [EUR]
Lower estimate[a]	€ 1.5 bn	€ 59 bn	€ 145 bn	€ -2.0 bn	€ 13 bn	€ 42 bn
Calculation from economic analysis[b]	€ 3.9 bn	€ 104 bn	€ 252 bn	€ -2.3 bn	€ 24 bn	€ 71 bn
Upper estimate[c]	€ 6.4 bn	€ 150 bn	€ 360 bn	€ -2.5 bn	€ 34 bn	€ 100 bn

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] Calculated using the lower range estimates from the Monte Carlo simulation for the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country (Table 23). The extrapolation and forecasting steps were performed as described in the sections above.
- [b] Taken from Table 22.
- [c] Calculated using the upper range estimates from the Monte Carlo simulation for the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country (Table 23). The extrapolation and forecasting steps were performed as described in the sections above.

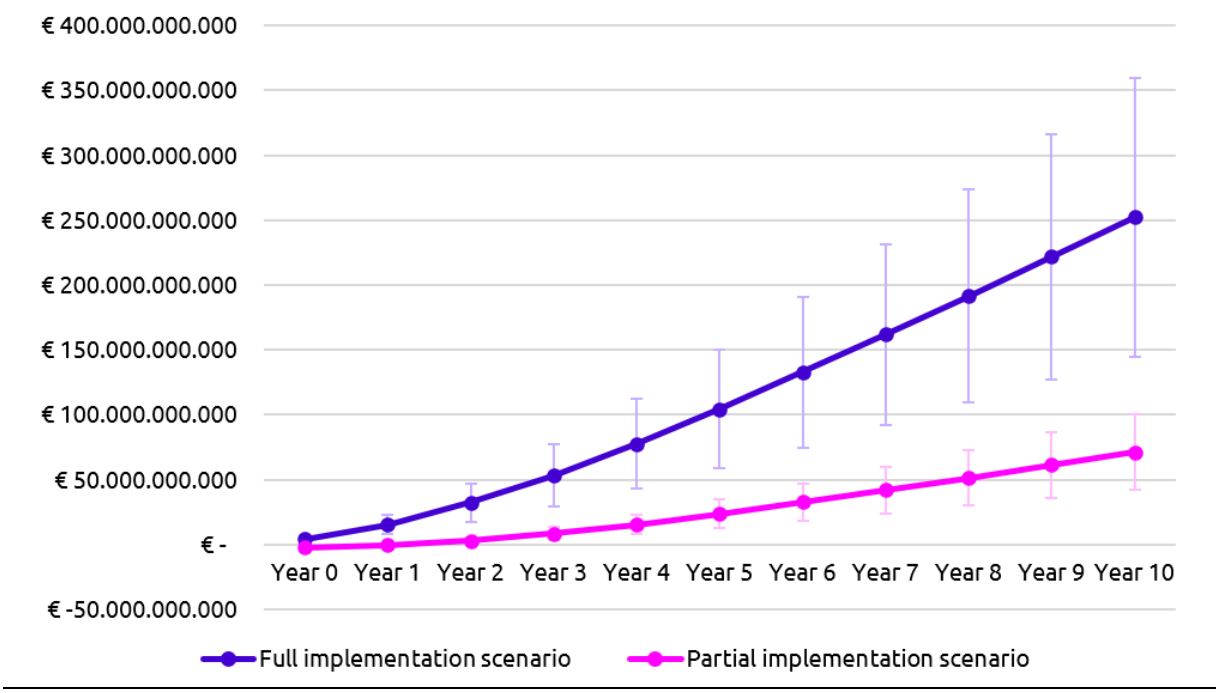


Figure 102: Forecast of the cumulative net cost avoidance over ten years for the full and partial implementation scenarios, including uncertainty ranges.

4.2.6(i) Discussion and conclusions

The analysis shows that clinical decision support systems (CDSS), in both a full and partial scenarios, can generate cost savings (net cost avoidance) across EU healthcare systems. The most impactful value drivers are 'fewer procedures' and 'shorter hospital stays', which together account for the largest share of potential savings. These reflect the ability of CDSS to support earlier and more accurate clinical decisions by leveraging medical data, leading to more efficient and less resource-intensive care. In addition, the results suggest that CDSS can greatly improve operational efficiency in hospitals by reducing time spent on documentation, chart reviews, and test ordering.

The full implementation scenario demonstrates a steep and consistent increase in net cost avoidance over time, whereas the partial scenario yields only 28% of the full potential benefit. In the partial scenario, the impact of value drivers such as fewer hospital-acquired infections, fewer procedures, fewer duplicate tests, and shorter hospital stays is significantly reduced, reflecting a scenario where the technology is not well integrated within clinical workflows. Within hospitals, the effectiveness of CDSS would be impacted by its integration across hospital departments. When the use of technology systems is fragmented (for example, departments operate independent systems), the utility of the technology can be hindered. This highlights the importance of not only deploying the technology but also ensuring its effective use by clinicians. Full integration of the technology is essential to unlock its full spectrum of benefits.

More broadly, the effectiveness of CDSS is also closely tied to the availability and interoperability of patient data. Countries with lower scores on the eHealth maturity index may face challenges in realising the full benefits due to limited digital infrastructure.

Moreover, certain value drivers, such as 'fewer duplicate tests' or 'less wasted medication', require interoperability and collaboration between hospitals and other care providers, such as general practitioners and community care. Without seamless data exchange and collaboration, the impact of CDSS may be significantly reduced.

As shown in **Figure 101** the value drivers 'fewer procedures' and 'shorter hospital stays' have the greatest impact on the overall uncertainty in the model's output and are therefore the most critical factors for achieving the full net cost avoidance estimated in this analysis. The value drivers 'fewer

procedures' and 'shorter hospital stays' are also less direct in nature, compared to value drivers such as 'less time spent on documentation', 'less time spent on ordering' and 'less time spent on chart review. For example, shorter hospital stays may result from earlier discharge planning but is also dependent on clinical recovery. Indeed, these two value drivers have dependencies on other factors, such as patient characteristics and clinical protocols. Moreover, it may be more challenging for experts to provide confident estimates regarding cost savings for value drivers that are less direct. Indeed, the cost saving range for the 'fewer procedures' value driver is one such case where the estimates provided by experts do not overlap. All other drivers have a negligible effect on the overall uncertainty of the model.

Based on indexed 2022 expenditure[185] and a projected compound annual growth rate of 4.3%[186] for the EU, cumulative healthcare expenditure over the 2025–2035 period is estimated at €25.1 trillion. To place the findings of this use case in a broader perspective, the estimated net cost avoidance as a proportion of the projected cumulative healthcare expenditure over the next ten years amounts to **approximately 1.0% of healthcare expenditure in the full scenario**. In a partial scenario, clinical decision support systems (CDSS) are estimated to reduce total healthcare expenditure by around 0.3% over the same period.

[185] Data source: Eurostat (2022)

[186] Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State

5 Use Case 2: Automated medical image analysis

Medical imaging – the use of digital technologies to visualise internal structures and functions of the human body – plays a central role in modern healthcare. It serves as a diagnostic tool and often forms the basis for treatment decisions. In this way, medical imaging supports clinical decision-making, enables early disease detection, and enhances both diagnostic accuracy and workflow efficiency. In this context, a growing number of technological solutions are being developed to further advance the field.

The selected use case for this analysis is an automated medical image analysis system, enhanced by artificial intelligence. This analysis establishes a **full implementation scenario**, in which AI enables (under the oversight and validation of clinicians) the rapid and precise analysis of medical images, facilitating the detection of clinical abnormalities and early signs of disease and supporting the creation of personalised treatment plans for patients.

The analysis assumes a **baseline scenario** where no automated medical image analysis is implemented in hospitals. In this baseline scenario, healthcare professionals rely on traditional methods for diagnostic imaging and interpretation.

Key takeaways

- **Economic impact**: Automated medical image analysis offers a strong economic case for cost avoidance across EU healthcare systems. The implementation of the use case is projected to yield a cumulative net cost avoidance of €192 billion (full scenario) and €126 billion (partial scenario) over ten years.
- **Implementation scenarios**: The cumulative net cost avoidance for both the full and partial scenario show a consistent increase over time, although the partial is at a lower level. The partial implementation delivers 66% of the full scenario's benefit.
- **Sensitivity analysis**: The sensitivity analysis indicates that the value drivers 'shorter scan time' and 'shorter duration of hospital stay' are associated with the highest levels of uncertainty in the model's output.
- **System-level impact**: When benchmarked against projected EU healthcare expenditure, the full implementation of automated medical image analysis could reduce total healthcare expenditure by approximately 0.8% after ten years, while the partial scenario may achieve a reduction of around 0.5%.

Please refer to section 5.2.6 for the discussion and conclusions of this analysis and Part C for the overall conclusions and limitations.

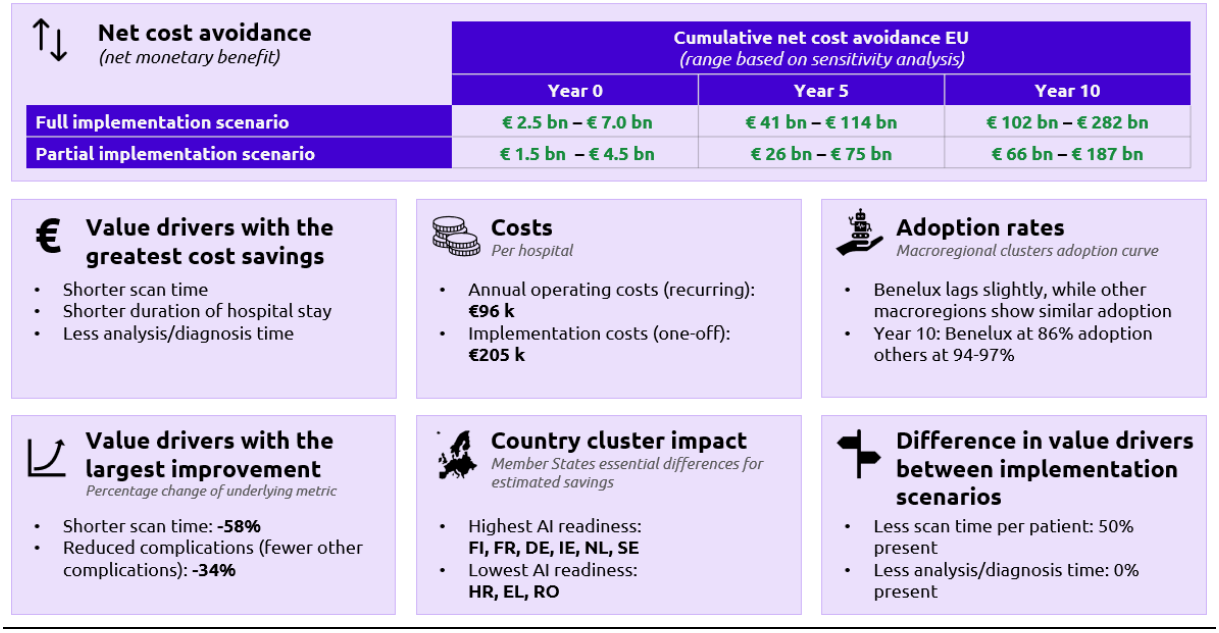


Figure 103: Overview of key findings for the use case 'automated medical image analysis'

5.1 ANALYSIS OF THE GROSS FINANCIAL SAVINGS

5.1.1(a) Quantification and monetisation of the value drivers and resulting cost savings from implementing the use case, using pricing data of a reference country

To identify the underlying causes of cost savings offered by the use case (i.e. the activities the use case helps improve), a list of value drivers was defined and is presented in **column A of Table 25** (refer to **Annex F1** for the list of experts that provided input for the data collection and **Annex F2** for the simplified benefits logic diagram that resulted from their input).

These value drivers lead to the benefit of cost savings through various underlying mechanisms. For example, a patient spending a shorter time in hospital (value driver) or a clinician spending less time analysing a medical image (value driver), thanks to automated and better image processing enabled by the use case, gives rise to cost savings due to a reduced use of resources by the healthcare system.

The metrics used to quantify the value drivers are listed in **column B of Table 25.** These metrics are converted into monetary terms based on annual pricing data from the reference country for this use case, the Netherlands, for the subset of medical conditions applicable to the use case. The results of these calculations are presented in **column C of Table 25** and represent the cost of performing the activities described by the value drivers in the absence of the use case (baseline scenario). Refer to **Annex F3** for the sources of these data and the calculations for each value driver.

To quantify the effect the use case has on the value drivers, a mean savings rate was estimated for the full implementation scenario, in which the use case is assumed to be fully effective (see **column D of Table 25** and refer to **Annex F4** for the calculation of the savings rate).

By multiplying the savings rate per value driver (**column D**) with the baseline cost of the value driver (**column C**), the benefit in terms of cost savings is given for each value driver (see **column E of Table 25)** for the fictional reference case. The analysis shows that the greatest cost savings for this use case are attributable to shorter time spent per imaging scan (value driver #2) and shorter hospital stays per patient (value driver #1).

To calculate the cost savings of the value drivers for a scenario in which the use case is partially effective, the value drivers were annotated as likely to be 'absent' (0%), 'partially realised' (assumed at 50%), or 'fully realised' (100%) in a partial scenario. These presence rates are presented in **column F of Table 25** and are based on input from the workshop (**Annex F2**). By multiplying the cost savings of the value driver in the full scenario (**column E**) with the presence rate of that value driver in the partial scenario (**column F**), the cost savings of each value driver in the partial scenario is calculated (see **column G of Table 25**) for the fictional reference case.

Table 25: Quantified and monetised costs of the value drivers in the baseline scenario, the cost savings (benefit) of the full implementation scenario, and the cost savings (benefit) of the partial scenario using annual pricing data from the reference country

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
	What is the activity that the use case helps improve?	*How is the activity measured?*	*How much does it cost to do the activity without the use case?*	*How much less will the activity cost with the use case fully implemented and effective compared to the baseline?*	*How much money is saved per activity with the use case fully effective in its implementation?*	*To what degree will the cost savings be present if the use case is partial effective compared to the full scenario?*	*How much money is saved per activity with the use case partially effective in its implementation?*
1	Shorter duration of hospital stay per patient	Average duration of hospital stay	€ 2 196 m	9%	€ 201 m	100%	€ 201 m
2	Shorter scan time per patient due to faster acquisition and reconstruction	Share of imaging diagnostics costs being variable	€ 799 m	58%	€ 464 m	50%	€ 232 m
3	Less analysis/ diagnosis time per image	Costs of analysis time for imaging diagnostic	€ 361 m	23%	€ 81 m	0%	€ 0
4	Reduced complications (more effective treatment): fewer missed diagnoses	Costs for missed diagnosis	€ 184 m	21%	€ 38 m	100%	€ 38 m

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
5	Reduced complications (more effective treatment): fewer delayed diagnoses	Costs for delayed diagnosis	€ 297 m	24%	€ 72 m	100%	€ 72 m
6	Reduced complications (more effective treatment): fewer critical ill patients not recognised in time	Costs for critically ill patient not recognised in time	€ 269 m	24%	€65 m	100%	€65 m
7	Reduced complications (more effective treatment): fewer misinterpreted results	Costs for test results misinterpreted	€ 113 m	8%	€ 8.5 m	100%	€ 8.5 m
8	Reduced complications (more effective treatment): fewer delayed tests	Costs for test performed with delay	€ 42 m	6%	€ 2.5 m	100%	€ 2.5 m
9	Reduced complications (more effective treatment): fewer other complications	Costs for other	€ 71 m	34%	€ 24 m	100%	€ 24 m
Total cost savings for the fictional reference case					**€ 957 m**	**—**	**€ 644 m**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]

- [a] The metrics either relate directly to the value driver (e.g. shorter hospital stays can be measured directly in days) or are closely correlated to it (e.g. fewer medical errors can be measured indirectly through the number of medical procedures).
- [b] To be comparable, the metrics are scaled to the order of the country, meaning they represent the cost for all hospitals in a country's healthcare system. See Annex F3 for the calculations of each value driver.
- [c] The magnitude of the savings was determined through interviews with experts. Experts were asked to provide estimated ranges, both conservative and optimistic, regarding the improvements the use case could bring to the value drivers. The midpoint of this estimated range was taken as the savings rate. See Annex F4 for the calculations.
- [d] Calculated with the formula: Baseline scenario [EUR] × savings rate [%]
- [e] The likelihood of a value driver being present in the partial scenario was determined through an expert workshop. Refer to the benefits logic in Annex F2.
- [f] Calculated with the formula: Cost savings in full scenario [EUR] × presence rate [%]

5.1.2(b) Extrapolating the benefits to the EU-27

The result of quantifying and monetising the value drivers of the use case in the previous section is the estimated cost savings for a full and partial implementation scenario in a fictional reference case. To convert the reference values to values specific to each Member State, several adjustment factors must be applied to the pricing data and the savings rate use in the reference case.

To account for essential differences in the extent to which countries may achieve the estimated savings rate for this use case, countries are clustered into four groups based on the AI Readiness Index[187]. The AI Readiness Index assesses the extent to which the country is AI-ready based on three pillars: government, technology, and data and infrastructure. This index is used to cluster the countries on the premise that countries with a higher AI Readiness score are generally better positioned to leverage AI-driven solutions, such as this use case, effectively due to stronger strategic governance, technological maturity, and robust data ecosystems. In this way, the AI Readiness Index provides a reflection of a country's ability to realise the potential benefits of this use case. A weighting is assigned to each cluster based on the median maturity score of the countries in the cluster relative to the median maturity score of all Member States. The calculations are presented in **Table 26**.

Table 26: Calculation of the cluster weighting

A: Cluster name	B: Cluster definition	C: Member States in the cluster	D: Cluster weighting [factor] [a]
High	AI Readiness Index ≥ 75%	Finland, France, Germany, Ireland, Netherlands, Sweden	$\frac{77\ \%}{70\ \%} = 1.10$
Moderate high	70% ≤ AI Readiness Index < 75%	Austria, Belgium, Czechia, Denmark, Estonia, Italy, Luxembourg, Portugal	$\frac{72\ \%}{70\ \%} = 1.02$
Moderate low	60% ≤ AI Readiness Index < 70%	Bulgaria, Cyprus, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia, Spain	$\frac{64\ \%}{70\ \%} = 0.91$
Low	AI Readiness Index < 60%	Croatia, Greece, Romania	$\frac{58\ \%}{70\ \%} = 0.82$

Notes:

- The cluster factor is displayed rounded to two decimals. Calculations are performed using the unrounded values.
- [a] Calculated with the formula: median share of AI Readiness Index in the cluster [%] ÷ median AI Readiness Index among enterprises of all countries [%]

Another two factors that represent differences between countries related to the use case is the number of medical scans performed in each country as well as price differences. By multiplying the cost savings of the fictional reference case (**Table 25**) by the cluster weighting, as well as by the number of medical scans (see **column C** of **Table 27** and **Annex F5** for the underlying calculation) and purchasing power parity in Euros (see **column D** of **Table 27** and **Annex D4** for the underlying calculation) of each Member State relative to the Netherlands, an estimate of the cost savings in each

[187] Oxford insights (2024)

Member State is produced, corrected for pricing differences relative to the reference country. The estimate assumes that the use case is implemented in all hospitals (100% adoption). This calculation is presented in **Table 27**.

Table 27: Calculation of the total cost savings for the full and partial implementation scenarios per Member State in one year assuming 100% adoption of the use case

A: Member State	B: Cluster weighting [factor][a]	C: Number of scans relative to the Netherlands [factor][b]	D: Purchasing power parity (PPP) relative to the Netherlands [factor][c]	E: Cost savings: full scenario in all hospitals [EUR][d]	F: Cost savings: partial scenario in all hospitals [EUR][e]
Austria	1.02	0.99	1.05	€ 1 018 m	€ 685 m
Belgium	1.02	1.15	0.89	€ 1 009 m	€ 678 m
Bulgaria	0.91	0.23	0.30	€ 62 m	€ 42 m
Croatia	0.82	0.23	0.46	€ 82 m	€ 55 m
Cyprus	0.91	0.05	0.72	€ 29 m	€ 19 m
Czechia	1.02	0.61	0.39	€ 232 m	€ 156 m
Denmark	1.02	0.56	1.04	€ 569 m	€ 383 m
Estonia	1.02	0.08	0.64	€ 49 m	€ 33 m
Finland	1.10	0.16	1.14	€ 197 m	€ 132 m
France	1.10	7.39	0.73	€ 5 700 m	€ 3 833 m
Germany	1.10	7.65	0.82	€ 6 588 m	€ 4 430 m
Greece	0.82	0.89	0.60	€ 415 m	€ 279 m
Hungary	0.91	0.77	0.29	€ 197 m	€ 132 m
Ireland	1.10	0.56	1.33	€ 780 m	€ 525 m
Italy	1.02	3.26	0.85	€ 2 732 m	€ 1 837 m
Latvia	0.91	0.18	0.44	€ 69 m	€ 46 m
Lithuania	0.91	0.20	0.46	€ 81 m	€ 54 m
Luxembourg	1.02	0.07	1.27	€ 86 m	€ 58 m
Malta	0.91	0.03	0.67	€ 17 m	€ 11 m
Netherlands	1.10	1.00	1.00	€ 1 050 m	€ 707 m
Poland	0.91	2.08	0.49	€ 878 m	€ 591 m
Portugal	1.02	1.10	0.62	€ 666 m	€ 448 m
Romania	0.82	0.56	0.22	€ 97 m	€ 65 m
Slovakia	0.91	0.39	0.51	€ 174 m	€ 117 m
Slovenia	0.91	0.14	0.71	€ 84 m	€ 56 m
Spain	0.91	3.58	0.72	€ 2 240 m	€ 1 506 m
Sweden	1.10	1.15	1.15	€ 1 393 m	€ 936 m
Total cost savings for the EU-27 with 100% adoption				**€ 26 bn**	**€ 18 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] See Table 26. for the underlying calculation.
- [b] See Annex F5 for the underlying calculation. The Netherlands = 1.

A: Member State	B: Cluster weighting [factor][a]	C: Number of scans relative to the Netherlands [factor][b]	D: Purchasing power parity (PPP) relative to the Netherlands [factor][c]	E: Cost savings: full scenario in all hospitals [EUR][d]	F: Cost savings: partial scenario in all hospitals [EUR][e]

- [c] See Annex D4 for the underlying calculation. Netherlands = 1.
- [d] Calculated with the formula:
  Reference case savings in full scenario [EUR] × cluster factor × number of scans factor × PPP. See Table 25 for the calculation of the reference case savings in the full scenario.
- [e] Calculated with the formula:
  Reference case savings in partial scenario [EUR] × cluster factor × number of scans factor × PPP. See Table 25 for the calculation of the reference case savings in the partial scenario.

5.1.3(c) Forecasting the benefits to the EU-27 over time

The result of extrapolating the cost savings from the fictional reference case to each Member State in the previous section is an estimate of the full market potential (100% adoption) for gross cost savings of the use case. To adjust the estimated savings based on the expected degree of adoption of the use case, adoption rates per regional cluster of Member States were calculated for the current year and forecasted for the next ten years (see **Figure 104** and **Annex F6**) based on the results of the healthcare provider survey (see **Figure 1**). Furthermore, to account for changes in health expenditure over time, the average health expenditure growth (compound annual growth rate) per Member State was calculated for the period 2014 – 2022 (see **column F of Table 28**) and forecasted for the next ten years. By multiplying the cost savings calculated in a case of 100% adoption (**Table 25**) by the estimated adoption rates (of the macro-region) and the growth of health expenditure, the estimated cost savings per country per year is calculated. By dividing by a discount rate, the estimated future savings are normalised to the present-day value of money. Adding up the annual values over 5 years and 10 years gives the cumulative cost savings in present-day money. The calculation for the full implementation scenario is presented in **Table 28** and for the partial implementation scenario in **Table 29.**

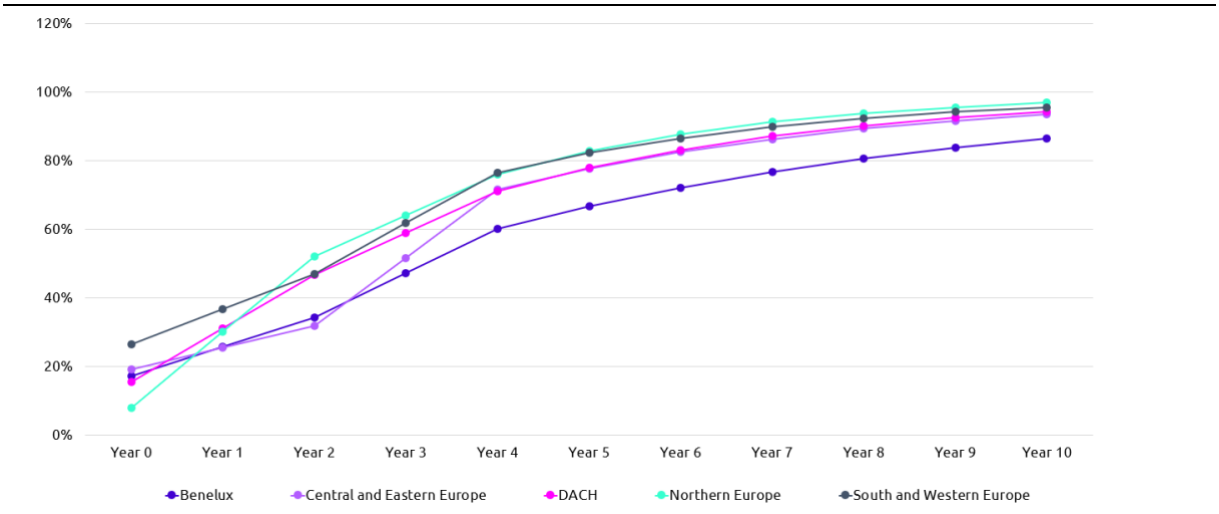


Figure 104: Adoption curve for AI-powered solutions for radiology image analytics and AI-based medical imaging based on the healthcare provider survey (see Figure 1) for years 0 to 4 and an extrapolated trend curve for years 5 to 10 (see Annex F6).

Table 28: Forecasted cost savings for the full implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€ 1 018 m	16%	€ 158 m	4.71%	€ 3 062 m	€ 7 596 m
Belgium	Benelux	€ 1 009 m	17%	€ 173 m	4.25%	€ 2 527 m	€ 6 542 m
Bulgaria	Central and Eastern Europe	€ 62 m	19%	€ 12 m	8.98%	€ 171 m	€ 444 m
Croatia	Central and Eastern Europe	€ 82 m	19%	€ 16 m	6.83%	€ 227	€ 591 m
Cyprus	South and Western Europe	€ 29 m	27%	€ 7.7 m	9.28%	€ 96 m	€ 228 m
Czechia	Central and Eastern Europe	€ 232 m	19%	€ 44 m	9.24%	€ 641 m	€ 1 665 m
Denmark	Northern Europe	€ 569 m	8%	€ 46 m	3.50%	€ 1 779 m	€ 4 417 m
Estonia	Central and Eastern Europe	€ 49 m	19%	€ 9.4 m	8.93%	€ 136 m	€ 354 m
Finland	Northern Europe	€197 m	8%	€ 16 m	3.14%	€ 615 m	€ 1 528 m
France	South and Western Europe	€ 5 700 m	27%	€ 1 511 m	2.99%	€ 18 825 m	€ 44 854 m
Germany	DACH	€ 6 588 m	16%	€ 1 025 m	5.32%	€ 19 818 m	€ 49 154 m
Greece	South and Western Europe	€ 415 m	27%	€ 110 m	2.89%	€ 1 372 m	€ 3 269 m
Hungary	Central and Eastern Europe	€ 197 m	19%	€ 37 m	5.27%	€ 544 m	€ 1 413 m
Ireland	Northern Europe	€ 780 m	8%	€ 62 m	6.62%	€ 2 437 m	€ 6 054 m

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Italy	South and Western Europe	€ 2 732 m	27%	€ 724 m	2.49%	€ 9 022 m	€ 21 497 m
Latvia	Central and Eastern Europe	€ 69 m	19%	€ 13 m	10.77%	€ 190 m	€ 494 m
Lithuania	Central and Eastern Europe	€ 81 m	19%	€ 15 m	10.07%	€ 223 m	€ 579 m
Luxembourg	Benelux	€ 86 m	17%	€ 15 m	5.96%	€ 216 m	€ 558 m
Malta	South and Western Europe	€ 17 m	27%	€ 4.5 m	9.65%	€ 56 m	€ 135 m
Netherlands	Benelux	€ 1 050 m	17%	€ 180 m	3.96%	€ 2 632 m	€ 6 815 m
Poland	Central and Eastern Europe	€ 878 m	19%	€ 167 m	6.30%	€ 2 428 m	€ 6 304 m
Portugal	South and Western Europe	€ 666 m	27%	€ 176 m	5.79%	€ 2 198 m	€ 5 238 m
Romania	Central and Eastern Europe	€ 97 m	19%	€ 18 m	10.10%	€ 268 m	€ 696 m
Slovakia	Central and Eastern Europe	€ 174 m	19%	€ 33 m	6.15%	€ 480 m	€ 1 247 m
Slovenia	Central and Eastern Europe	€ 84 m	19%	€ 16 m	6.95%	€ 231 m	€ 601 m
Spain	South and Western Europe	€ 2 240 m	27%	€ 594 m	4.27%	€ 7 398 m	€ 17 626 m
Sweden	Northern Europe	€ 1 393 m	8%	€ 111 m	2.63%	€ 4 350 m	€ 10 804 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 5.3 bn**	**—**	**€ 82 bn**	**€ 201 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
▪ [b] See Table 27 for the underlying calculation. ▪ [c] See Figure 104 and Annex F6 for the underlying calculations. ▪ [d] Calculated for year 0 with the formula: Cost savings with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1 ▪ [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State. ▪ [f] Calculated for other years with the formula: ▪ Cost savings in year 0 + (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n. ▪ Formula for discount rate: $(1 + 0.04)^n$, where n = year number. ▪ Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.							

Table 29: Forecasted cost savings for the partial implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€ 685 m	16%	€ 107 m	4.71%	€ 2 060 m	€ 5 108 m
Belgium	Benelux	€ 678 m	17%	€ 116 m	4.25%	€ 1 699 m	€ 4 400 m
Bulgaria	Central and Eastern Europe	€ 42 m	19%	€ 7.9 m	8.98%	€ 115 m	€ 299 m
Croatia	Central and Eastern Europe	€ 55 m	19%	€ 11 m	6.83%	€ 153 m	€ 397 m
Cyprus	South and Western Europe	€ 19 m	27%	€ 5.2 m	9.28%	€ 64 m	€ 153 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Czechia	Central and Eastern Europe	€ 156 m	19%	€ 30 m	9.24%	€ 431 m	€ 1 120 m
Denmark	Northern Europe	€ 383 m	8%	€ 31 m	3.50%	€ 1 196 m	€ 2 970 m
Estonia	Central and Eastern Europe	€ 33 m	19%	€ 6.3 m	8.93%	€ 92 m	€ 238 m
Finland	Northern Europe	€ 132 m	8%	€ 11 m	3.14%	€ 414 m	€ 1 027 m
France	South and Western Europe	€ 3 833 m	27%	€ 1 016 m	2.99%	€ 12 660 m	€ 30 164 m
Germany	DACH	€ 4 430 m	16%	€ 689 m	5.32%	€ 13 328 m	€ 33 056 m
Greece	South and Western Europe	€ 279 m	27%	€ 74 m	2.89%	€ 923 m	€ 2 198 m
Hungary	Central and Eastern Europe	€ 132 m	19%	€ 25 m	5.27%	€ 366 m	€ 950 m
Ireland	Northern Europe	€ 525 m	8%	€ 42 m	6.62%	€ 1 639 m	€ 4 071 m
Italy	South and Western Europe	€ 1 837 m	27%	€ 487 m	2.49%	€ 6 067 m	€ 14 456 m
Latvia	Central and Eastern Europe	€ 46 m	19%	€ 8.8 m	10.77%	€ 128 m	€ 332 m
Lithuania	Central and Eastern Europe	€ 54 m	19%	€ 10 m	10.07%	€ 150 m	€ 389 m
Luxembourg	Benelux	€ 58 m	17%	€ 9.9 m	5.96%	€ 145 m	€ 375 m
Malta	South and Western Europe	€ 11 m	27%	€ 3.0 m	9.65%	€ 38 m	€ 90 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Netherlands	Benelux	€ 707 m	17%	€ 121 m	3.96%	€ 1 770 m	€ 4 583 m
Poland	Central and Eastern Europe	€ 591 m	19%	€ 112 m	6.30%	€ 1 633 m	€ 4 240 m
Portugal	South and Western Europe	€ 448 m	27%	€ 119 m	5.79%	€ 1 478 m	€ 3 523 m
Romania	Central and Eastern Europe	€ 65 m	19%	€ 12 m	10.10%	€ 180 m	€ 468 m
Slovakia	Central and Eastern Europe	€ 117 m	19%	€ 22 m	6.15%	€ 323 m	€ 838 m
Slovenia	Central and Eastern Europe	€ 56 m	19%	€ 11 m	6.95%	€ 156 m	€ 404 m
Spain	South and Western Europe	€ 1 506 m	27%	€ 399 m	4.27%	€ 4 975 m	€ 11 854 m
Sweden	Northern Europe	€ 936 m	8%	€ 75 m	2.63%	€ 2 926 m	€ 7 265 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 3.6 bn**	—	**€ 55 bn**	**€ 135 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 27 for the underlying calculation.
- [c] See Figure 104 and Annex F6 for the underlying calculations.
- [d] Calculated for year 0 with the formula: Cost savings with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:
- Cost savings in year 0 + (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n. ▪ Formula for discount rate: $(1 + 0.04)^n$, where n = year number. ▪ Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.							

5.2 ANALYSIS OF THE ONE-OFF AND RECURRING COSTS OF THE USE CASE

5.2.1(d) Quantification and monetisation of the costs of implementing and operating the use case based on pricing data of a reference country

To quantify the cost of implementing and operating the use case, both one-off and recurring costs were estimated. The one-off and recurring costs were estimated through both an expert interview and literature (refer to **Annex F7** for the underlying calculations).The average estimates of the expert and literature sources produce the recurring costs of operating the use case across the subspecialties in a single hospital in the reference country (see **column A and column B in Table 30**).

Table 30: Quantified and monetised costs of implementing (one-off) and operating (annual recurring) the use case based on pricing data from the reference country

A: One-off costs of implementing the use case for one hospital (across 10 radiology subspecialities) in the reference country [EUR][a]	B: Annual recurring costs of operating the use case for one hospital (across 10 radiology subspecialities) in the reference country [EUR][a]
€ 205 k	€ 96 k
Notes: ▪ Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'k' denotes thousands. Calculations are performed using the unrounded values. ▪ [a] See Annex F7	

5.2.2(e) Extrapolating the costs to the EU-27

The result of quantifying and monetising the one-off and recurring costs of the use case in the previous section is the estimated costs for one hospital in the reference country. To convert the reference values to values specific to each Member State, the costs per hospital for both the one-off and recurring costs (**Table 30**) were multiplied by the number of hospitals in each Member State (see **column B of Table 31**) and by a factor of purchasing power parity in Euros (PPP) relative to the Netherlands (see **column C of Table 31** and **Annex D4**) to give the total implementation and operating costs for all hospitals in each Member State (100% adoption), corrected for pricing differences relative to the reference country. The calculation is presented in **Table 31.**

Table 31: Calculation of the total one-off (implementation) and annual recurring (operational) cost of the use case per Member State in one year assuming 100% adoption of the use case

A: Member State	B: Total number of hospitals per country[a]	C: Purchasing power parity (PPP) relative to the Netherlands [factor][b]	D: Total one-off implementation costs in all hospitals in year 0 *(100% adoption)* [EUR][c]	E: Total recurring operation costs in all hospitals in year 0 *(100% adoption)* [EUR][d]
Austria	279	1.05	€ 60 m	€ 28 m
Belgium	187	0.89	€ 34 m	€ 16 m
Bulgaria	349	0.30	€ 22 m	€ 10 m
Croatia	65	0.46	€ 6.1 m	€ 2.9 m
Cyprus	84	0.72	€ 12 m	€ 5.8 m
Czechia	257	0.39	€ 20 m	€ 9.5 m
Denmark	258	1.04	€ 55 m	€ 26 m
Estonia	30	0.64	€ 3.9 m	€ 1.8 m
Finland	258	1.14	€ 60 m	€ 28 m
France	3111	0.73	€ 467 m	€ 220 m
Germany	3138	0.82	€ 526 m	€ 247 m
Greece	283	0.60	€ 35 m	€ 16 m
Hungary	174	0.29	€ 10 m	€ 4.9 m
Ireland	95	1.33	€ 26 m	€ 12 m
Italy	1135	0.85	€ 198 m	€ 93 m
Latvia	64	0.44	€ 5.8 m	€ 2.7 m
Lithuania	94	0.46	€ 8.8 m	€ 4.2 m
Luxembourg	12	1.27	€ 3.1 m	€ 1.5 m
Malta	9	0.67	€ 1.2 m	€ 579 449
Netherlands	273	1.00	€ 56 m	€ 26 m
Poland	1096	0.49	€ 109 m	€ 51 m
Portugal	225	0.62	€ 29 m	€ 13 m
Romania	526	0.22	€ 24 m	€ 11 m
Slovakia	134	0.51	€ 14 m	€ 6.6 m
Slovenia	29	0.71	€ 4.2 m	€ 2.0 m
Spain	764	0.72	€ 113 m	€ 53 m
Sweden	81	1.15	€ 19 m	€ 9.0 m
Total costs for the EU-27 with 100% adoption			**€ 1 922 m**	**€ 904 m**

Notes:

- [a] Source: WHO (2014)
- [b] See Annex D4 for the underlying calculation. Netherlands = 1.
- [c] Calculated with the formula:

A: Member State	B: Total number of hospitals per country[a]	C: Purchasing power parity (PPP) relative to the Netherlands [factor][b]	D: Total one-off implementation costs in all hospitals in year 0 *(100% adoption)* [EUR][c]	E: Total recurring operation costs in all hospitals in year 0 *(100% adoption)* [EUR][d]

one-off costs for one hospital in the reference country × total number of hospitals in the country

× relative PPP. See Table 30 for the calculation of the one-off costs for one hospital in the reference country.

- [d] Calculated with the formula:
recurring costs for one hospital in the reference country × total number hospitals in the country

× relative PPP. See Table 30 for the calculation of the recurring costs for one hospital in the reference country.

5.2.3(f) Forecasting the costs to the EU-27 over time

The result of extrapolating the costs from the reference country to each Member State in the previous section is an estimate of the full market cost (100% adoption) of the use case. To adjust the estimated costs based on the expected degree of adoption of the use case, adoption rates per regional cluster were calculated for the current year and forecasted for the next ten years (see **Figure 104** and **Annex F6**). Furthermore, to account for changes in health expenditure over time, the average health expenditure growth (compound annual growth rate) per Member State was calculated for the period 2014 – 2022 (see **column F of Table 32**) and forecasted for the next ten years.

Since once-off costs are incurred in the first year in which the use case is implemented and each year incrementally more hospitals adopt the use case for the first time, the one-off costs were estimated by multiplying the costs calculated in a case of 100% adoption (**Table 31**) by the difference in adoption rates (of the macro-region) between the current and previous years (annual increment in adoption) and the growth of health expenditure for a given year.

Since recurring costs apply only to the proportion of hospitals who have adopted the use case, the recurring costs were estimated by multiplying the costs calculated in a case of 100% adoption (**Table 31**) by the estimated adoption rates (of the macro-region) and the growth of health expenditure for a given year.

By dividing by a discount rate, the estimated costs are normalised to the present-day value of money. Adding up the annual values over 5 years and 10 years gives the cumulative costs in present-day money. The calculation for the one-off costs is presented in **Table 32** and for the recurring costs in **Table 33**.

Table 32: Forecasted one-off costs (implementation) based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Austria	DACH	€ 60 m	36%	€ 9.3 m	4.71%	€ 46 m	€ 53 m
Belgium	Benelux	€ 34 m	31%	€ 5.9 m	4.25%	€ 22 m	€ 27 m
Bulgaria	Central and Eastern Europe	€ 22 m	30%	€ 4.1 m	8.98%	€ 17 m	€ 19 m
Croatia	Central and Eastern Europe	€ 6.1 m	30%	€ 1.2 m	6.83%	€ 4.7 m	€ 5.4 m
Cyprus	South and Western Europe	€ 12 m	24%	€ 3.2 m	9.28%	€ 10.0 m	€ 11 m
Czechia	Central and Eastern Europe	€ 20 m	30%	€ 3.9 m	9.24%	€ 15 m	€ 18 m
Denmark	Northern Europe	€ 55 m	28%	€ 4.4 m	3.50%	€ 45 m	€ 50 m
Estonia	Central and Eastern Europe	€ 3.9 m	30%	€ 0.7 m	8.93%	€ 3.0 m	€ 3.4 m
Finland	Northern Europe	€ 60 m	28%	€ 4.8 m	3.14%	€ 49 m	€ 55 m
France	South and Western Europe	€ 467 m	24%	€ 124 m	2.99%	€ 379 m	€ 426 m
Germany	DACH	€ 526 m	36%	€ 82 m	5.32%	€ 403 m	€ 467 m
Greece	South and Western Europe	€ 35 m	24%	€ 9.2 m	2.89%	€ 28 m	€ 31 m

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Hungary	Central and Eastern Europe	€ 10 m	30%	€ 2.0 m	5.27%	€ 8.0 m	€ 9.2 m
Ireland	Northern Europe	€ 26 m	28%	€ 2.0 m	6.62%	€ 21 m	€ 24 m
Italy	South and Western Europe	€ 198 m	24%	€ 53 m	2.49%	€ 161 m	€ 181 m
Latvia	Central and Eastern Europe	€ 5.8 m	30%	€ 1.1 m	10.77%	€ 4.4 m	€ 5.1 m
Lithuania	Central and Eastern Europe	€ 8.8 m	30%	€ 1.7 m	10.07%	€ 6.7 m	€ 7.8 m
Luxembourg	Benelux	€ 3.1 m	31%	€ 0.5 m	5.96%	€ 2.0 m	€ 2.5 m
Malta	South and Western Europe	€ 1.2 m	24%	€ 0.3 m	9.65%	€ 1.0 m	€ 1.1 m
Netherlands	Benelux	€ 56 m	31%	€ 9.6 m	3.96%	€ 36 m	€ 45 m
Poland	Central and Eastern Europe	€ 109 m	30%	€ 21 m	6.30%	€ 83 m	€ 96 m
Portugal	South and Western Europe	€ 29 m	24%	€ 7.6 m	5.79%	€ 23 m	€ 26 m
Romania	Central and Eastern Europe	€ 24 m	30%	€ 4.5 m	10.10%	€ 18 m	€ 21 m
Slovakia	Central and Eastern Europe	€ 14 m	30%	€ 2.7 m	6.15%	€ 11 m	€ 12 m
Slovenia	Central and Eastern Europe	€ 4.2 m	30%	€ 0.8 m	6.95%	€ 3.2 m	€ 3.7 m

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Spain	South and Western Europe	€ 113 m	24%	€ 30 m	4.27%	€ 91 m	€ 103 m
Sweden	Northern Europe	€ 19 m	28%	€1.5 m	2.63%	€16 m	€ 18 m
Total cumulative one-off costs for the EU-27 (present-day money)				**€ 0.4 bn**	**—**	**€ 1.5 bn**	**€ 1.7 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 31 for the underlying calculation.
- [c] See Figure 104 and Annex F6 for the underlying calculation.
- [d] Calculated with the formula: Costs with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:
- Costs in year $0 +$ (costs with 100% adoption × (adoption rate in year 1 [%] $-$ adoption rate in year 0 [%]) × expenditure factor in year 1 ÷ discount rate in year 1) + … + (costs with 100% adoption × (adoption rate in year n [%] $-$ adoption rate in year (n $-$ 1) [%]) × expenditure factor in year n ÷ discount rate in year n. Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
- Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

Table 33: Forecasted recurring costs (operational) based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Austria	DACH	€ 28 m	36%	€ 4.4 m	4.71%	€ 85 m	€ 211 m
Belgium	Benelux	€ 16 m	31%	€ 2.8 m	4.25%	€ 40 m	€ 104 m
Bulgaria	Central and Eastern Europe	€ 10 m	30%	€ 2.0 m	8.98%	€ 28 m	€ 74 m
Croatia	Central and Eastern Europe	€ 2.9 m	30%	€ 0.5 m	6.83%	€ 7.9 m	€ 21 m
Cyprus	South and Western Europe	€ 5.8 m	24%	€ 1.5 m	9.28%	€ 19 m	€ 46 m
Czechia	Central and Eastern Europe	€ 9.5 m	30%	€ 1.8 m	9.24%	€ 26 m	€ 68 m
Denmark	Northern Europe	€ 26 m	28%	€ 2.1 m	3.50%	€ 80 m	€ 200 m
Estonia	Central and Eastern Europe	€ 1.8 m	30%	€ 0.3 m	8.93%	€ 5.1 m	€ 13 m
Finland	Northern Europe	€ 28 m	28%	€ 2.3 m	3.14%	€ 88 m	€ 220 m
France	South and Western Europe	€ 220 m	24%	€ 58 m	2.99%	€ 726 m	€ 1 730 m
Germany	DACH	€ 247 m	36%	€ 38 m	5.32%	€ 744 m	€ 1 846 m
Greece	South and Western Europe	€ 16 m	24%	€ 4.3 m	2.89%	€ 54 m	€ 128 m
Hungary	Central and Eastern Europe	€ 4.9 m	30%	€ 0.9 m	5.27%	€ 14 m	€ 35 m
Ireland	Northern Europe	€ 12 m	28%	€ 1.0 m	6.62%	€ 38 m	€ 94 m

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Italy	South and Western Europe	€ 93 m	24%	€ 25 m	2.49%	€ 308 m	€ 735 m
Latvia	Central and Eastern Europe	€ 2.7 m	30%	€ 0.5 m	10.77%	€ 7.5 m	€ 20 m
Lithuania	Central and Eastern Europe	€ 4.2 m	30%	€ 0.8 m	10.07%	€ 11 m	€ 30 m
Luxembourg	Benelux	€ 1.5 m	31%	€ 0.3 m	5.96%	€ 3.7 m	€ 9.5 m
Malta	South and Western Europe	€ 0.6 m	24%	€ 0.2 m	9.65%	€ 1.9 m	€ 4.6 m
Netherlands	Benelux	€ 26 m	31%	€ 4.5 m	3.96%	€ 66 m	€ 170 m
Poland	Central and Eastern Europe	€ 51 m	30%	€ 9.8 m	6.30%	€142 m	€ 369 m
Portugal	South and Western Europe	€ 13 m	24%	€ 3.6 m	5.79%	€ 44 m	€ 106 m
Romania	Central and Eastern Europe	€ 11 m	30%	€ 2.1 m	10.10%	€ 31 m	€ 79 m
Slovakia	Central and Eastern Europe	€ 6.6 m	30%	€ 1.3 m	6.15%	€ 18 m	€ 47 m
Slovenia	Central and Eastern Europe	€ 2.0 m	30%	€ 0.4 m	6.95%	€ 5.5 m	€ 14 m
Spain	South and Western Europe	€ 53 m	24%	€ 14 m	4.27%	€ 175 m	€ 417 m
Sweden	Northern Europe	€ 9.0 m	28%	€ 0.7 m	2.63%	€ 28 m	€ 70 m
Total cumulative recurring costs for the EU-27 (present-day money)				**€ 0.2 bn**	**—**	**€ 2.8 bn**	**€ 6.9 bn**

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all hospitals in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 31 for the underlying calculation.
- [c] See Figure 104 and Annex F6 for the underlying calculation.
- [d] Calculated with the formula: Costs with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year $0 = 1$
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:
- Costs in year $0 +$ (costs with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (costs with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n. Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
- Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

5.2.4(g) Analysis of the net cost avoidance (monetary benefit)

Having calculated in the previous sections the gross cost savings that the use case can bring to the value drivers as well as the costs of implementing and operating it, the net cost savings are calculated by subtracting the costs (both one-off and recurring) from the gross cost savings. The calculation is presented in **Table 34** for both the full and partial realisation of the use case's potential savings.

Table 34: Net present cost avoidance (net monetary benefit) in year 0, year 5 and year 10 (cumulative)

A: Member State	Full scenario			Partial scenario		
	B: Net cost savings in year 0 in a full scenario [EUR][a]	C: Net cumulative cost savings in year 5 in a full scenario [EUR][a]	D: Net cumulative monetary benefit in year 10 in a full scenario [EUR][a]	E: Net cumulative cost savings in year 0 in a partial scenario [EUR][b]	F: Net cumulative cost savings in year 5 in a partial scenario [EUR][b]	G: Net cumulative monetary benefit in year 10 in a partial scenario [EUR][b]
Austria	€ 145 m	€ 2 932 m	€ 7332 m	€ 93 m	€ 1 928 m	€ 4 844 m
Belgium	€ 164 m	€ 2 464 m	€ 6 410 m	€ 108 m	€ 1 637 m	€ 4 268 m
Bulgaria	€ 5.7 m	€ 126 m	€ 352 m	€ 1.8 m	€ 70 m	€ 206 m
Croatia	€ 14 m	€ 215 m	€ 565 m	€ 8.8 m	€ 140 m	€ 371 m
Cyprus	€ 2.9 m	€ 67 m	€ 171 m	€ 362 738	€ 35 m	€ 96 m
Czechia	€ 39 m	€ 600 m	€ 1 579 m	€ 24 m	€ 389 m	€ 1 034 m
Denmark	€ 39 m	€ 1 654 m	€ 4 167 m	€ 24 m	€ 1 071 m	€ 2 720 m
Estonia	€ 8.3 m	€ 128 m	€ 337 m	€ 5.2 m	€ 84 m	€ 221 m
Finland	€ 8.7 m	€ 478 m	€ 1 253 m	€ 3.5 m	€ 276 m	€ 753 m
France	€ 1 329 m	€ 17 720 m	€ 42 698 m	€ 834 m	€ 11 554 m	€ 28 008 m
Germany	€ 904 m	€ 18 671 m	€ 46 841 m	€ 569 m	€ 12 180 m	€ 30 743 m
Greece	€ 97 m	€ 1 290 m	€ 3 110 m	€ 61 m	€ 841 m	€ 2 039 m
Hungary	€ 35 m	€ 522 m	€ 1 368 m	€ 22 m	€ 344 m	€ 906 m
Ireland	€ 59 m	€ 2 379 m	€ 5 936 m	€ 39 m	€ 1 580 m	€ 3 953 m
Italy	€ 647 m	€ 8 553 m	€ 20 581 m	€ 410 m	€ 5 598 m	€ 13 541 m
Latvia	€ 11 m	€ 178 m	€ 470 m	€ 7.2 m	€ 116 m	€ 308 m
Lithuania	€ 13 m	€ 205 m	€ 541 m	€ 7.9 m	€ 132 m	€ 352 m

A: Member State	Full scenario			Partial scenario		
	B: Net cost savings in year 0 in a full scenario [EUR][a]	C: Net cumulative cost savings in year 5 in a full scenario [EUR][a]	D: Net cumulative monetary benefit in year 10 in a full scenario [EUR][a]	E: Net cumulative cost savings in year 0 in a partial scenario [EUR][b]	F: Net cumulative cost savings in year 5 in a partial scenario [EUR][b]	G: Net cumulative monetary benefit in year 10 in a partial scenario [EUR][b]
Luxembourg	€ 14 m	€ 210 m	€ 546 m	€ 9.1 m	€ 139 m	€ 363 m
Malta	€ 4.1 m	€ 54 m	€ 129 m	€ 2.6 m	€ 35 m	€ 85 m
Netherlands	€ 166 m	€ 2 530 m	€ 6 600 m	€ 107 m	€ 1 668 m	€ 4 368 m
Poland	€ 137 m	€ 2 202 m	€ 5 840 m	€ 82 m	€ 1 407 m	€ 3 775 m
Portugal	€ 165 m	€ 2 131 m	€ 5 107 m	€ 108 m	€ 1 411 m	€ 3 391 m
Romania	€ 12 m	€ 219 m	€ 596 m	€ 5.8 m	€ 132 m	€ 368 m
Slovakia	€ 29 m	€ 451 m	€ 1 187 m	€ 18 m	€ 294 m	€ 779 m
Slovenia	€ 15 m	€ 223 m	€ 583 m	€ 9.5 m	€ 147 m	€ 386 m
Spain	€ 550 m	€ 7 131 m	€ 17 107 m	€ 356 m	€4 709 m	€ 11 334 m
Sweden	€ 109 m	€ 4 307 m	€ 10 717 m	€ 73 m	€ 2 882 m	€ 7 178 m
Cumulative net cost savings for the EU-27 (present-day money)	**€ 4.7 bn**	**€ 78 bn**	**€ 192 bn**	**€ 3.0 bn**	**€ 51 bn**	**€ 126 bn**

Notes:

- [a] Calculated with the formula: Cumulative cost savings for the full scenario in year n – (cumulative one-off costs in year n + cumulative recurring costs in year n) using data from Table 28, Table 32, and Table 33, where n = year number.
- [b] Calculated with the formula: Cumulative cost savings for the partial scenario in year n – (cumulative one-off costs in year n + cumulative recurring costs in year n) using data from Table 29, Table 32, and Table 33, where n = year number.

5.2.5(h) Analysis of the model's sensitivity

Monte Carlo simulations were conducted to assess the robustness of the economic analysis. In the economic analysis, fixed input values were used for the calculations. In the Monte Carlo simulations, the input values used to quantify (1) the gross cost savings (see **Table 25** for the quantification of the value drivers), (2) the one-off costs, and (3) the recurring costs (see **Table 30** for the quantification of the one-off and recurring costs) in the reference country were randomly varied in three independent simulations, each using 1 million samples. Only the quantification equations used to calculate these three quantities were modelled in the simulation.

The range (distribution) of possible values for each value driver was determined based on the range of values estimated in **Annex F4**. The range of possible values for the cost components was determined based on the range of values estimated in **Annex F7**. The randomly sampled input values from these distributions were then used to estimate (1) the total gross cost savings, (2) the total implementation costs, and (3) the total recurring costs in the reference country in year 0.

The results of the simulation are summarised in **Table 35**. The distributions from the simulations capture the likely range and uncertainty of the values quantified for the reference country. The range of uncertainty is defined as two standard deviations from the mean of the distribution.

Table 35: Estimates of the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country in year 0 based on three Monte Carlo simulations (sample size = 1 million)

Parameters	A: Total cost savings (benefit) of the full implementation scenario in the reference country in a full scenario [EUR][a]	B: Total cost savings (benefit) of the partial implementation scenario in the reference country in a partial scenario [EUR][b]	C: Total one-off costs of implementing the use case in all hospitals in the reference country *(100% adoption)* [EUR][c]	D: Total annual recurring costs of operating the use case in all hospitals in the reference country *(100% adoption)* [EUR][d]
Lower estimate from simulation (−2 sigma)[e]	€ 491 m	€ 340 m	€ 33 m	€ 6 m
Calculation from economic analysis[f]	€ 957 m	€ 644 m	€ 56 m	€ 26 m
Upper estimate from simulation (+2 sigma)[e]	€ 1 386 m	€ 992 m	€ 71 m	€ 43 m
Standard deviation from simulation	€ 224 m	€ 163 m	€ 9 m	€ 9 m

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] Compare with column E in Table 25.
- [b] Compare with column G in Table 25.

- [c] Compare with column D of the reference country in Table 31.
- [d] Compare with column E of the reference country in Table 31.
- [e] The expected range of the estimated values is defined as two standard deviations ("2 sigma") from the mean of the distribution. The lower and upper estimates are calculated with the formula: $\text{mean} \pm (2 \times \text{standard deviation})$.
- [f] The single-point value calculated from the analysis is approximately equal to the mean of the simulations.

By quantifying the individual impact of each value driver on model variance, the analysis enables a clearer understanding of how sensitive the overall outcome is to changes in specific inputs. During the simulation of the gross cost savings, the outputs of each value driver were recorded (1 million samples per value driver). Based on the distribution of each value driver, the variance was calculated. To calculate the contribution of each value driver to the overall uncertainty (variance) of the model, the variance of each value driver was divided by the variance of the gross cost savings (total variance). The relative contribution of the value drivers to the benefit model's uncertainty is illustrated in **Figure 105.**

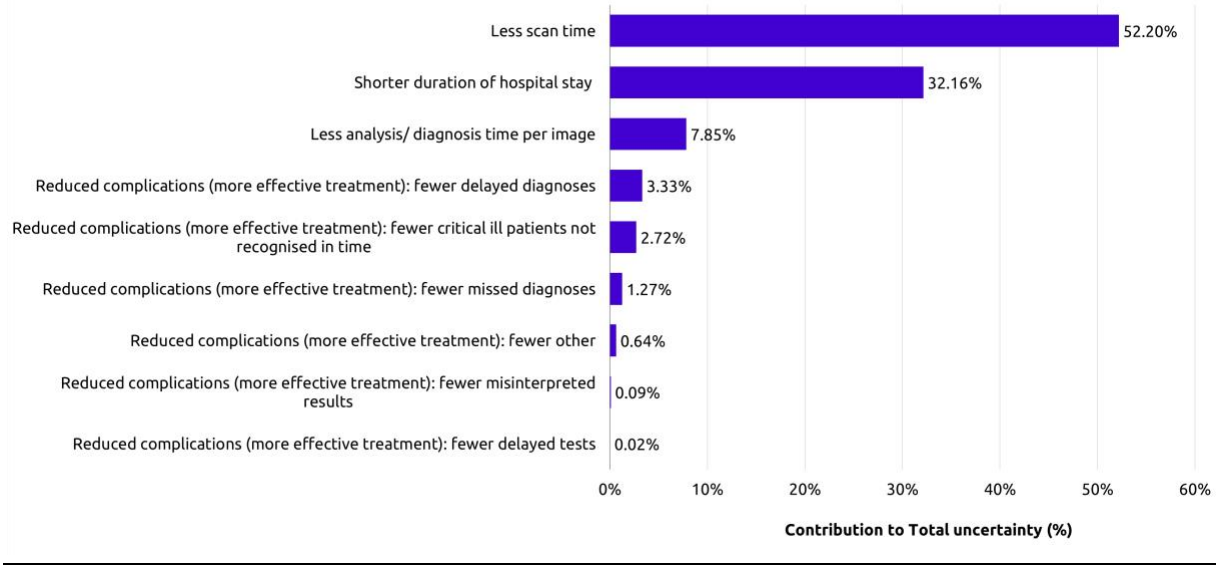


Figure 105: Relative contribution of each value driver to the uncertainty in the benefits model of the reference country

To understand the effect different likely estimates for the value drivers and costs in the reference country have on the final result of the economic analysis, the lower-bound and upper-bound estimated values from the simulations for the total gross cost savings, the total implementation costs, and the total recurring costs were used to recalculate the net cost avoidance in the EU-27. The three lower-bound estimates for the reference country were used in the analysis pipeline to calculate a lower-bound estimate of the net cost avoidance in the EU-27. The same was done with the three upper-bound estimates for the reference country to give an upper-bound estimate of the net cost avoidance in the EU-27. Together, these represent the likely range of the net cost avoidance in the EU-27 when implementing this use case. These results are summarised in **Table 36** and plotted in **Figure 106** (the vertical bars indicate the range of uncertainty of each data point, as derived from the upper and lower bounds produced by the simulation).

Table 36: Estimated uncertainty of the net cost avoidance (net monetary benefit) in year 0, year 5 and year 10 (cumulative) for the EU-27

Parameters	Full scenario			Partial scenario		
	A: Net cost savings in year 0 in a full scenario [EUR]	B: Net cumulative cost savings in year 5 in a full scenario [EUR]	C: Net cumulative monetary benefit in year 10 in a full scenario [EUR]	D: Net cost savings in year 0 in a partial scenario [EUR]	E: Net cumulative cost savings in year 5 in a partial scenario [EUR]	F: Net cumulative monetary benefit in year 10 in a partial scenario [EUR]
Lower estimate[a]	€ 2.5 bn	€ 41 bn	€ 102 bn	€ 1.5 bn	€ 26 bn	€ 66 bn
Calculation from economic analysis[b]	€ 4.7 bn	€ 78 bn	€ 192 bn	€ 3.0 bn	€ 51 bn	€ 126 bn
Upper estimate[c]	€ 7.0 bn	€ 114 bn	€ 282 bn	€ 4.5 bn	€ 75 bn	€ 187 bn

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] Calculated using the lower range estimates from the Monte Carlo simulation for the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country (Table 35). The extrapolation and forecasting steps were performed as described in the sections above.
- [b] Taken from Table 34.
- [c] Calculated using the upper range estimates from the Monte Carlo simulation for the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country (Table 35). The extrapolation and forecasting steps were performed as described in the sections above.

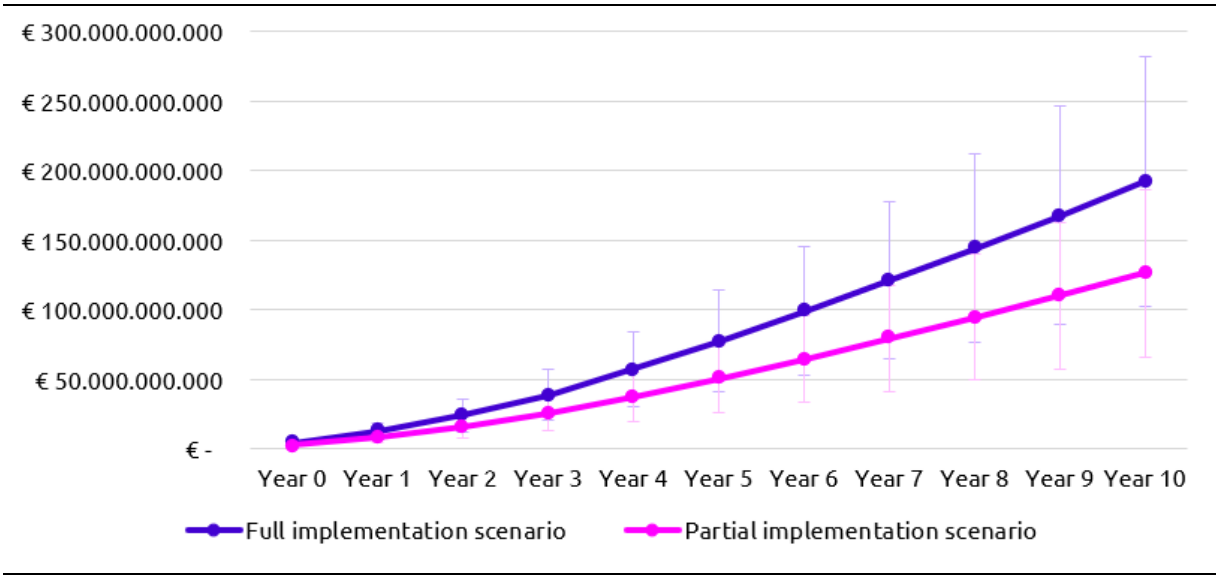


Figure 106: Forecast of the cumulative net cost avoidance over ten years for the full and partial implementation scenarios, including uncertainty ranges.

5.2.6(i) Discussion and conclusions

The analysis shows that automated medical image analysis can generate cost savings (net cost avoidance) across EU healthcare systems. The most impactful value drivers are 'shorter duration of hospital stays' and 'shorter scan time per patient'. In addition, the results suggest that automated medical image analysis can also reduce diagnosis time by radiologists and reduce clinical complications due to fewer missed or delayed diagnoses (of critically ill patients), fewer misinterpretations of test results and overall improved patient outcomes.

The full implementation scenario demonstrates a steep and consistent increase in net cost avoidance over time, whereas the partial scenario yields more modest gains (66% of the gains in the full scenario). The impact of value drivers such as 'reduced analysis time', 'fewer misinterpreted results', and 'fewer delayed tests' is significantly diminished when the technology is not well integrated, as postulated by the partial scenario.

One barrier expressed by experts to realising the cost savings estimated in the full scenario is the requirement under the AI Act for human oversight when implementing AI. In radiology, this often translates into the need for a radiologist to validate AI outputs, limiting fully autonomous operation. Additional barriers to realising the estimated cost savings include cultural resistance, which slows adoption due to scepticism among clinicians, and regulatory oversight, which increases compliance costs through the need for quality assurance. Furthermore, experts cited basic workflow efficiency, interdepartmental coordination, and frequent interruptions (such as false positive system alerts and validation requirements to confirm results from AI systems) as ongoing challenges that could impact overall efficiency of clinical workflows and that could therefore be barriers to achieving the efficiency gains assumed by the use case. Lastly, AI readiness could also be a barrier if technological infrastructure, accessible and representative data, and a mature tech sector with innovation and skilled talent are not present to support the use case's implementation.

Several limitations were identified through the validation session. During the validation session, some participants expressed that the presence rates for the partial scenario appear arbitrary. For example, the value driver 'missed diagnoses' assumes that 100% of benefits are realised under the partial scenario, which is unlikely. In addition, the value driver 'shorter analysis/diagnosis time' is set to 0% but during the validation session one expert suggested that a rate of around 50% would be more realistic. Last, it was mentioned that 100% realisation of benefits in the partial scenario for the value driver shorter hospital stay is too optimistic, and that 50% is more realistic. However, the presence rates were determined during a workshop with several experts and decided through a majority vote.

It may be possible that the experts overlooked these value drivers in the initial workshop when assessing the partial scenario. If the economic impact analysis is redone using the recommended presence rates for the partial scenario from the validation session, the resulting net cost avoidance is estimated at €2.6 bn in year 0 (compared to €3 bn in the original analysis), €44 bn in year 5 (compared to €51 bn in the original analysis), and €110 bn in year 10 (compared to €126 bn in the original analysis). Notably, the 10-year figure is 13% lower than the €126 bn projected when applying the original presence rates.

Furthermore, one expert in the validation session expressed that the value driver 'shorter duration of hospital stay' may be overstated. While diagnostic AI may have some influence on length of stay, faster imaging alone does not reduce it, as the primary bottleneck lies in the availability of radiologists and also depends on the patient's medical condition. Therefore, it should be acknowledged that this technology does not function as an independent, stand-alone solution, but rather as part of a broader medical system. Moreover, according to one expert, current AI in medical imaging is not expected to reduce administrative workload. Radiologists currently receive both the original images and an AI-generated report, which can increase the time required for analysis.

Consequently, the value driver 'shorter diagnosis/analysis time' may be optimistic, and its full projected cost savings may not be achievable. However, in a future state where technology has advanced and diagnostics are broadly implemented, several experts expect this to be a plausible outcome.

Some experts expressed during the validation session that the costs of operating the use case may be underestimated. In addition, the scope of this study does not account for indirect costs. For example, AI may detect subtle findings that human clinicians might overlook, potentially increasing the workload for clinicians and the associated downstream costs.

As shown in **Figure 105**, the value drivers 'shorter scan time' and 'shorter duration of hospital stay' have the greatest impact on the overall uncertainty in the model's output and are therefore the most critical factors for achieving the full net cost avoidance estimated in this analysis. The observation that the value driver 'shorter duration of hospital stay' may be overstated further increases the level of uncertainty in the model, suggesting that the forecast may be overly optimistic.

To place the findings of this use case in a broader perspective, the estimated net cost avoidance as a proportion of the projected cumulative healthcare expenditure over the next ten years amounts to **approximately 0.8% of healthcare expenditure in the full scenario**. In a partial scenario, automated medical imaging analysis is estimated to reduce total healthcare expenditure by around 0.5% over the same period.

6 Use Case 3: Virtual human twins of the brain and heart

Digital twins are virtual representations of physical entities, processes, or systems that enable the simulation of real-world scenarios to support improved decision-making. In the healthcare domain, this concept is applied through virtual human twins, which are digital models of individual patients and their biological characteristics, including cells, tissues, organs, and organ systems. Virtual human twins simulate the behaviour of their physical counterparts, including interactions between co-existing diseases, thereby supporting more accurate clinical decision-making.

The selected use case for this analysis is the application of virtual human twins in disease management, specifically for the management of conditions related to the neurological system (a brain twin) and for conditions related to the cardiac system (a heart twin). The analysis establishes a **full implementation scenario** in which virtual human twins provide real-time, patient-specific simulations to support precise diagnostics, predictive health insights, and personalised treatment strategies. These simulations are updated using data streams from electronic health records (EHRs), medical imaging, and wearable devices. The integration of artificial intelligence further enhances the capabilities of virtual human twins by enabling the processing of large-scale data and adaptive learning to refine individualised care pathways. Currently, several research initiatives are focused on organ-specific virtual twins, notably the virtual brain twin[188] and the virtual heart twin[189]. In this analysis, the scope of the use case is limited to these two organs: the brain and the heart.

The **baseline scenario** assumes that virtual human twin technologies are in an early developmental stage and are not yet integrated into routine clinical practice. In this context, patient care continues to rely on conventional diagnostic and treatment methods, without the benefit of dynamic, personalised simulations.

Key takeaways

- **Economic impact:** A full economic impact analysis could not be performed due to a lack of robust data from hospital settings for the cost estimates. Nonetheless, the implementation of the use case is projected to yield a cumulative gross cost saving of €60 billion (full scenario) and €30 billion (partial scenario) over ten years. To understand the true economic benefit of the use case, the gross cost savings would need to be offset against the one-off and recurring costs of the use case to calculate net cost avoidance.
- **Benefits of the use case:** The analysis shows that virtual human twins offer promising clinical benefits, such as more timely interventions, improved diagnostic accuracy, and reduced complications. The most substantial value driver is shorter hospital stays.
- **Sensitivity analysis:** The sensitivity analysis indicates that the value driver 'reduction of follow-up appointments' is associated with the highest levels of uncertainty in the model's output.

Please refer to section 6.2.3 for the discussion and conclusions of this analysis and Part C for the overall conclusions and limitations.

[188] For example, Virtualbraintwin (2025)

[189] For example, Dassault Systemes (2025)

6.1 ANALYSIS OF THE GROSS FINANCIAL SAVINGS

6.1.1(a) Quantification and monetisation of the value drivers and resulting cost savings from implementing the use case, using pricing data of a reference country

To identify the underlying causes of cost savings offered by the use case (i.e. the activities the use case helps improve), a list of value drivers was defined and is presented in **column A of Table 37** (refer to **Annex G1** for the list of experts that provided input for the data collection and **Annex G2** for the simplified benefits logic diagram that resulted from their input).

These value drivers contribute to cost savings through several underlying mechanisms. For instance, the simulations generated by virtual human twins enable more accurate predictions of disease progression, which in turn allow for earlier and more targeted interventions. This proactive approach leads to shorter hospital stays, thereby decreasing the overall utilisation of healthcare resources.

The metrics used to quantify the value drivers are listed in **column B of Table 37**. These metrics are converted into monetary terms based on annual pricing data from the reference country for this use case, the Netherlands, for the subset of medical conditions applicable to the use case. The results of these calculations are presented in **column C of Table 37** and represent the cost of performing the activities described by the value drivers in the absence of the use case (baseline scenario). Refer to **Annex G3** for the sources of these data and the calculations for each value driver.

To quantify the effect the use case has on the value drivers, a mean savings rate was estimated for the full implementation scenario, in which the use case is assumed to be fully effective (see **column D of Table 37** and refer to **Annex G4** for the calculation of the savings rate).

By multiplying the savings rate per value driver (**column D**) with the baseline cost of the value driver (**column C**), the benefit in terms of cost savings is given for each value driver (see **column E of Table 37**) for the fictional reference case. The analysis shows that the greatest cost savings for this use case are attributable to more timely intervention (value driver #1).

To calculate the cost savings of the value drivers for a scenario in which the use case is partially effective, the value drivers were annotated as likely to be 'absent' (0%), 'partially realised' (assumed at 50%), or 'fully realised' (100%) in a partial scenario. These presence rates are presented in **column F of Table 37** and are based on input from the workshop. By multiplying the cost savings of the value driver in the full scenario (**column E**) with the presence rate of that value driver in the partial scenario (**column F**), the cost savings of each value driver in the partial scenario is calculated (see **column G of Table 37**) for the fictional reference case.

Table 37: Quantified and monetised costs of the value drivers in the baseline scenario, the cost savings (benefit) of the full implementation scenario, and the cost savings (benefit) of the partial scenario using annual pricing data from the reference country

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
	What is the activity that the use case helps improve?	*How is the activity measured?*	*How much does it cost to do the activity without the use case?*	*How much less will the activity cost with the use case fully implemented and effective compared to the baseline?*	*How much money is saved per activity with the use case fully effective in its implementation?*	*To what degree will the cost savings be present if the use case is partial effective compared to the full scenario?*	*How much money is saved per activity with the use case partially effective in its implementation?*
1	More timely intervention	Hospital stay days	€ 560 m	87 %	€ 485 m	50 %	€ 241 m
2	Reduction of follow-up appointments	Outpatient visits	€ 85 m	40 %	€ 31 m	0 %	€ 0
3	Reduction in diagnostic process of ICU (response time)	Intensive care treatment costs	€ 8.5 m	35 %	€ 3.0 m	100 %	€ 3.0 m
4	Higher diagnostic accuracy	Costs for missed diagnosis	€ 184 m	13 %	€ 23 m	100 %	€ 23 m
Total cost savings for the fictional reference case					**€ 525 m**	**—**	**€ 260 m**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The metrics either relate directly to the value driver (e.g. shorter hospital stays can be measured directly in days) or are closely correlated to it (e.g. fewer medical errors can be measured indirectly through the number of medical procedures).

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]

- [b] To be comparable, the metrics are scaled to the order of the country, meaning they represent the cost for all hospitals in a country's healthcare system. See Annex G3 for the calculations of each value driver.
- [c] The magnitude of the savings was determined through interviews with experts. Experts were asked to provide estimated ranges, both conservative and optimistic, regarding the improvements the use case could bring to the value drivers. The midpoint of this estimated range was taken as the savings rate. See Annex G4 for the calculations.
- [d] Calculated with the formula: Baseline scenario [EUR] × savings rate [%]
- [e] The likelihood of a value driver being present in the partial scenario was determined through an expert workshop. Refer to the benefits logic in Annex G2.
- [f] Calculated with the formula: Cost savings in full scenario [EUR] × presence rate [%]

6.1.2(b) Extrapolating the benefits to the EU-27

The result of quantifying and monetising the value drivers of the use case in the previous section is the estimated cost savings for a full and partial implementation scenario in a fictional reference case. To convert the reference values to values specific to each Member State, several adjustment factors must be applied to the pricing data and the savings rate use in the reference case.

To account for essential differences in the extent to which countries may achieve the estimated savings rate for this use case, countries are clustered into four groups based on the AI Readiness Index[190]. The AI Readiness Index assesses the extent to which the country is AI-ready based on three pillars: government, technology, and data and infrastructure. This index is used to cluster the countries on the premise that countries with a higher AI Readiness score are generally better positioned to leverage AI-driven solutions, such as this use case, effectively due to stronger strategic governance, technological maturity, and robust data ecosystems. In this way, the AI Readiness Index provides a reflection of a country's ability to realise the potential benefits of this use case. A weighting is assigned to each cluster based on the median maturity score of the countries in the cluster relative to the median maturity score of all Member States. The calculations are presented in **Table 38**. This calculation is based on the premise that countries with a higher AI Readiness Index are better positioned to realise the potential benefits of this use case.

Table 38: Calculation of the cluster weighting

A: Cluster name	B: Cluster definition	C: Member States in the cluster	D: Cluster weighting [factor] [a]
High	AI Readiness Index ≥ 75%	Finland, France, Germany, Ireland, Netherlands, Sweden	$\frac{77\ \%}{70\ \%} = 1.10$
Moderate high	70% ≤ AI Readiness Index < 75%	Austria, Belgium, Czech Republic (Czechia), Denmark, Estonia, Italy, Luxembourg, and Portugal	$\frac{72\ \%}{70\ \%} = 1.02$
Moderate low	60% ≤ AI Readiness Index < 70%	Bulgaria, Cyprus, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia, and Spain	$\frac{64\ \%}{70\ \%} = 0.91$
Low	AI Readiness Index < 60%	Croatia, Greece, Romania	$\frac{58\ \%}{70\ \%} = 0.82$

Notes:

- The cluster factor is displayed rounded to two decimals. Calculations are performed using the unrounded values.
- [a] Calculated with the formula: median share of AI Readiness Index in the cluster [%] ÷ median AI Readiness Index among enterprises of all countries [%]

In addition to difference related to the use case, countries have general difference in their healthcare expenditures, which reflects differences in prices, population size, and demographic characteristic, among other variables. For this analysis, healthcare expenditure is calculated as a factor compared to the reference country (the Netherlands' pricing data) (see **column C** of **Table 39** and **Annex G5** for the underlying calculation).

By multiplying the cost savings of the fictional reference case (**Table 37**) by the cluster weighting and the health expenditure factor of each Member State, an estimate of the cost savings in each Member State is produced, which assumes that the use case is implemented in all hospitals (100% adoption). This calculation is presented in **Table 39**.

[190] Oxford Insights (2024) Government AI Readiness Index

Table 39: Calculation of the total cost savings for the full and partial implementation scenarios per Member State in one year assuming 100% adoption of the use case

A: Member State	B: Cluster weighting [factor][a]	C: Healthcare expenditure relative to the Netherlands [factor][b]	D: Cost savings: full scenario in all hospitals [EUR][c]	E: Cost savings: partial scenario in all hospitals [EUR][d]
Austria	1.02	0.52	€ 288 m	€142 m
Belgium	1.02	0.62	€ 344 m	€ 169 m
Bulgaria	0.91	0.07	€ 34 m	€ 17 m
Croatia	0.82	0.05	€ 23 m	€ 11 m
Cyprus	0.91	0.03	€ 13 m	€ 6.2 m
Czechia	1.02	0.25	€ 140 m	€ 69 m
Denmark	1.02	0.37	€ 208 m	€ 102 m
Estonia	1.02	0.03	€15 m	€ 7.2 m
Finland	1.10	0.27	€ 160 m	€ 79 m
France	1.10	3.24	€ 1 937 m	€ 954 m
Germany	1.10	5.05	€ 3 018 m	€ 1 486 m
Greece	0.82	0.18	€ 81 m	€ 40 m
Hungary	0.91	0.12	€ 58 m	€ 28 m
Ireland	1.10	0.32	€ 191 m	€ 94 m
Italy	1.02	1.81	€ 1 013 m	€ 499 m
Latvia	0.91	0.03	€ 15 m	€ 7.4 m
Lithuania	0.91	0.05	€ 25 m	€ 12 m
Luxembourg	1.02	0.04	€ 25 m	€ 12 m
Malta	0.91	0.02	€ 8.5 m	€ 4.2 m
Netherlands	1.10	1.00	€ 598 m	€ 295 m
Poland	0.91	0.43	€ 214 m	€ 105 m
Portugal	1.02	0.26	€ 146 m	€ 72 m
Romania	0.82	0.17	€ 76 m	€ 37 m
Slovakia	0.91	0.09	€ 43 m	€ 21 m
Slovenia	0.91	0.06	€ 28 m	€ 14 m
Spain	0.91	1.35	€ 669 m	€ 329 m
Sweden	1.10	0.61	€ 365 m	€ 180 m
Total cost savings for the EU-27 with 100% adoption			**€ 9.7 bn**	**€ 4.8 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] See Table 38 for the underlying calculation.
- [b] See Annex G5 for the underlying calculation. The Netherlands = 1.

A: Member State	B: Cluster weighting [factor][a]	C: Healthcare expenditure relative to the Netherlands [factor][b]	D: Cost savings: full scenario in all hospitals [EUR][c]	E: Cost savings: partial scenario in all hospitals [EUR][d]

- [c] Calculated with the formula: Reference case savings in full scenario [EUR] × cluster factor × expenditure factor. See Table 37 for the calculation of the reference case savings in the full scenario.
- [d] Calculated with the formula: Reference case savings in partial scenario [EUR] × cluster factor × expenditure factor. See Table 37 for the calculation of the reference case savings in the partial scenario.

6.1.3(c) Forecasting the benefits to the EU-27 over time

The result of extrapolating the cost savings from the fictional reference case to each Member State in the previous section is an estimate of the full market potential (100% adoption) for gross cost savings of the use case. To adjust the estimated savings based on the expected degree of adoption of the use case, adoption rates per regional cluster of Member States were calculated for the current year and forecasted for the next ten years (see **Figure 107** and **Annex G6**) based on the results of the healthcare provider survey (see **Figure 1**). Furthermore, to account for changes in health expenditure over time, the average health expenditure growth (compound annual growth rate) per Member State was calculated for the period 2014 – 2022 (see **column F of Table 40**) and forecasted for the next ten years. By multiplying the cost savings calculated in a case of 100% adoption (**Table 39**) by the estimated adoption rates (of the macro-region) and the growth of health expenditure, the estimated cost savings per country per year is calculated. By dividing by a discount rate, the estimated future savings are normalised to the present-day value of money. Adding up the annual values over 5 years and 10 years gives the cumulative cost savings in present-day money. The calculation for the full implementation scenario is presented in **Table 40** and for the partial implementation scenario in **Table 41**.

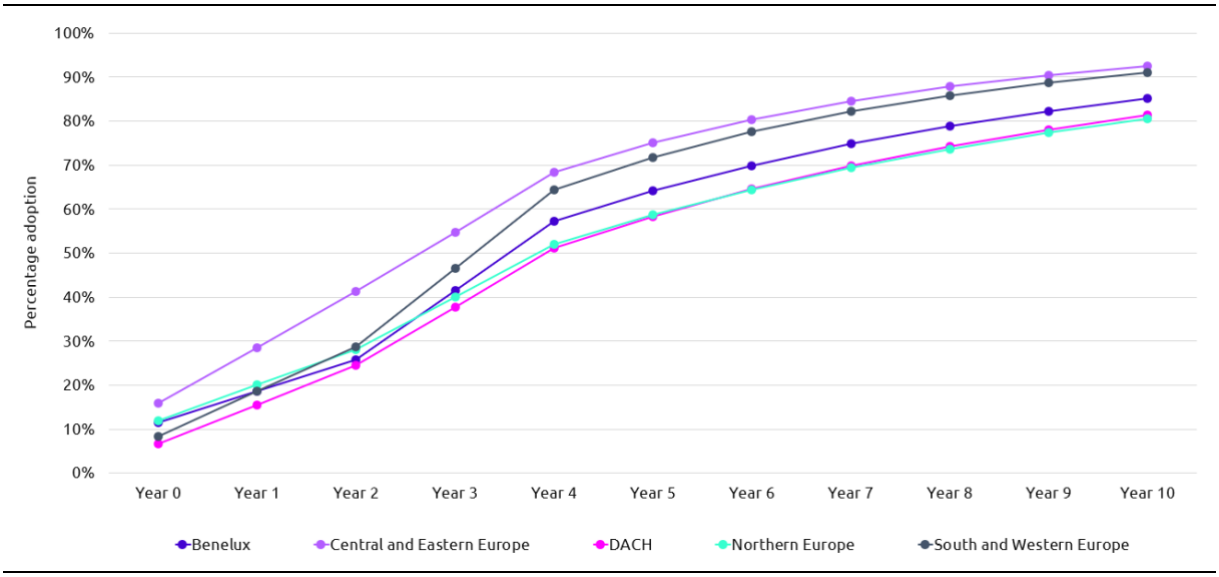


Figure 107: Adoption curve virtual human twins based on the healthcare provider survey Figure 1 for years 0 to 4 and an extrapolated trend curve for years 5 to 10 (see Annex G6).

Table 40: Forecasted cost savings for the full implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€ 288 m	6.7%	€ 19 m	4.71%	€ 567 m	€ 1611 m
Belgium	Benelux	€ 344 m	11.4%	€ 39 m	4.25%	€ 749 m	€ 2 089 m
Bulgaria	Central and Eastern Europe	€ 34 m	15.9%	€ 5.3 m	8.98%	€ 95 m	€ 241 m
Croatia	Central and Eastern Europe	€ 23 m	15.9%	€ 3.6 m	6.83%	€ 65 m	€ 164 m
Cyprus	South and Western Europe	€ 13 m	8.3%	€ 1.0 m	9.28%	€ 30 m	€ 83 m
Czechia	Central and Eastern Europe	€ 140 m	15.9%	€ 22 m	9.24%	€ 397 m	€ 1006 m
Denmark	Northern Europe	€ 208 m	12.0%	€ 25 m	3.50%	€ 437 m	€ 1 195 m
Estonia	Central and Eastern Europe	€15 m	15.9%	€ 2.3 m	8.93%	€ 41 m	€ 105 m
Finland	Northern Europe	€ 160 m	12.0%	€ 19 m	3.14%	€ 337 m	€ 920 m
France	South and Western Europe	€ 1 937 m	8.3%	€ 161 m	2.99%	€ 4 610 m	€ 12 818 m
Germany	DACH	€ 3 018 m	6.7%	€ 201 m	5.32%	€ 5 844 m	€ 16 909 m
Greece	South and Western Europe	€ 81 m	8.3%	€ 6.8 m	2.89%	€ 193 m	€ 537 m
Hungary	Central and Eastern Europe	€ 58 m	15.9%	€ 9.1 m	5.27%	€ 163 m	€ 414 m
Ireland	Northern Europe	€ 191 m	12.0%	€ 23 m	6.62%	€ 403 m	€ 1 100 m

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Italy	South and Western Europe	€ 1 013 m	8.3%	€ 84 m	2.49%	€ 2 411 m	€ 6 703 m
Latvia	Central and Eastern Europe	€ 15 m	15.9%	€ 2.4 m	10.77%	€ 42 m	€ 107 m
Lithuania	Central and Eastern Europe	€ 25 m	15.9%	€ 4.0 m	10.07%	€ 71 m	€ 179 m
Luxembourg	Benelux	€ 25 m	11.4%	€ 2.8 m	5.96%	€ 54 m	€ 151 m
Malta	South and Western Europe	€ 8.5 m	8.3%	€ 0.7 m	9.65%	€ 20 m	€ 56 m
Netherlands	Benelux	€ 598 m	11.4%	€ 68 m	3.96%	€ 1 304 m	€ 3 635 m
Poland	Central and Eastern Europe	€ 214 m	15.9%	€ 34 m	6.30%	€ 605 m	€ 1 534 m
Portugal	South and Western Europe	€ 146 m	8.3%	€ 12 m	5.79%	€ 348 m	€ 968 m
Romania	Central and Eastern Europe	€ 76 m	15.9%	€ 12 m	10.10%	€ 214 m	€ 542 m
Slovakia	Central and Eastern Europe	€ 43 m	15.9%	€ 6.9 m	6.15%	€ 123 m	€ 311 m
Slovenia	Central and Eastern Europe	€ 28 m	15.9%	€ 4.4 m	6.95%	€ 79 m	€ 201 m
Spain	South and Western Europe	€ 669 m	8.3%	€ 56 m	4.27%	€ 1 592 m	€ 4 428 m
Sweden	Northern Europe	€ 365 m	12.0%	€ 44 m	2.63%	€ 768 m	€ 2 098 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 0.9 bn**	**—**	**€ 22 bn**	**€ 60 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1).

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]

- [b] See Table 39 for the underlying calculation.
- [c] See Figure 107 and Annex G6 for the underlying calculations.
- [d] Calculated for year 0 with the formula: Cost savings with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year 0 $= (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Cost savings in year 0 + (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n.
  Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

Table 41: Forecasted cost savings for the partial implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€142 m	6.7%	€ 9.4 m	4.71%	€ 274 m	€ 794 m
Belgium	Benelux	€ 169 m	11.4%	€ 19 m	4.25%	€ 369 m	€ 1 029 m
Bulgaria	Central and Eastern Europe	€ 17 m	15.9%	€ 2.7 m	8.98%	€ 47 m	€ 119 m
Croatia	Central and Eastern Europe	€ 11 m	15.9%	€ 1. 8 m	6.83%	€ 32 m	€ 81 m
Cyprus	South and Western Europe	€ 6.2 m	8.3%	€ 515 985	9.28%	€ 15 m	€ 41 m
Czechia	Central and Eastern Europe	€ 69 m	15.9%	€ 11 m	9.24%	€ 196 m	€ 495 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Denmark	Northern Europe	€ 102 m	12.0%	€ 12 m	3.50%	€ 215 m	€ 588 m
Estonia	Central and Eastern Europe	€ 7.2 m	15.9%	€ 1.1 m	8.93%	€ 20 m	€ 51 m
Finland	Northern Europe	€ 79 m	12.0%	€ 9.5 m	3.14%	€ 166 m	€ 453 m
France	South and Western Europe	€ 954 m	8.3%	€ 79 m	2.99%	€ 2 271 m	€ 6 313 m
Germany	DACH	€ 1 486 m	6.7%	€ 99 m	5.32%	€ 2 878 m	€ 8 328 m
Greece	South and Western Europe	€ 40 m	8.3%	€ 3.3 m	2.89%	€ 95 m	€ 265 m
Hungary	Central and Eastern Europe	€ 28 m	15.9%	€ 4.5 m	5.27%	€80 m	€ 204 m
Ireland	Northern Europe	€ 94 m	12.0%	€ 11 m	6.62%	€ 198 m	€ 542 m
Italy	South and Western Europe	€ 499 m	8.3%	€ 42 m	2.49%	€ 1 187 m	€ 3 301 m
Latvia	Central and Eastern Europe	€ 7.4 m	15.9%	€ 1.2 m	10.77%	€ 21 m	€ 53 m
Lithuania	Central and Eastern Europe	€ 12 m	15.9%	€ 1.9 m	10.07%	€ 35 m	€ 88 m
Luxembourg	Benelux	€ 12 m	11.4%	€ 1.4 m	5.96%	€ 27 m	€ 74 m
Malta	South and Western Europe	€ 4.2 m	8.3%	€ 347 818	9.65%	€ 9.9 m	€ 28 m
Netherlands	Benelux	€ 295 m	11.4%	€ 34 m	3.96%	€ 642 m	€ 1 790 m
Poland	Central and Eastern Europe	€ 105 m	15.9%	€ 17 m	6.30%	€ 298 m	€ 755 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all hospitals *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Portugal	South and Western Europe	€ 72 m	8.3%	€ 6.0 m	5.79%	€ 171 m	€ 477 m
Romania	Central and Eastern Europe	€ 37 m	15.9%	€ 5.9 m	10.10%	€ 105 m	€ 267 m
Slovakia	Central and Eastern Europe	€ 21 m	15.9%	€ 3.4 m	6.15%	€ 60 m	€ 153 m
Slovenia	Central and Eastern Europe	€ 14 m	15.9%	€ 2.2 m	6.95%	€ 39 m	€ 99 m
Spain	South and Western Europe	€ 329 m	8.3%	€ 27 m	4.27%	€ 784 m	€ 2 181 m
Sweden	Northern Europe	€ 180 m	12.0%	€ 22 m	2.63%	€ 378 m	€ 1033 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 0.4 bn**	—	**€ 11 bn**	**€ 30 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see **Figure 1**).
- [b] See Table 39 for the underlying calculation.
- [c] See Figure 107 and Annex G6 for the underlying calculations.
- [d] Calculated for year 0 with the formula: $\text{Cost savings with } 100\% \text{ adoption}$ × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year $0 = (1 + 0.04)^0 = 1$. Expenditure factor in year $0 = 1$.
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Cost savings in year $0 +$ (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n.
  Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

6.2 ANALYSIS OF THE ONE-OFF AND RECURRING COSTS OF THE USE CASE

6.2.1(d) Quantification and monetisation of the costs of implementing and operating the use case based on pricing data of a reference country

The calculation of the one-off and recurring costs for this use case was not feasible due to several factors, primarily that there is currently limited real-world implementation of the technology in hospital settings, meaning there are few established case studies to draw upon for accurate cost estimation by the experts. Efforts are still primarily concentrated on research and development rather than on commercial deployment and adoption of a mature and scalable product. Therefore, there is considerable uncertainty stemming from the emerging and rapidly evolving nature of this digital health technology. A further challenge is that costs are highly variable and case-specific to the medical condition being addressed, meaning that cost estimations are heavily reliant on case studies from hospital settings.

Nonetheless, several cost drivers for constructing a VHT have been identified, some of which currently involve resource-intensive activities. One of the key cost drivers is the availability and quality of patient data. Personalising the VHT for individual patients often involves collecting data through expensive modalities such as MRI, CT, PET scans, or EEGs, particularly for neurological applications. Another significant cost component is the engineering effort required to build and fine-tune the model. This process can be time-consuming and labour-intensive, especially when done in the context of research and development with technologies that have limited automation. Finally, clinical validation adds further costs, as it requires expert review to ensure the model accurately reflects the patient's physiology and is suitable for clinical use. These elements contribute to the overall complexity and variability of VHT implementation costs given the current maturity level of the technology.

However, experts noted that the costs associated with constructing a VHT are decreasing. Whereas several years ago the engineering process could take several days per patient, it now typically requires only a few hours. The ambition is to develop a model that clinicians can use with minimal effort, enabling near-immediate application in clinical settings.

6.2.2(e) Analysis of the model's sensitivity

Monte Carlo simulations were conducted to assess the robustness of the economic analysis. In the economic analysis, fixed input values were used for the calculations. In the Monte Carlo simulations, the input values used to quantify the gross cost savings (see **Table 37** for the quantification of the value drivers) in the reference country were randomly varied in a simulation using 1 million samples. Only the quantification equations used to calculate the gross cost savings in the reference country were modelled in the simulation.

The range (distribution) of possible values for each value driver was determined based on the range of values estimated in **Annex G4**. The randomly sampled input values from these distributions were then used to estimate the total gross cost savings in the reference country in year 0.

The results of the simulation are summarised in **Table 42**. The distributions from the simulation capture the likely range and uncertainty of the values quantified for the reference country. The range of uncertainty is defined as two standard deviations from the mean of the distribution.

Table 42: Estimates of the total gross cost savings in the reference country in year 0 based on three Monte Carlo simulations (sample size = 1 million)

Parameters	A: Total cost savings (benefit) of the full implementation scenario in the reference country in a full scenario [EUR][a]	B: Total cost savings (benefit) of the partial implementation scenario in the reference country in a partial scenario [EUR][b]
Lower estimate from simulation (−2 sigma)[c]	€ 532 m	€ 262 m
Calculation from economic analysis[d]	€ 545 m	€ 268 m
Upper estimate from simulation (+2 sigma)[c]	€ 558 m	€ 275 m
Standard deviation from simulation	€ 6.3 m	€ 3.1 m

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] Compare with column E in Table 37.
- [b] Compare with column G in Table 37.
- [c] The expected range of the estimated values is defined as two standard deviations ("2 sigma") from the mean of the distribution. The lower and upper estimates are calculated with the formula: $\text{mean} \pm (2 \times \text{standard deviation})$.
- [d] The single-point value calculated from the analysis is approximately equal to the mean of the simulations.

By quantifying the individual impact of each value driver on model variance, the analysis enables a clearer understanding of how sensitive the overall outcome is to changes in specific inputs. During the simulation of the gross cost savings, the outputs of each value driver were recorded (1 million samples per value driver). Based on the distribution of each value driver, the variance was calculated. To calculate the contribution of each value driver to the overall uncertainty (variance) of the model, the variance of each value driver was divided by the variance of the gross cost savings (total variance). The relative contribution of the value drivers to the benefit model's uncertainty is illustrated in **Figure 108.**

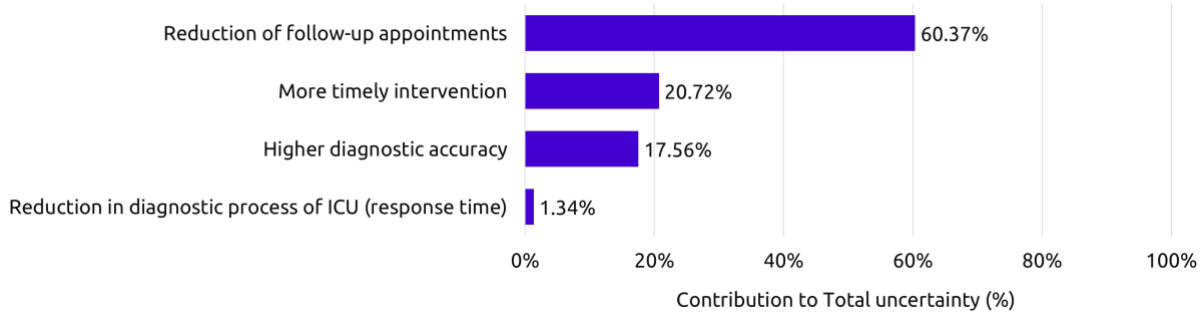


Figure 108: Relative contribution of each value driver to the uncertainty in the benefits model of the reference country

Since one-off and recurring costs were not calculated, the net cost avoidance could not be computed nor evaluated in a sensitivity analysis.

6.2.3(f) Discussion and conclusions

The analysis shows that virtual human twins offer promising clinical benefits, such as more timely interventions, improved diagnostic accuracy, and reduced complications. The most substantial value driver is 'shorter hospital stays'.

The gross costs savings of these clinical benefits were modelled. As shown in **Figure 108**, the value driver 'reduction of follow-up appointments' has the greatest impact on the overall uncertainty in the model's output and is therefore the most critical factor for achieving the gross cost savings estimated in this analysis. Compared to the sensitivity analyses conducted for other use cases, uncertainty in this model is attributable to multiple value drivers instead of being captured by primarily by only one or two parameters. Only the value driver 'reduction in diagnostic process of ICU (response time)' has a negligible effect on the model's output.

As a critique of the analysis, one expert in the validation session expressed that the adoption rate used to extrapolate the gross cost savings across the EU may be overly optimistic. Nonetheless, the adoption rate was calculated based on responses to a wide-scale survey.

Since it was not feasible to calculate the one-off and recurring costs of the use case due to a lack of robust data from hospital settings, the net cost avoidance could not be determined. Therefore, the potential financial impact of this use case could not be fully evaluated. Nonetheless, the potential impact of this technology on healthcare should not be overlooked. Virtual human twins may offer meaningful improvements to quality of care, including faster diagnostics, reduced complications, and more personalised treatment pathways. These aspects are outside the scope of this financial study and are therefore not reflected in this report. Additionally, experts noted that the field is advancing rapidly, which may further influence both the cost structure and the clinical utility of VHTs in the future. In general, current efforts are primarily concentrated on research and development rather than on commercial deployment and adoption of a mature and optimised product. A commercial-scale technology will likely address the current need for labour-intensive input from an expert and instead introduce more automated steps for clinicians to use the technology in hospital settings.

7 Use Case 4: Mental health platforms

Mental health platforms include a range of technologies that leverage data from wearables, mobile applications and electronic health records to support individuals with mental health needs through remote access, data-driven insights and personalised care.

The selected use case for this analysis is a mental health platform enhanced by artificial intelligence. In the **full implementation scenario**, the platform offers remote consultations with a clinician, AI-powered chatbots, and tools for tracking the progress of therapy and the patient's mental health outcomes. Processes such as clinical documentation, mental health monitoring (e.g. depression, anxiety, well-being) and appointment scheduling can be automated to increase the operational efficiency of healthcare delivery. In turn, the platform provides real-time, personalised mental health services and actionable insights to both patients and clinicians.

The analysis assumes a **baseline scenario** where no digital mental health platforms are implemented. Mental healthcare is delivered in-person and there is a lack of data and tools to enable personalisation and early detection capabilities.

Key takeaways

- **Economic impact:** Mental health platforms offer a strong economic case for cost avoidance across EU healthcare systems. The full implementation of the use case is projected to yield a cumulative net cost avoidance of €164 billion (full scenario) and €136 billion (partial scenario) over ten years.
- **Implementation scenario:** The full implementation scenario's cumulative net cost avoidance rises steeply and consistently over time. the partial implementation scenario increases at a slightly slower rate. The cumulative net cost avoidance in the partial implementation scenario delivers 83% of the full scenario's benefit.
- **Sensitivity analysis:** The sensitivity analysis indicates that the value drivers 'fewer residential admissions' is associated with the highest levels of uncertainty in the model's output.
- **System-level impact:** When benchmarked against projected EU healthcare expenditure, the full implementation of mental health platforms could reduce total healthcare expenditure by approximately 0.65% after ten years, while the partial scenario may achieve a reduction of 0.5%.

Please refer to section 7.2.6 for the discussion and conclusions of this analysis and Part C for the overall conclusions and limitations.

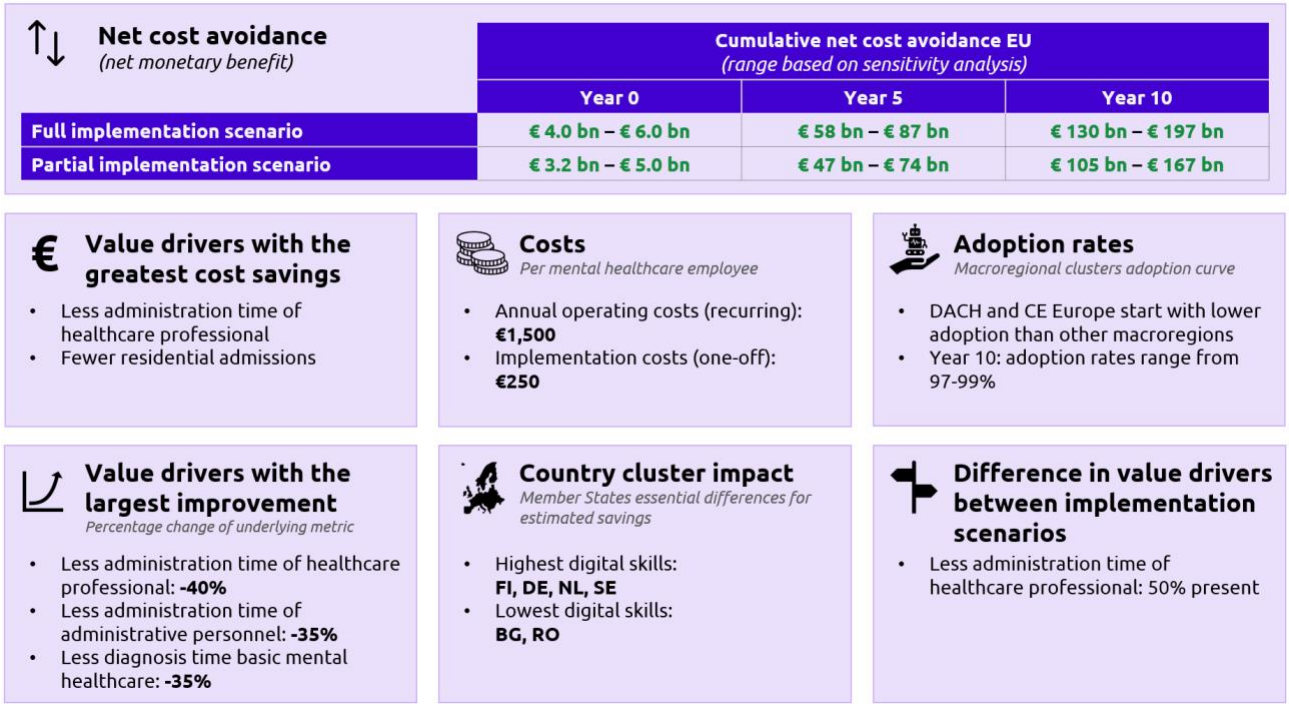


Figure 109: Overview of key findings for the use case 'mental health platform'

7.1 ANALYSIS OF THE GROSS FINANCIAL SAVINGS

7.1.1(a) Quantification and monetisation of the value drivers and resulting cost savings from implementing the use case, using pricing data of a reference country

To identify the underlying causes of cost savings offered by the use case (i.e. the activities the use case helps improve), a list of value drivers was defined and is presented in **column A of Table 43** (refer to **Annex H1** for the list of experts that provided input for the data collection and **Annex H2** for the simplified benefits logic diagram that resulted from their input).

These value drivers lead to the benefit of cost savings through various underlying mechanisms. For example, a patient that is better connected to the healthcare provider online will allow more remote working for the healthcare professionals and that leads to reduced travel expenses (value driver) and less office space needed (value driver).

The metrics used to quantify the value drivers are listed in **column B of Table 43.** These metrics are converted into monetary terms based on annual pricing data from the reference country for this use case, the Netherlands, for the subset of medical conditions applicable to the use case. The results of these calculations are presented in **column C of Table 43** and represent the cost of performing the activities described by the value drivers in the absence of the use case (baseline scenario). Refer to **Annex H3** for the sources of these data and the calculations for each value driver.

To quantify the effect the use case has on the value drivers, a mean savings rate was estimated for the full implementation scenario, in which the use case is assumed to be fully effective (see **column D of Table 43** and refer to **Annex H4** for the calculation of the savings rate).

By multiplying the savings rate per value driver (**column D**) with the baseline cost of the value driver (**column C**), the benefit in terms of cost savings is given for each value driver (see **column E of Table 43**) for the fictional reference case. The analysis shows that the greatest cost savings for this use case are

attributable to less administration time (value drivers #4 and #5) and to fewer residential admissions (value driver #7).

To calculate the cost savings of the value drivers for a scenario in which the use case is partially effective, the value drivers were annotated as likely to be 'absent' (0%), 'partially realised' (assumed at 50%), or 'fully realised' (100%) in a partial scenario. These presence rates are presented in **column F of Table 43** and are based on input from the workshop (**Annex H2**). By multiplying the cost savings of the value driver in the full scenario (**column E**) with the presence rate of that value driver in the partial scenario (**column F**), the cost savings of each value driver in the partial scenario is calculated (see **column G of Table 43**) for the fictional reference case.

Table 43: Quantified and monetised costs of the value drivers in the baseline scenario, the cost savings (benefit) of the full implementation scenario, and the cost savings (benefit) of the partial scenario using annual pricing data from the reference country

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
	What is the activity that the use case helps improve?	*How is the activity measured?*	*How much does it cost to do the activity without the use case?*	*How much less will the activity cost with the use case fully implemented and effective compared to the baseline?*	*How much money is saved per activity with the use case fully effective in its implementation?*	*To what degree will the cost savings be present if the use case is partial effective compared to the full scenario?*	*How much money is saved per activity with the use case partially effective in its implementation?*
1	Less travel expenses	Total travel costs	€ 276 m	4 %	€ 9.7 m	100 %	€ 9.7 m
2	Less diagnosis time basic mental health care	Total diagnosis costs	€ 256 m	35 %	€ 90 m	100 %	€ 90 m
3	Less diagnosis time specialised mental health care	Total diagnosis costs	€ 338 m	20 %	€ 68 m	100 %	€ 68 m
4	Less administration time of healthcare professional	Total administration time costs	€ 970 m	40 %	€ 388 m	50 %	€ 194 m
5	Less administration time of	Total administration time costs	€ 594 m	35 %	€ 208 m	100 %	€ 208 m

#	A: Value driver description	B: Value driver metric[a]	C: Value driver costs in the baseline scenario: monetised for the reference country [EUR][b]	D: Savings rate compared to the baseline (midpoint of estimated range) [%][c]	E: Cost savings (benefit) of the full implementation scenario in the reference case [EUR][d]	F: Presence rate compared to the full scenario [%][e]	G: Cost savings (benefit) of the partial scenario in the reference case [EUR][f]
	administrative personnel						
6	Less office space needed	Total rent and energy costs	€ 1 262 m	15 %	€ 189 m	100 %	€ 189 m
7	Fewer residential admissions	Total residential admission costs (excluding treatment)	€ 1 243 m	25 %	€ 310 m	100 %	€ 310 m
Total cost savings for the fictional reference case					**€ 1.3 bn**	**—**	**€ 1.1 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The metrics either relate directly to the value driver (e.g. shorter hospital stays can be measured directly in days) or are closely correlated to it (e.g. fewer medical errors can be measured indirectly through the number of medical procedures).
- [b] To be comparable, the metrics are scaled to the order of the country, meaning they represent the cost for all mental health facilities in a country's healthcare system. See Annex H3 for the calculations of each value driver.
- [c] The magnitude of the savings was determined through interviews with experts. Experts were asked to provide estimated ranges, both conservative and optimistic, regarding the improvements the use case could bring to the value drivers. The midpoint of this estimated range was taken as the savings rate. See Annex H4 for the calculations.
- [d] Calculated with the formula: Baseline scenario [EUR] × savings rate [%]
- [e] The likelihood of a value driver being present in the partial scenario was determined through an expert workshop. Refer to the benefits logic in Annex H2.
- [f] Calculated with the formula: Cost savings in full scenario [EUR] × presence rate [%]

7.1.2(b) Extrapolating the benefits to the EU-27

The result of quantifying and monetising the value drivers of the use case in the previous section is the estimated cost savings for a full and partial implementation scenario in a fictional reference case. To convert the reference values to values specific to each Member State, several adjustment factors must be applied to the pricing data and the savings rate use in the reference case.

To account for essential differences in the extent to which countries may achieve the estimated savings rate for this use case, countries are clustered into four groups based on the individuals' level of digital skills[191], an index that measures the citizens' digital skills in four specific areas: information, communication, problem solving, and software skills. This index is used to cluster the countries on the premise that countries in which citizens are more able and prepared to use digital health technologies are generally better positioned to realise the potential benefits of a use case like mental health platforms that requires the direct engagement of the citizen with the digital health solution. A weighting is assigned to each cluster based on the median maturity score of the countries in the cluster relative to the median maturity score of all Member States. The calculations are presented in **Table 44.** This calculation is performed on the premise that countries with lower levels of digital skills have less ability to embrace the new technology and are thus limited in their ability to reap the potential benefits of the use cases when they adopt it in year 0.

Table 44: Calculation of the cluster weighting

A: Cluster name	B: Cluster definition	C: Member States in the cluster	D: Cluster weighting [factor] [a]
High	Level of digital skills ≥70%	Finland, Germany, Netherlands, Sweden	$\frac{74\ \%}{56\ \%} = 1.33$
Moderate high	55% ≤ Level of digital skills < 70%	Austria, Belgium, Czechia, Denmark, Estonia, France, Lithuania, Luxembourg, Malta, Slovenia, Spain	$\frac{61\ \%}{56\ \%} = 1.09$
Moderate low	40% ≤ Level of digital skills < 55%	Croatia, Cyprus, Greece, Hungary, Ireland, Italy, Latvia, Poland, Portugal, Slovakia	$\frac{50\ \%}{56\ \%} = 0.89$
Low	Level of digital skills < 40%	Bulgaria, Romania	$\frac{30\ \%}{56\ \%} = 0.54$

Notes:
- The cluster factor is displayed rounded to two decimals. Calculations are performed using the unrounded values.
- [a] Calculated with the formula: median individuals' level of digital skills of countries in the cluster [%] ÷ median individuals' level of digital skills of all countries [%]

In addition to difference related to the use case, countries have general difference in their healthcare expenditures, which reflects differences in prices, population size, and demographic characteristic, among other variables. For this analysis, mental healthcare expenditure is calculated as a factor compared to the reference country (the Netherlands' pricing data) (see **column C** of **Table 45** and **Annex H5** for the underlying calculation).

By multiplying the cost savings of the fictional reference case (**Table 43**) by the cluster weighting and the relative proportion of mental health expenditure of each Member State, an estimate of the cost

[191] Eurostat (2019)

savings in each Member State is produced, which assumes that the use case is implemented in all mental health facilities (100% adoption). This calculation is presented in **Table 45**.

Table 45: Calculation of the total cost savings for the full and partial implementation scenarios per Member State in one year assuming 100% adoption of the use case

A: Member State	B: Cluster weighting [factor][a]	C: Proportion of mental healthcare expenditure relative to the Netherlands [factor][b]	D: Cost savings: full scenario in all mental health facilities [EUR][c]	E: Cost savings: partial scenario in all mental health facilities [EUR][d]
Austria	1.09	0.30	€ 419 m	€ 355 m
Belgium	1.09	0.36	€ 501 m	€ 424 m
Bulgaria	0.54	0.01	€ 6.1 m	€ 5.1 m
Croatia	0.89	0.03	€ 34 m	€ 29 m
Cyprus	0.89	0.01	€ 13 m	€ 11 m
Czechia	1.09	0.07	€ 94 m	€ 79 m
Denmark	1.09	0.22	€ 303 m	€ 256 m
Estonia	1.09	0.01	€ 19 m	€ 16 m
Finland	1.33	0.10	€ 164 m	€ 139 m
France	1.09	3.90	€ 5 372 m	€ 4 547 m
Germany	1.33	5.19	€ 8 737 m	€ 7 395 m
Greece	0.89	0.07	€ 84 m	€ 71 m
Hungary	0.89	0.06	€ 62 m	€ 53 m
Ireland	0.89	0.19	€ 212 m	€ 180 m
Italy	0.89	0.85	€ 951 m	€ 805 m
Latvia	0.89	0.02	€ 19 m	€ 16 m
Lithuania	1.09	0.03	€ 41 m	€ 35 m
Luxembourg	1.09	0.03	€ 36 m	€ 31 m
Malta	1.09	0.01	€ 15 m	€ 13 m
Netherlands	1.33	1.00	€ 1 684 m	€ 1 425 m
Poland	0.89	0.21	€ 231 m	€ 196 m
Portugal	0.89	0.13	€ 143 m	€ 121 m
Romania	0.54	0.10	€ 68 m	€ 58 m
Slovakia	0.89	0.05	€ 58 m	€ 49 m
Slovenia	1.09	0.04	€ 58 m	€ 49 m
Spain	1.09	0.63	€ 871 m	€ 737 m
Sweden	1.33	0.57	€ 961 m	€ 813 m
Total cost savings for the EU-27 with 100% adoption			**€ 21.2 bn**	**€ 17.9 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] See Table 44 for the underlying calculation.

A: Member State	B: Cluster weighting [factor][a]	C: Proportion of mental healthcare expenditure relative to the Netherlands [factor][b]	D: Cost savings: full scenario in all mental health facilities [EUR][c]	E: Cost savings: partial scenario in all mental health facilities [EUR][d]

- [b] See Annex H5 for the underlying calculation. The Netherlands = 1.
- [c] Calculated with the formula: Reference case savings in full scenario [EUR] × cluster factor × expenditure factor. See Table 13 for the calculation of the reference case savings in the full scenario.
- [d] Calculated with the formula: Reference case savings in partial scenario [EUR] × cluster factor × expenditure factor. See Table 43 for the calculation of the reference case savings in the partial scenario.

7.1.3(c) Forecasting the benefits to the EU-27 over time

The result of extrapolating the cost savings from the fictional reference case to each Member State in the previous section is an estimate of the full market potential (100% adoption) for gross cost savings of the use case. To adjust the estimated savings based on the expected degree of adoption of the use case, adoption rates per regional cluster of Member States were calculated for the current year and forecasted for the next ten years (see **Figure** 110 and **Annex H6**) based on the results of the healthcare provider survey (see **Figure 1**). Furthermore, to account for changes in health expenditure over time, the average health expenditure growth (compound annual growth rate) per Member State was calculated for the period 2014 – 2022 (see **column F of Table 46**) and forecasted for the next ten years. By multiplying the cost savings calculated in a case of 100% adoption (**Table 45**) by the estimated adoption rates (of the macro-region) and the growth of health expenditure, the estimated cost savings per country per year is calculated. By dividing by a discount rate, the estimated future savings are normalised to the present-day value of money. Adding up the annual values over 5 years and 10 years gives the cumulative cost savings in present-day money. The calculation for the full implementation scenario is presented in **Table 46** and for the partial implementation scenario in **Table 47.**

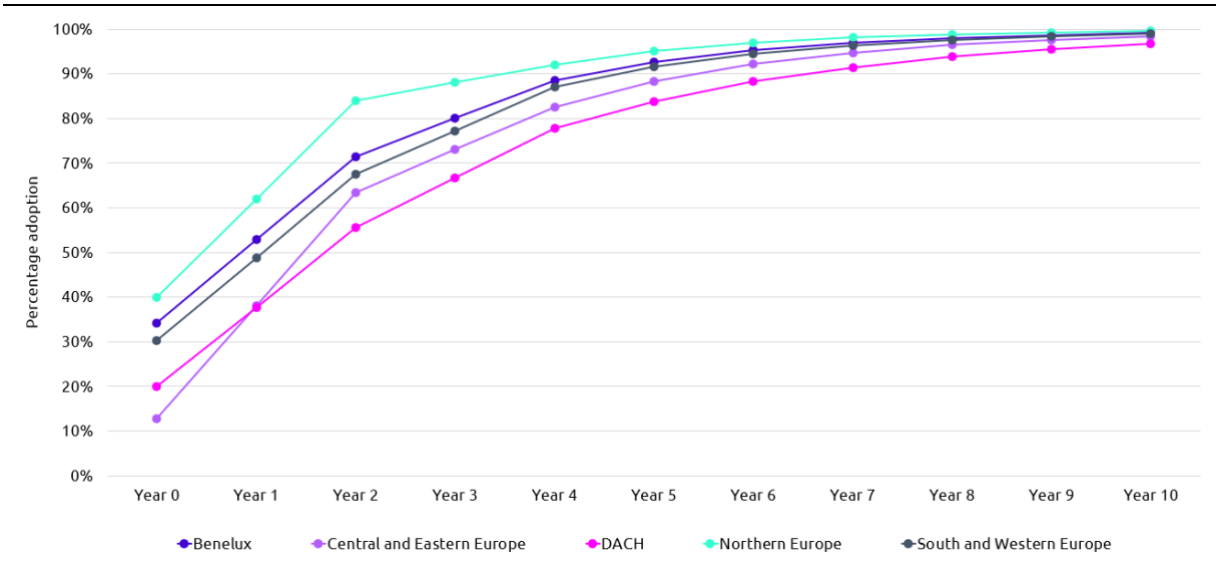


Figure 110: Adoption curve for telehealth and virtual care platforms based on the healthcare provider survey (see Figure 1) for years 0 to 4 and an extrapolated trend curve for years 5 to 10 (see Annex H6).

Table 46: Forecasted cost savings for the full implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all mental health facilities *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€ 419 m	20.0 %	84 m	4.71 %	1 429 m	3 374 m
Belgium	Benelux	€ 501 m	34.3 %	172 m	4.25 %	2 098 m	4 534 m
Bulgaria	Central and Eastern Europe	€ 6.1 m	12.7 %	0.7 m	8.98 %	22 m	51 m
Croatia	Central and Eastern Europe	€ 34 m	12.7 %	4.3 m	6.83 %	121 m	282 m
Cyprus	South and Western Europe	€ 13 m	30.3 %	3.9 m	9.28 %	51 m	113 m
Czechia	Central and Eastern Europe	€ 94 m	12.7 %	12 m	9.24 %	335 m	782 m
Denmark	Northern Europe	€ 303 m	40.0 %	121 m	3.50 %	1 395 m	2 882 m
Estonia	Central and Eastern Europe	€ 19 m	12.7 %	2.5 m	8.93 %	70 m	163 m
Finland	Northern Europe	€ 164 m	40.0 %	66 m	3.14 %	757 m	1564 m
France	South and Western Europe	€ 5 372 m	30.3 %	1 628 m	2.99 %	21 597 m	47 607 m
Germany	DACH	€ 8 737 m	20.0 %	1 747 m	5.32 %	29 810 m	70 369 m
Greece	South and Western Europe	€ 84 m	30.3 %	25 m	2.89 %	336 m	742 m
Hungary	Central and Eastern Europe	€ 62 m	12.7 %	8 m	5.27 %	223 m	521 m
Ireland	Northern Europe	€ 212 m	40.0 %	85 m	6.62 %	977 m	2 019 m

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all mental health facilities *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Italy	South and Western Europe	€ 951 m	30.3 %	288 m	2.49 %	4 721 m	8 431 m
Latvia	Central and Eastern Europe	€ 19 m	12.7 %	2.4 m	10.77 %	67 m	156 m
Lithuania	Central and Eastern Europe	€ 41 m	12.7 %	5.2 m	10.07 %	147 m	342 m
Luxembourg	Benelux	€ 36 m	34.3 %	12 m	5.96 %	152 m	327 m
Malta	South and Western Europe	€ 15 m	30.3 %	4.5 m	9.65 %	59 m	131 m
Netherlands	Benelux	€ 1 684 m	34.3 %	577 m	3.96 %	7 059 m	15 248 m
Poland	Central and Eastern Europe	€ 231 m	12.7 %	29 m	6.30 %	827 m	1 932 m
Portugal	South and Western Europe	€ 143 m	30.3 %	43 m	5.79 %	574 m	1 266 m
Romania	Central and Eastern Europe	€ 68 m	12.7 %	8.6 m	10.10 %	243 m	569 m
Slovakia	Central and Eastern Europe	€ 58 m	12.7 %	7.4 m	6.15 %	208 m	485 m
Slovenia	Central and Eastern Europe	€ 58 m	12.7 %	7.4 m	6.95 %	208 m	486 m
Spain	South and Western Europe	€ 871 m	30.3 %	264 m	4.27 %	3 500 m	7 715 m
Sweden	Northern Europe	€ 961 m	40.0 %	384 m	2.63 %	4 424 m	9 144 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 5.6 bn**		**€ 81 bn**	**€ 181 bn**

A: Member State	B: Regional cluster[a]	C: Cost savings: full scenario in all mental health facilities *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1).
- [b] See Table 45 for the underlying calculation.
- [c] See Figure 100 and Annex H6 for the underlying calculations.
- [d] Calculated for year 0 with the formula: Cost savings with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year 0 $= (1 + 0.04)^0 = 1$. Expenditure factor in year 0 $= 1$
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Cost savings in year $0 +$ (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n.
  Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

Table 47: Forecasted cost savings for the partial implementation scenario based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all mental health facilities *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Austria	DACH	€ 355 m	20.0 %	€ 71 m	4.71 %	€ 1 210 m	€ 2 856 m
Belgium	Benelux	€ 424 m	34.3 %	€ 145 m	4.25 %	€ 1 776 m	€ 3 837 m
Bulgaria	Central and Eastern Europe	€ 5.1 m	12.7 %	€ 0.6 m	8.98 %	€ 18 m	€ 43 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all mental health facilities *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Croatia	Central and Eastern Europe	€ 29 m	12.7 %	€ 3.6 m	6.83 %	€ 102 m	€ 239 m
Cyprus	South and Western Europe	€ 11 m	30.3 %	€ 3.3 m	9.28 %	€ 44 m	€ 96 m
Czechia	Central and Eastern Europe	€ 79 m	12.7 %	€ 10 m	9.24 %	€ 283 m	€ 662 m
Denmark	Northern Europe	€ 256 m	40.0 %	€ 103 m	3.50 %	€ 1 180 m	€ 2 439 m
Estonia	Central and Eastern Europe	€ 16 m	12.7 %	€ 2.1 m	8.93 %	€ 59 m	€ 138 m
Finland	Northern Europe	€ 139 m	40.0 %	€ 56 m	3.14 %	€ 641 m	€ 1 324 m
France	South and Western Europe	€ 4 547 m	30.3 %	€ 1 378 m	2.99 %	€ 18 280 m	€ 40 293 m
Germany	DACH	€ 7 395 m	20.0 %	€ 1 479 m	5.32 %	€ 25 230 m	€ 59 559 m
Greece	South and Western Europe	€ 71 m	30.3 %	€ 21 m	2.89 %	€ 285 m	€ 628 m
Hungary	Central and Eastern Europe	€ 53 m	12.7 %	€ 6.7 m	5.27 %	€ 189 m	€ 441 m
Ireland	Northern Europe	€ 180 m	40.0 %	€ 72 m	6.62 %	€ 827 m	€ 1 709 m
Italy	South and Western Europe	€ 805 m	30.3 %	€ 244 m	2.49 %	€ 3 237 m	€ 7 136 m
Latvia	Central and Eastern Europe	€ 16 m	12.7 %	€ 2.0 m	10.77 %	€ 57 m	€ 132 m
Lithuania	Central and Eastern Europe	€ 35 m	12.7 %	€ 4.4 m	10.07 %	€ 124 m	€ 290 m
Luxembourg	Benelux	€ 31 m	34.3 %	€ 10 m	5.96 %	€ 128 m	€ 277 m
Malta	South and Western Europe	€ 13 m	30.3 %	€ 3.8 m	9.65 %	€ 50 m	€ 111 m

A: Member State	B: Regional cluster[a]	C: Cost savings: partial scenario in all mental health facilities *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Cost savings in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative cost savings in year 5 [EUR][f]	H: Cumulative cost savings in year 10 [EUR][f]
Netherlands	Benelux	€ 1 425 m	34.3 %	€ 489 m	3.96 %	€ 5 975 m	€ 12 906 m
Poland	Central and Eastern Europe	€ 196 m	12.7 %	€ 25 m	6.30 %	€ 700 m	€ 1 635 m
Portugal	South and Western Europe	€ 121 m	30.3 %	€ 37 m	5.79 %	€ 486 m	€ 1 072 m
Romania	Central and Eastern Europe	€ 58 m	12.7 %	€ 7.3 m	10.10 %	€ 206 m	€ 481 m
Slovakia	Central and Eastern Europe	€ 49 m	12.7 %	€ 6.2 m	6.15 %	€ 176 m	€ 410 m
Slovenia	Central and Eastern Europe	€ 49 m	12.7 %	€ 6.3 m	6.95 %	€ 176 m	€ 412 m
Spain	South and Western Europe	€ 737 m	30.3 %	€ 223 m	4.27 %	€ 2 962 m	€ 6 530 m
Sweden	Northern Europe	€ 813 m	40.0 %	€ 325 m	2.63 %	€ 3 745 m	€ 7 739 m
Total cumulative cost savings for the EU-27 (present-day money)				**€ 4.7 bn**		**€ 68 bn**	**€ 153 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 15 for the underlying calculation.
- [c] See Figure 100 and Annex H6 for the underlying calculation.
- [d] Calculated for year 0 with the formula: Cost savings with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year 0 $= (1 + 0.04)^0 = 1$. Expenditure factor in year 0 $= 1$.
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula: Cost savings in year $0 +$ (cost savings with 100% adoption × adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (cost savings with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n. Formula for discount rate: $(1 + 0.04)^n$, where n = year number. Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

7.2 ANALYSIS OF THE ONE-OFF AND RECURRING COSTS OF THE USE CASE

7.2.1(d) Quantification and monetisation of the costs of implementing and operating the use case based on pricing data of a reference country

To quantify the cost of implementing and operating the use case, both one-off and recurring costs were estimated by an expert interview. The expert provided cost estimates on a per-employee basis, reflecting a common pricing strategy employed by technology vendors when contracting with healthcare providers (see **column A and column B of Table 48** and refer to **Annex H7** for the underlying calculations).

To calculate the total recurring and one-off costs in the reference country, the per-employee estimates were multiplied by the total number of mental healthcare professionals in the Netherlands (see **column C of Table 48**) to yield the one-off and annual recurring costs across all mental healthcare facilities (see **column D and columns E of Table 48**).

Table 48: Quantified and monetised costs of implementing (one-off) and operating (annual recurring) the use case relative to a benchmark case based on pricing data from the reference country

A: One-off costs of implementing the use case per employee (midpoint of estimated range) [EUR][a]	B: Annual recurring costs of operating the use case per employee (midpoint of estimated range) [EUR][a]	C: Number of mental healthcare professionals in the reference country[b]	D: Total one-off costs of implementing the use case in all mental healthcare facilities in the reference country [EUR][c]	E: Total annual recurring costs of operating the use case in all mental healthcare facilities in the reference country [EUR][d]
€ 250	€ 1 500	84 000	€ 21 m	€ 126 m

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The estimation of both one-off and recurring costs for the use case was derived through expert interviews. The expert was asked to provide a range of estimates, including conservative and optimistic scenarios. The midpoint of each range was used as the representative value for analysis. Detailed calculations can be found in Annex H7.
- [b] Sources: AZW (2023) and Vektis (2024); see Annex H3 value driver #1 for the calculation.
- [c] Calculated with the formula: One off costs per employee × number of mental healthcare employees
- [d] Calculated with the formula: Recurring costs per employee × number of mental healthcare employees

7.2.2(e) Extrapolating the costs to the EU-27

The result of quantifying and monetising the one-off and recurring costs of the use case in the previous section is the estimated costs for all mental healthcare facilities in the reference country. To convert the reference values to values specific to each Member State, both the one-off and recurring costs for all mental healthcare facilities in the reference country (**Table 48**) were multiplied by the relative number of psychiatrists in each Member State (see **column B of Table 49**) and by a factor of purchasing power parity in Euros (PPP) relative to the Netherlands (see **column C of Table 49** and **Annex D4**) to give the total implementation and operating costs for mental healthcare

facilities in each Member State (100% adoption), corrected for pricing differences relative to the reference country. The calculation is presented in **Table 49.** It should be noted that the total number of mental health professionals (i.e. beyond only psychiatrists) was used to calculate the reference value in the reference country; however, the relative number of psychiatrist is used in the extrapolation step due to these data being available for all Member States. It is therefore assumed that the number of psychiatrists is correlated to the number of mental health professionals.

Table 49: Calculation of the total one-off (implementation) and annual recurring (operational) cost of the use case per Member State in one year assuming 100% adoption of the use case

A: Member State	B: Total number of psychiatrists[a]	B: Total number of psychiatrists relative to the Netherlands [factor][b]	C: Purchasing power parity (PPP) relative to the Netherlands [factor][c]	D: Total one-off implementation costs in all mental health facilities in year 0 *(100% adoption)* [EUR][d]	E: Total recurring operation costs in all mental health facilities in year 0 *(100% adoption)* [EUR][e]
Austria	2 039	0.45	1.05	€ 9.9 m	€ 59 m
Belgium	2 073	0.45	0.89	€ 8.5 m	€ 51 m
Bulgaria	685	0.15	0.30	€ 1.0 m	€ 5.8 m
Croatia	728	0.16	0.46	€ 1.5 m	€ 9.2 m
Cyprus	134	0.03	0.72	€ 0.4 m	€ 2.6 m
Czechia	1 791	0.39	0.39	€ 3.2 m	€ 19 m
Denmark	1 117	0.24	1.04	€ 5.3 m	€ 32 m
Estonia	272	0.06	0.64	€ 0.8 m	€ 4.8 m
Finland	582	0.13	1.14	€ 3.0 m	€ 18 m
France	15 705	3.44	0.73	€ 53 m	€ 318 m
Germany	24 107	5.28	0.82	€ 91 m	€ 545 m
Greece	2 708	0.59	0.60	€ 7.4 m	€ 45 m
Hungary	1 481	0.32	0.29	€ 2.0 m	€ 12 m
Ireland	1 173	0.26	1.33	€ 7.1 m	€ 43 m
Italy	14 303	3.13	0.85	€ 56 m	€ 337 m
Latvia	275	0.06	0.44	€ 0.6 m	€ 3.4 m
Lithuania	733	0.16	0.46	€ 1.5 m	€ 9.3 m
Luxembourg	128	0.03	1.27	€ 0.7 m	€ 4.5 m
Malta	78	0.02	0.67	€ 0.2 m	€ 1.4 m
Netherlands	4 569	1.00	1.00	€ 21 m	€ 126 m
Poland	5 563	1.22	0.49	€ 12 m	€ 75 m
Portugal	1 631	0.36	0.62	€ 4.6 m	€ 28 m
Romania	3 084	0.67	0.22	€ 3.1 m	€ 19 m
Slovakia	728	0.16	0.51	€ 1.7 m	€ 10 m
Slovenia	380	0.08	0.71	€ 1.2 m	€ 7.5 m

A: Member State	B: Total number of psychiatrists[a]	B: Total number of psychiatrists relative to the Netherlands [factor][b]	C: Purchasing power parity (PPP) relative to the Netherlands [factor][c]	D: Total one-off implementation costs in all mental health facilities in year 0 *(100% adoption)* [EUR][d]	E: Total recurring operation costs in all mental health facilities in year 0 *(100% adoption)* [EUR][e]
Spain	6 417	1.40	0.72	€ 21 m	€ 127 m
Sweden	2 334	0.51	1.15	€ 12 m	€ 74 m
Total costs for the EU-27 with 100% adoption				**€ 0.3 bn**	**€ 2.0 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions.
- [a] Source: Eurostat (2023)
- [b] Calculated with the formula:
  total numbers of psychiatrists in country ÷ total numbers of psychiatrists in the reference country.
  Netherlands = 1.
- [c] See Annex D4 for the underlying calculation. Netherlands = 1.
- [d] Calculated with the formula: one-off costs for all mental health facilities in the reference country × the number of psychiatrists in the country relative to the reference country ×relative PPP. See Table 48 for the calculation of the one-off costs for all mental health facilities in the reference country.
- [e] Calculated with the formula: recurring costs for all mental health facilities in the reference country × the number of psychiatrists in the country relative to the reference country × relative PPP. See Table 48 for the calculation of the recurring costs for all mental health facilities in the reference country.

7.2.3(f) Forecasting the costs to the EU-27 over time

The result of extrapolating the costs from the reference country to each Member State in the previous section is an estimate of the full market cost (100% adoption) of the use case. To adjust the estimated costs based on the expected degree of adoption of the use case, adoption rates per regional cluster were calculated for the current year and forecasted for the next ten years (see **Figure** 110 and **Annex H6**). Furthermore, to account for changes in health expenditure over time, the average health expenditure growth (compound annual growth rate) per Member State was calculated for the period 2014 – 2022 (see **column F of Table 50**) and forecasted for the next ten years.

Since once-off costs are incurred in the first year in which the use case is implemented and each year incrementally more mental healthcare facilities adopt the use case for the first time, the one-off costs were estimated by multiplying the costs calculated in a case of 100% adoption (**Table 49**) by the difference in adoption rates (of the macro-region) between the current and previous years (annual increment in adoption) and the growth of health expenditure for a given year.

Since recurring costs apply only to the proportion of mental healthcare facilities who have adopted the use case, the recurring costs were estimated by multiplying the costs calculated in a case of 100% adoption (**Table 49**) by the estimated adoption rates (of the macro-region) and the growth of health expenditure for a given year.

By dividing by a discount rate, the estimated costs are normalised to the present-day value of money. Adding up the annual values over 5 years and 10 years gives the cumulative costs in present-day money. The calculation for the one-off costs is presented in **Table 50** and for the recurring costs in **Table 51**.

Table 50: Forecasted one-off costs (implementation) based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all mental health facilities in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Austria	DACH	€ 9.9 m	20.0 %	€ 2.0 m	4.71 %	€ 8.2 m	€ 9.1 m
Belgium	Benelux	€ 8.5 m	34.3 %	€ 2.9 m	4.25 %	€ 7.8 m	€ 8.2 m
Bulgaria	Central and Eastern Europe	€ 1.0 m	12.7 %	€ 0.1 m	8.98 %	€ 0.8 m	€ 0.9 m
Croatia	Central and Eastern Europe	€ 1.5 m	12.7 %	€ 0.2 m	6.83 %	€ 1.3 m	€ 1.5 m
Cyprus	South and Western Europe	€ 0.4 m	30.3 %	€ 0.1 m	9.28 %	€ 0.4 m	€ 0.4 m
Czechia	Central and Eastern Europe	€ 3.2 m	12.7 %	€ 0.4 m	9.24 %	€ 2.8 m	€ 3.0 m
Denmark	Northern Europe	€ 5.3 m	40.0 %	€ 2.1 m	3.50 %	€ 5.0 m	€ 5.2 m
Estonia	Central and Eastern Europe	€ 0.8 m	12.7 %	€ 0.1 m	8.93 %	€ 0.7 m	€ 0.8 m
Finland	Northern Europe	€ 3.0 m	40.0 %	€ 1.2 m	3.14 %	€ 2.9 m	€ 3.0 m
France	South and Western Europe	€ 53 m	30.3 %	€ 16 m	2.99 %	€ 48 m	€ 51 m
Germany	DACH	€ 91 m	20.0 %	€ 18 m	5.32 %	€ 75 m	€ 84 m
Greece	South and Western Europe	€ 7.4 m	30.3 %	€ 2.2 m	2.89 %	€ 6.7 m	€ 7.1 m
Hungary	Central and Eastern Europe	€ 2.0 m	12.7 %	€ 0.3 m	5.27 %	€ 1.7 m	€ 1.9 m

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all mental health facilities in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Ireland	Northern Europe	€ 7.1 m	40.0 %	€ 2.9 m	6.62 %	€ 6.8 m	€ 7.0 m
Italy	South and Western Europe	€ 56 m	30.3 %	€ 17 m	2.49 %	€ 51 m	€ 54 m
Latvia	Central and Eastern Europe	€ 0.6 m	12.7 %	€ 0.1 m	10.77 %	€ 0.5 m	€ 0.5 m
Lithuania	Central and Eastern Europe	€ 1.5 m	12.7 %	€ 0.2 m	10.07 %	€ 1.3 m	€ 1.5 m
Luxembourg	Benelux	€ 0.7 m	34.3 %	€ 0.3 m	5.96 %	€ 0.7 m	€ 0.7 m
Malta	South and Western Europe	€ 0.2 m	30.3 %	€ 0.1 m	9.65 %	€ 0.2 m	€ 0.2 m
Netherlands	Benelux	€ 21 m	34.3 %	€ 7.2 m	3.96 %	€ 19 m	€ 20 m
Poland	Central and Eastern Europe	€ 12 m	12.7 %	€ 1.6 m	6.30 %	€ 11 m	€ 12 m
Portugal	South and Western Europe	€ 4.6 m	30.3 %	€ 1.4 m	5.79 %	€ 4.2 m	€ 4.5 m
Romania	Central and Eastern Europe	€ 3.1 m	12.7 %	€ 0.4 m	10.10 %	€ 2.7 m	€ 2.9 m
Slovakia	Central and Eastern Europe	€ 1.7 m	12.7 %	€ 0.2 m	6.15 %	€ 1.5 m	€ 1.6 m
Slovenia	Central and Eastern Europe	€ 1.2 m	12.7 %	€ 0.2 m	6.95 %	€ 1.1 m	€ 1.2 m
Spain	South and Western Europe	€ 21 m	30.3 %	€ 6.4 m	4.27 %	€ 19 m	€ 20 m

A: Member State	B: Regional cluster[a]	C: Total one-off costs in all mental health facilities in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: One off-costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative one off-costs in year 5 [EUR][f]	H: Cumulative one off-costs in year 10 [EUR][f]
Sweden	Northern Europe	€ 12 m	40.0 %	€ 4.9 m	2.63 %	€ 12 m	€ 12 m
Total cumulative one-off costs for the EU-27 (present-day money)				**€ 89 m**	**—**	**€ 293 m**	**€ 315 m**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 49 for the underlying calculation.
- [c] See Figure 110 and Annex H6 for the underlying calculation.
- [d] Calculated with the formula: Costs with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year 0 $= (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Costs in year $0 +$ (costs with 100% adoption × (adoption rate in year 1 [%] $-$ adoption rate in year 0 [%]) × expenditure factor in year 1 ÷ discount rate in year 1) + … + (costs with 100% adoption × (adoption rate in year n [%] $-$ adoption rate in year (n $-$ 1) [%]) × expenditure factor in year n ÷ discount rate in year n. Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

Table 51: Forecasted recurring costs (operational) based on adoption rates and growth in health expenditure in year 0, year 5 and year 10 (cumulative), corrected to present values using a discount rate

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all mental health facilities in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Austria	DACH	€ 59 m	20.0 %	€ 12 m	4.71 %	€ 202 m	€ 477 m
Belgium	Benelux	€ 51 m	34.3 %	€ 18 m	4.25 %	€ 214 m	€ 463 m
Bulgaria	Central and Eastern Europe	€ 5.8 m	12.7 %	€ 0.7 m	8.98 %	€ 21 m	€ 48 m
Croatia	Central and Eastern Europe	€ 9.2 m	12.7 %	€ 1.2 m	6.83 %	€ 33 m	€ 77 m
Cyprus	South and Western Europe	€ 2.6 m	30.3 %	€ 0.8 m	9.28 %	€ 11 m	€ 23 m
Czechia	Central and Eastern Europe	€ 19 m	12.7 %	€ 2.4 m	9.24 %	€ 68 m	€ 159 m
Denmark	Northern Europe	€ 32 m	40.0 %	€ 13 m	3.50 %	€ 147 m	€ 304 m
Estonia	Central and Eastern Europe	€ 4.8 m	12.7 %	€ 0.6 m	8.93 %	€ 17 m	€ 40 m
Finland	Northern Europe	€ 18 m	40.0 %	€ 7.3 m	3.14 %	€ 84 m	€ 174 m
France	South and Western Europe	€ 318 m	30.3 %	€ 96 m	2.99 %	€ 1 279 m	€ 2 819 m
Germany	DACH	€ 545 m	20.0 %	€ 109 m	5.32 %	€ 1 859 m	€ 4 388 m
Greece	South and Western Europe	€ 45 m	30.3 %	€ 13 m	2.89 %	€ 179 m	€ 395 m

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all mental health facilities in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Hungary	Central and Eastern Europe	€ 12 m	12.7 %	€ 1.5 m	5.27 %	€ 43 m	€ 100 m
Ireland	Northern Europe	€ 43 m	40.0 %	€ 17 m	6.62 %	€ 197 m	€ 408 m
Italy	South and Western Europe	€ 337 m	30.3 %	€ 102 m	2.49 %	€ 1 356 m	€ 2 988 m
Latvia	Central and Eastern Europe	€ 3.4 m	12.7 %	€ 0.4 m	10.77 %	€ 12 m	€ 28 m
Lithuania	Central and Eastern Europe	€ 9.3 m	12.7 %	€ 1.2 m	10.07 %	€ 33 m	€ 77 m
Luxembourg	Benelux	€ 4.5 m	34.3 %	€ 1.5 m	5.96 %	€ 19 m	€ 41 m
Malta	South and Western Europe	€ 1.4 m	30.3 %	€ 0.4 m	9.65 %	€ 5.8 m	€ 13 m
Netherlands	Benelux	€ 126 m	34.3 %	€ 43 m	3.96 %	€ 528 m	€ 1 141 m
Poland	Central and Eastern Europe	€ 75 m	12.7 %	€ 9.5 m	6.30 %	€ 267 m	€ 624 m
Portugal	South and Western Europe	€ 28 m	30.3 %	€ 8.4 m	5.79 %	€ 112 m	€ 247 m
Romania	Central and Eastern Europe	€ 19 m	12.7 %	€ 1.4 m	10.10 %	€ 67 m	€ 155 m
Slovakia	Central and Eastern Europe	€ 10 m	12.7 %	€ 1.3 m	6.15 %	€ 37 m	€ 86 m
Slovenia	Central and Eastern Europe	€ 7.5 m	12.7 %	€ 0.9 m	6.95 %	€ 27 m	€ 62 m

A: Member State	B: Regional cluster[a]	C: Total recurring costs in all mental health facilities in year 0 *(100% adoption)* [EUR][b]	D: Cluster adoption rate in year 0 [%][c]	E: Recurring costs in year 0 [EUR][d]	F: Average compound annual growth rate (2014 – 2022) [%][e]	G: Cumulative recurring-costs in year 5 [EUR][f]	H: Cumulative recurring-costs in year 10 [EUR][f]
Spain	South and Western Europe	€ 127 m	30.3 %	€ 39 m	4.27 %	€ 512 m	€ 1 130 m
Sweden	Northern Europe	€ 74 m	40.0 %	€ 30 m	2.63 %	€ 341 m	€ 706 m
Total cumulative recurring costs for the EU-27 (present-day money)				**€ 0.5 bn**	**—**	**€ 7.7 bn**	**€ 17 bn**

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] The regional clusters are based on the geographical macro-regions from the healthcare provider survey (see Figure 1)
- [b] See Table 49 for the underlying calculation.
- [c] See Figure 110 and Annex H6 for the underlying calculation.
- [d] Calculated with the formula: Costs with 100% adoption × adoption rate in year 0 [%] × expenditure factor in year 0 ÷ discount rate in year 0. Discount rate in year 0 $= (1 + 0.04)^0 = 1$. Expenditure factor in year 0 = 1
- [e] Data source: Eurostat (2022). Calculated as the average of data for year 2014 to 2022 (inclusive) per Member State.
- [f] Calculated for other years with the formula:

  Costs in year $0 + (\text{costs with } 100\% \text{ adoption} \times$ adoption rate in year 1 [%] × expenditure factor in year 1 ÷ discount rate in year 1) + … + (costs with 100% adoption × adoption rate in year n [%] × expenditure factor in year n ÷ discount rate in year n. Formula for discount rate: $(1 + 0.04)^n$, where n = year number.
  Formula for expenditure factor: $(1 +$ average compound annual growth rate [2014 – 2022]$)^n$, where n = year number.

7.2.4(g) Analysis of the net cost avoidance (monetary benefit)

Having calculated in the previous sections the cost savings that the use case can bring to the value drivers as well as the costs of implementing and operating it, the net cost savings are calculated by subtracting the costs (both one-off and recurring) from the gross cost savings. The calculation is presented in **Table 52** for both the full and partial realisation of the use case's potential savings.

Table 52: Net present cost avoidance (net monetary benefit) in year 0, year 5 and year 10 (cumulative)

A: Member State	Full scenario			Partial scenario		
	B: Net cost savings in year 0 in a full scenario [EUR][a]	C: Net cumulative cost savings in year 5 in a full scenario [EUR][a]	D: Net cumulative monetary benefit in year 10 in a full scenario [EUR][a]	E: Net cumulative cost savings in year 0 in a partial scenario [EUR][b]	F: Net cumulative cost savings in year 5 in a partial scenario [EUR][b]	G: Net cumulative monetary benefit in year 10 in a partial scenario [EUR][b]
Austria	€ 70 m	€ 1 219 m	€ 2 888 m	€ 57 m	€ 100 m	€ 2 370 m
Belgium	€ 151 m	€ 1 877 m	€ 4 063 m	€ 125 m	€ 1 554 m	€ 3 366 m
Bulgaria	€ - 0.1 m	€ 0.3 m	€ 1.6 m	€ - 0.2 m	€ - 3.1 m	€ - 6.1 m
Croatia	€ 2.9 m	€ 87 m	€ 204 m	€ 2.3 m	€ 67 m	€ 160 m
Cyprus	€ 2.9 m	€ 40 m	€ 90 m	€ 2.3 m	€ 33 m	€ 72 m
Czechia	€ 9.1 m	€ 264 m	€ 620 m	€ 7.2 m	€ 213 m	€ 500 m
Denmark	€ 106 m	€ 1 243 m	€ 2 573 m	€ 88 m	€ 1 028 m	€ 2 230 m
Estonia	€ 1.8 m	€ 52 m	€ 122 m	€ 1.4 m	€ 41 m	€ 97 m
Finland	€ 57 m	€ 670 m	€ 1 387 m	€ 47 m	€ 553 m	€ 1 147 m
France	€ 1 515 m	€ 20 271 m	€ 44 736 m	€ 1 265 m	€ 16 953 m	€ 37 423 m
Germany	€ 1 620 m	€ 27 876 m	€ 65 897 m	€ 1 352 m	€ 23 296 m	€ 55 087 m
Greece	€ 9.6 m	€ 151 m	€ 340 m	€ 5.7 m	€ 99 m	€ 226 m
Hungary	€ 6.1 m	€ 179 m	€ 419 m	€ 4.9 m	€ 144 m	€ 339 m
Ireland	€ 65 m	€ 773 m	€ 1 604 m	€ 52 m	€ 623 m	€ 1 294 m
Italy	€ 169 m	€ 2 418 m	€ 5 389 m	€ 125 m	€ 1 831 m	€ 4 094 m
Latvia	€ 1.9 m	€ 54 m	€ 128 m	€ 1.5 m	€ 44 m	€ 104 m
Lithuania	€ 3.8 m	€ 112 m	€ 264 m	€ 3.0 m	€ 90 m	€ 211 m
Luxembourg	€ 11 m	€ 132 m	€ 286 m	€ 8.7 m	€ 109 m	€ 236 m
Malta	€ 4.0 m	€ 53 m	€ 118 m	€ 3.3 m	€ 44 m	€ 98 m

A: Member State	Full scenario			Partial scenario		
	B: Net cost savings in year 0 in a full scenario [EUR][a]	C: Net cumulative cost savings in year 5 in a full scenario [EUR][a]	D: Net cumulative monetary benefit in year 10 in a full scenario [EUR][a]	E: Net cumulative cost savings in year 0 in a partial scenario [EUR][b]	F: Net cumulative cost savings in year 5 in a partial scenario [EUR][b]	G: Net cumulative monetary benefit in year 10 in a partial scenario [EUR][b]
Netherlands	€ 527 m	€ 6 512 m	€ 14 087 m	€ 438 m	€ 5 427 m	€ 11 745 m
Poland	€ 18 m	€ 549 m	€ 1 296 m	€ 14 m	€ 422 m	€ 999 m
Portugal	€ 33 m	€ 458 m	€ 1 015 m	€ 27 m	€ 370 m	€ 820 m
Romania	€ 5.9 m	€ 174 m	€ 410 m	€ 4.6 m	€ 137 m	€ 323 m
Slovakia	€ 5.8 m	€ 169 m	€ 397 m	€ 4.7 m	€ 137 m	€ 323 m
Slovenia	€ 6.3 m	€ 180 m	€ 423 m	€ 5.1 m	€ 148 m	€ 348 m
Spain	€ 219 m	€ 2 968 m	€ 6 565 m	€ 178 m	€ 2 431 m	€ 5 380 m
Sweden	€ 350 m	€ 4 071 m	€ 8 426 m	€ 291 m	€ 3 392 m	€ 7 021 m
Cumulative net cost savings for the EU-27 (present-day money)	**€ 5.0 bn**	**€ 73 bn**	**€ 164 bn**	**€ 4.1 bn**	**€ 60 bn**	**€ 136 bn**

Notes:

- [a] Calculated with the formula: Cumulative cost savings for the full scenario in year n - (cumulative one-off costs in year n + cumulative recurring costs in year n), using data from Table 46, Table 50, and Table 51, where n= year number.
- [b] Calculated with the formula: Cumulative cost savings for the partial scenario in year n - (cumulative one-off costs in year n + cumulative recurring costs in year n) using data from Table 47, Table 50, and Table 51, where n= year number.

7.2.5(h) Analysis of the model's sensitivity

Monte Carlo simulations were conducted to assess the robustness of the economic analysis. In the economic analysis, fixed input values were used for the calculations. In the Monte Carlo simulations, the input values used to quantify (1) the gross cost savings (see **Table 43** for the quantification of the value drivers), (2) the one-off costs, and (3) the recurring costs (see **Table 48** for the quantification of the one-off and recurring costs) in the reference country were randomly varied in three independent simulations, each using 1 million samples. Only the quantification equations used to calculate these three quantities were modelled in the simulation.

The range (distribution) of possible values for each value driver was determined based on the range of values estimated in **Annex H4**. The range of possible values for the cost components was determined based on the range of values estimated in **Annex H7**. The randomly sampled input values from these distributions were then used to estimate (1) the total gross cost savings, (2) the total implementation costs, and (3) the total recurring costs in the reference country in year 0.

The results of the simulation are summarised in **Table 53**. The distributions from the simulations capture the likely range and uncertainty of the values quantified for the reference country. The range of uncertainty is defined as two standard deviations from the mean of the distribution.

Table 53: Estimates of the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country in year 0 based on three Monte Carlo simulations (sample size = 1 million)

Parameters	A: Total cost savings (benefit) of the full implementation scenario in the reference country in a full scenario [EUR][a]	B: Total cost savings (benefit) of the partial implementation scenario in the reference country in a partial scenario [EUR][b]	C: Total one-off costs of implementing the use case in all mental health facilities in the reference country *(100% adoption)* [EUR][c]	D: Total annual recurring costs of operating the use case in all mental health facilities in the reference country *(100% adoption)* [EUR][d]
Lower estimate from simulation (−2 sigma)[e]	€ 1 003 m	€ 827 m	€ 16 m	€ 97 m
Calculation from economic analysis[f]	€ 1 263 m	€ 1 069 m	€ 21 m	€ 126 m
Upper estimate from simulation (+2 sigma)[e]	€ 1 523 m	€ 1 310 m	€ 26 m	€ 155 m
Standard deviation from simulation	€ 130 m	€ 121 m	€ 2.4 m	€ 15 m

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] Compare with column E in Table 43.
- [b] Compare with column G in Table 43.

- [c] Compare with column D of the reference country in Table 49.
- [d] Compare with column E of the reference country in Table 49.
- [e] The expected range of the estimated values is defined as two standard deviations ("2 sigma") from the mean of the distribution. The lower and upper estimates are calculated with the formula: $\text{mean} \pm (2 \times \text{standard deviation})$.
- [f] The single-point value calculated from the analysis is approximately equal to the mean of the simulations.

By quantifying the individual impact of each value driver on model variance, the analysis enables a clearer understanding of how sensitive the overall outcome is to changes in specific inputs. During the simulation of the gross cost savings, the outputs of each value driver were recorded (1 million samples per value driver). Based on the distribution of each value driver, the variance was calculated. To calculate the contribution of each value driver to the overall uncertainty (variance) of the model, the variance of each value driver was divided by the variance of the gross cost savings (total variance). The relative contribution of the value drivers to the benefit model's uncertainty is illustrated in **Figure 111.**

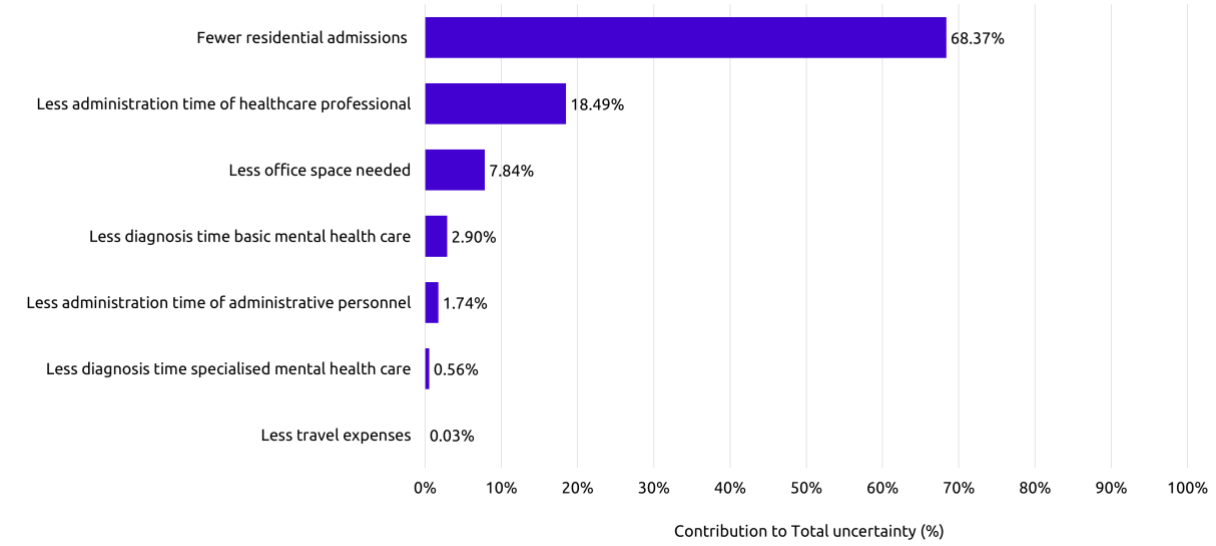


Figure 111: Relative contribution of each value driver to the uncertainty in the benefits model of the reference country

To understand the effect different likely estimates for the value drivers and costs in the reference country have on the final result of the economic analysis, the lower-bound and upper-bound estimated values from the simulations for the total gross cost savings, the total implementation costs, and the total recurring costs were used to recalculate the net cost avoidance in the EU-27. The three lower-bound estimates for the reference country were used in the analysis pipeline to calculate a lower-bound estimate of the net cost avoidance in the EU-27. The same was done with the three upper-bound estimates for the reference country to give an upper-bound estimate of the net cost avoidance in the EU-27. Together, these represent the likely range of the net cost avoidance in the EU-27 when implementing this use case. These results are summarised in **Table 54** and plotted in **Figure 112** (the vertical bars indicate the range of uncertainty of each data point, as derived from the upper and lower bounds produced by the simulation).

Table 54: Estimated uncertainty of the net cost avoidance (net monetary benefit) in year 0, year 5 and year 10 (cumulative) for the EU-27

Parameters	Full scenario			Partial scenario		
	A: Net cost savings in year 0 in a full scenario [EUR]	B: Net cumulative cost savings in year 5 in a full scenario [EUR]	C: Net cumulative monetary benefit in year 10 in a full scenario [EUR]	D: Net cost savings in year 0 in a partial scenario [EUR]	E: Net cumulative cost savings in year 5 in a partial scenario [EUR]	F: Net cumulative monetary benefit in year 10 in a partial scenario [EUR]
Lower estimate[a]	€ 4.0 bn	€ 58 bn	€ 130 bn	€ 3.2 bn	€ 47 bn	€ 105 bn
Calculation from economic analysis[b]	€ 5.0 bn	€ 73 bn	€ 164 bn	€ 4.1 bn	€ 60 bn	€ 136 bn
Upper estimate[c]	€ 6.0 bn	€ 87 bn	€ 197 bn	€ 5.0 bn	€ 74 bn	€ 167 bn

Notes:

- Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions. Calculations are performed using the unrounded values.
- [a] Calculated using the lower range estimates from the Monte Carlo simulation for the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country (Table 53). The extrapolation and forecasting steps were performed as described in the sections above.
- [b] Taken from Table 52.
- [c] Calculated using the upper range estimates from the Monte Carlo simulation for the total gross cost savings, the total implementation costs, and the total recurring costs in the reference country (Table 53). The extrapolation and forecasting steps were performed as described in the sections above.

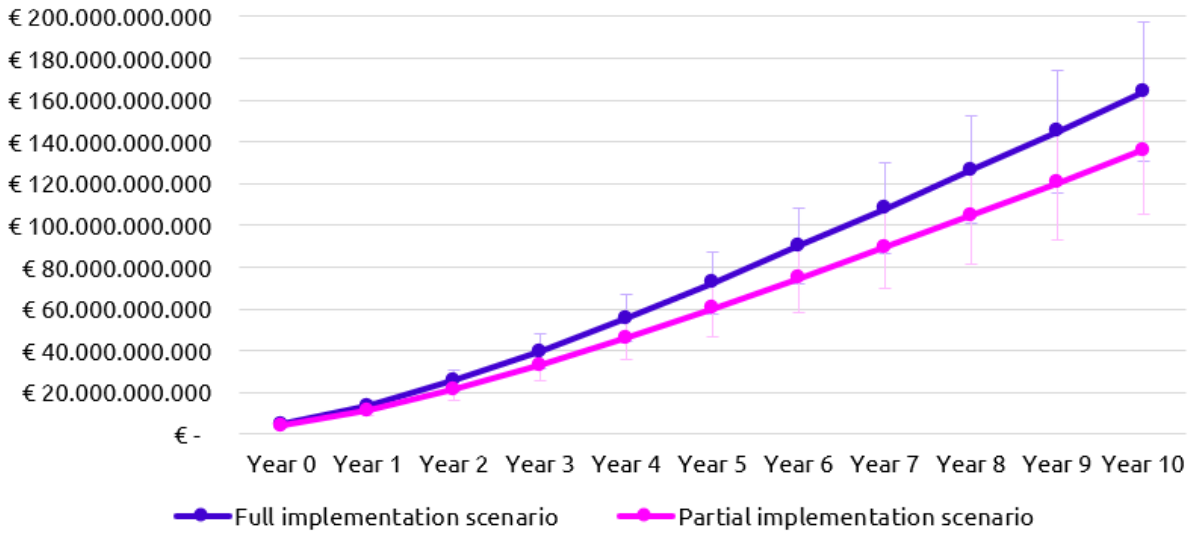


Figure 112: Forecast of the cumulative net cost avoidance over ten years for the full and partial implementation scenarios, including uncertainty ranges.

7.2.6(i) Discussion and conclusions

The analysis shows that mental health platforms can generate cost savings (net cost avoidance) across EU healthcare systems. The most impactful value drivers are 'reduced administrative workload' for healthcare professionals and 'fewer residential admissions'. Additional drivers of cost savings include 'reduced diagnosis time' and 'lower office space requirements'.

The full implementation scenario demonstrates a consistent and significant increase in net cost avoidance over time, while the partial scenario yields slightly lower but still positive gains, approximately 83% of the full scenario's savings. However, this similarity between the two scenarios may reflect an overestimation of benefits in the partial scenario. Moreover, some value drivers, such as administrative and diagnostic time, may overlap, potentially inflating the projected savings. Administrative tasks are often inherently linked to the diagnostic process and treating these are separate activities might result in an overestimation of potential savings.

As with other use cases, efficiency gains do not automatically translate into cost savings without deliberate organisational change. It can be the case that staff numbers (FTEs) are not reduced, and the time saved is reallocated to new activities such as breaks, education, or improving the quality of care, in which case, efficiency gains are not translated into cost savings.

The adoption rate assumes a 40% implementation already in year 0, which some experts considered overly optimistic during the validation session, given the typical resistance to change within healthcare systems. A more gradual uptake would have provided a more realistic scenario.

As shown in **Figure 111**, the value driver 'fewer residential admissions' has the greatest impact on the overall uncertainty in the model's output and is therefore the most critical factor for achieving the full net cost avoidance estimated in this analysis. During the expert interview, it was noted that the potential to reduce residential admissions is highly dependent on national baseline admission rates and care models. Therefore, the extrapolation of results from the reference country may not adequately reflect cross-country differences and therefore may not accurately capture the associated reduction potential. This absence might contribute to the uncertainty in the estimates used to projected cost savings for this value driver and, by extension, the overall net cost avoidance at EU level.

To place the findings of this use case in a broader perspective, the estimated net cost avoidance as a proportion of the projected cumulative healthcare expenditure over the next ten years amounts to **approximately 0.7% in the full scenario**. In a partial scenario, mental health platforms are estimated to reduce total healthcare expenditure by around 0.5% over the same period.

8 Use Case 5: Next generation genetic sequencing

Digital genomics technologies enable the analysis and clinical use of genomic data to support precise diagnosis, risk prediction, and personalised care. These tools help clinicians and researchers identify genetic mutations and subsequently stratify patients into risk groups and reduce trial-and-error in diagnosis and treatment.

The selected use case for the analysis is personalised treatment enabled by advanced genetic sequencing. The analysis establishes a **full implementation scenario** in which genomic data from Next Generation Sequencing (NGS) – a modern DNA sequencing technology that allows for the simultaneous sequencing of millions of DNA fragments – is fully integrated with EHR and clinical decision systems. This provides the clinician with a comprehensive view of a patient's genetic information and enables personalised treatment plans to be developed more effectively. More accurate diagnoses and timely and targeted interventions help save costs in the healthcare sector.

The analysis assumes a **baseline scenario** where no personalised treatment based on genetic sequencing is implemented, but clinicians and researchers rely solely on data collected retroactively, traditional diagnostic methods and generalised treatment protocols.

Note on data availability and the results of this use case

For this use case, no estimations of benefits could be collected through expert interviews to quantify and monetise the value drivers. Therefore, this section presents an overview of the identified benefits from the expert workshop and the quantification of the implementation and operating costs in the reference country. While the net cost avoidance could not be quantified, this section concludes with a reflection on the potential value of the use case, highlighting key uncertainties and suggesting directions for future research.

Key takeaways

- **Economic impact:** A full economic impact analysis could not be performed due to the unavailability of data and difficulty in quantifying the identified value drivers that were indirect in nature for the perspective of a healthcare provider. Nevertheless, existing literature highlights that sequencing costs are steadily declining, making the technology increasingly affordable to operate.
- **Benefits of the use case:** While not quantified, genomic sequencing shows potential to improve the quality of care. It can enable earlier diagnosis, more targeted treatments, and reduced reliance on ineffective interventions, contributing to better outcomes and efficiency for the healthcare system.

Please refer to section 8.3 for the discussion and conclusions of this use case and Part C for the overall conclusions and limitations.

8.1 IDENTIFICATION OF VALUE DRIVERS

To identify the underlying causes of cost savings offered by the use case (i.e. the activities the use case helps improve), a list of value drivers was defined. The simplified benefit logic diagram, which is the result of the workshop, is presented in **Figure 113**. These value drivers lead to cost savings through mechanisms such as avoiding ineffective treatments and reducing time to diagnosis, enabled by earlier detection of genetic mutations. This helps to reduce financial resource use in the healthcare system.

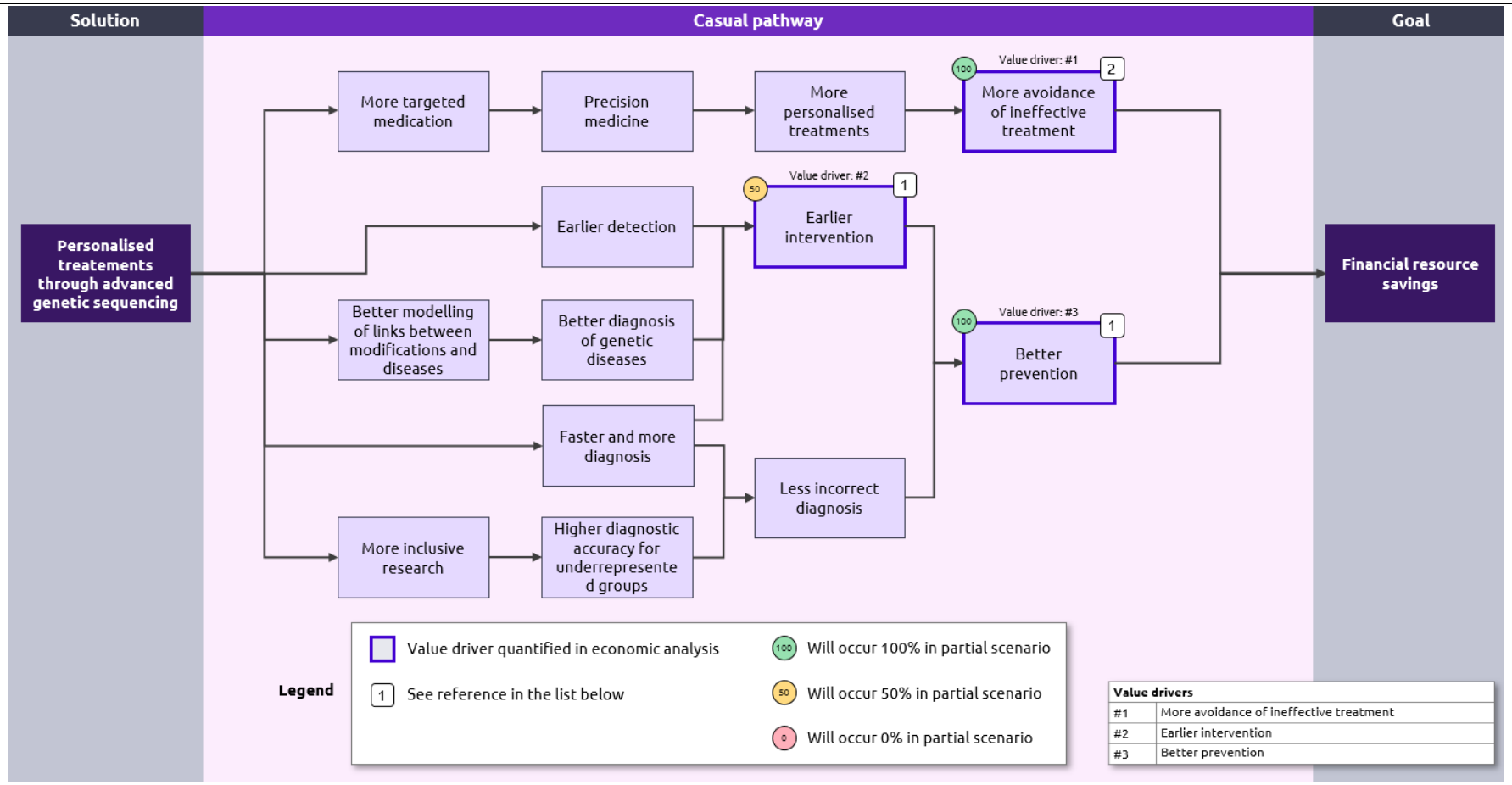


Figure 113: Simplified benefit logic diagram: Advanced genetic sequencing

Literature sources of value drivers (numbered in the benefit logics diagram):

1. Bourke, M., McInerney-Leo, A., Steinberg, J., Boughtwood, T., Milch, V., Ross, A. L., ... & Goranitis, I. (2025). The cost effectiveness of genomic medicine in cancer control: a systematic literature review. Applied Health Economics and Health Policy, 1-35.
2. Olowu, A., Olanlokun, Y., & Timothy, O. Economic Evaluation of Pharmacogenomics Integration in Precision Oncology: Implications for Cost Reduction and Clinical Efficacy.

8.2 ANALYSIS OF THE ONE-OFF AND RECURRING COSTS OF THE USE CASE

8.2.1.1 Quantification and monetisation of the costs of implementing and operating the use case based on price data of a reference country

To quantify the cost of implementing and operating the use case, both one-off and recurring costs were estimated. The one-off costs and recurring costs per laboratory were derived from desk research and are presented in **Table 55**. The calculation assumes that an average laboratory can sequence approximately 5000 patients (genomes) per year.

Table 55: Quantified and monetised costs of implementing (one-off) and operating (annual recurring)

A: One-off costs of implementing the use case in one laboratory in the reference country [EUR] [a]	B: Annual recurring costs of operating the use case in one laboratory in the reference country [EUR] [b]
€ 568 k	€ 673 k
Notes: ▪ Monetary values are displayed in an abbreviated format. 'm' denotes millions, and 'bn' denotes billions and 'k' denotes thousands. Calculations are performed using the unrounded values. ▪ [a] One-off costs for acquiring a sequencing instrument were derived from literature. Reported estimates include €457,000[192], €544,000[193], and a comparative range between €215,000 and €1,720,000, averaging €702,000[194]. The overall average across these figures is approximately €568,000. ▪ [b] Recurring annual costs were also drawn from literature. Reported values include €457,000[192]; €1,021,000[194] based on 5,000 samples and average cost per sample; and €447,200 based on 5,000 samples and a lower cost per sample[195]. The overall average is approximately €673,000.	

[192] Marklewitz, M., et al. (2025)
[193] Schwarze, K., et al. (2019)
[194] Complete Genomics (2024)
[195] NC State University (2024)

8.3 Discussion and conclusions

It was not possible to conduct a full cost-benefit analysis for the use case on advanced genetic sequencing. This stems from several factors. Primarily, the benefits (value drivers) of genetic sequencing tend to be indirect and long-term and are thus difficult to quantify accurately from the perspective of a healthcare provider. Unlike other use cases in this study, which often involve value drivers that directly impact clinical workflows and activities performed by healthcare professionals, the benefits of genetic sequencing are often realised through earlier diagnosis or prevention of future treatments. Furthermore, the experts interviewed in this study expressed that it is not feasible for them to estimate these broad, future effects and relevant data was not found through desk research. Other studies have described similar challenges when assessing the economic value of NGS[196].

Given this large amount of uncertainty of future impacts, it is not appropriate to quantify the cost savings. Nonetheless, several logics that could lead to benefits have been identified in **Figure 113** and several scientific studies suggest that NGS is a promising technology, both in terms of cost savings and improvements in quality of care[197, 198, 199, 200, 201]. Therefore, more work is needed to be able to quantify the economic value of NGS as cost-saving applications of NGS evolve.

Additionally, further methodological work is needed to determine how disease-specific findings can be extrapolated across conditions, thereby enabling a more comprehensive and scalable impact assessments.

[196] Phillips, K. A., Deverka, P. A., Marshall, D. A., Wordsworth, S., Regier, D. A., Christensen, K. D., & Buchanan, J. (2018).
[197] Nhgri. (2019)
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Part C: Conclusions, recommendations and further research needs

1 Conclusions

The European digital health market is experiencing rapid growth, supported by increasingly robust, though still evolving, policy frameworks, accelerating technological advancements, and sustained demand from healthcare providers. Despite this momentum, the market remains fragmented and globally underrepresented on the supply side, with notable dependencies on vendors located outside the European Union.

To fully unlock both the healthcare and economic potential of digital health, Europe should overcome persistent challenges related to interoperability, financing, regulatory harmonisation, and workforce readiness. At the same time, it should continue to foster innovation in frontier domains such as artificial intelligence, genomics, and cybersecurity.

At the healthcare provider level, digital technologies are already demonstrating tangible value. Many healthcare organisations report efficiency gains, cost reductions, and productivity improvements. Economic impact analyses highlight positive financial outcomes across several use cases, particularly clinical decision support systems, automated medical image analysis, and mental health platforms. These benefits are largely driven by reduced administrative burden and more timely, personalised, and effective care.

However, implementing a digital health technology does not automatically guarantee cost savings. The extent of financial benefit depends heavily on the degree to which healthcare organisations integrate the technology to replace or complement existing processes and quality of implementation and the degree to which efficiency gains are translated into actual resource savings through organisational change. Foundational barriers, including digital maturity, interoperability, and workforce readiness, remain critical to realising the full economic promise of digital health across Europe.

Market size and growth outlook

- The EU27 digital health market is growing strongly, projected to reach €51.4 billion by 2027 (CAGR 15%). Current spending is concentrated in electronic health records (EHRs), clinical data management, and medical imaging, with the latter and genomics-related digital technologies expected to expand most rapidly, driven by advances in artificial intelligence and rising demand for diagnostics. Survey results confirm that digital health is steadily becoming a strategic budget line for healthcare providers: 42% of organisations still allocate less than 5% of their overall funds to digital health, 37% dedicate 5–10%, and only 13% exceed 11%; year-on-year increases are now treated as strategic rather than discretionary, signalling the normalisation of digital health as core expenditure. The market is expected to grow significantly over the next 12 years, increasing by more than 456% from €11.0 billion in 2023 to €61.2 billion by 2035, driven by healthcare modernisation, EU-level policy initiatives, and a stabilised post-pandemic investment climate.
- Europe's digital health market is expanding, yet uneven adoption across Member States risks exacerbating intra-EU disparities. By 2035, the DACH region together with Southern and Western Europe will account for nearly three-quarters of EU27 spending, whereas Central and Eastern Europe, despite a robust 13% CAGR, risks remaining constrained by weaker infrastructure and workforce capacity. Evidence from the healthcare providers survey corroborates these disparities: Southern Europe allocates the highest budget shares yet face pronounced risks of budgetary volatility, while DACH, the Nordics, and the Benelux countries exhibit more stable and consistent investment patterns, reflecting stronger economic resilience.
- Across technologies, medical imaging, genomics, EHRs, and cybersecurity stand out as the principal growth hotspots, with investment now extending beyond hospitals (the largest provider segment) into outpatient and laboratory settings. The EU27 market for medical imaging is projected to reach €9.2 billion by 2035 (CAGR 2035 19%), driven by AI-enabled diagnostics and enterprise imaging platforms. Genomics technologies are expected to expand to €7.1 billion (CAGR 2035 18%), supported by precision-medicine programmes and genomic data infrastructures. Electronic Health Records (EHRs) remain the largest single segment at €9.4 billion (CAGR 2035 14 for hospital and 16% for other healthcare providers), underpinned by EHDS-driven interoperability and modernisation of legacy systems. Meanwhile, trust and cybersecurity solutions are forecast to grow to €3.8 billion (CAGR 2035 15%),

reflecting rising compliance and resilience requirements under GDPR, NIS2, and the EHDS framework.

- Survey evidence confirms that adoption of core digital health technologies among EU27 healthcare providers is now widespread, with over 80% already using EHRs and medical imaging systems, and more than 70% deploying clinical documentation and workflow management tools. Forward investment intentions remain strong: nearly two-thirds of providers plan to upgrade or expand their existing EHR and imaging platforms within the next four years, while over 40% intend to prioritise AI-driven clinical decision support and 35% plan to enhance telehealth capabilities as part of their EHR modernisation efforts. Although still at an early stage, emerging technologies are steadily entering providers' strategic planning cycles. Around 30% of organisations report plans to expand their current digital capabilities for genomics and 48% plan to invest in new solutions by 2029. Virtual twins are seen as one of the most promising future investment areas, with adoption expected to reach around 51% of healthcare providers by 2029 as technological maturity and clinical validation progress. Integrating medical imaging, physiological, and genomic data, these solutions are regarded as transformative for precision diagnostics, surgical planning, and personalised therapy simulation.

Barriers impacting digital health adoption and market growth

- **Fragmentation.** The EU digital health market continues to be constrained by nationally siloed requirements, procurement models, and market access rules that limit cross-border scaling and undermine the implementation of EU-level digital health initiatives and the impact of regulations such as the European Health Data Space. Vendors are often compelled to adapt products to specific national contexts, creating inefficiencies and higher costs. This fragmentation entrenches disparities, restricts competition, and slows innovation. Stronger alignment of system requirements, procurement policies, and incentives for joint cross-border adoption will be necessary to foster market integration.
- **Interoperability.** Lack of interoperability remains one of the most frequently cited obstacles, with 45% of providers and 43% of vendors reporting ongoing issues with data standardisation and outdated IT infrastructures. Inconsistent adoption of internationally recognised standards such as FHIR or architectural frameworks like openEHR hampers the seamless exchange of health data within and across Member States. Without addressing interoperability and enabling consistent data management and quality, advanced solutions such as AI-powered clinical decision support or remote monitoring cannot be deployed at scale. Accelerating the implementation of the EHDS and reinforcing national commitments to interoperability are critical steps to overcome this bottleneck.
- **Financial constraints and reimbursement models.** Financial limitations continue to undermine healthcare digitalisation. Nearly 48% of providers report budgetary restrictions, while vendors face margin pressures (39%), reimbursement misalignments (24%), and challenges in accessing growth capital (26% of SMEs). These constraints not only slow adoption but also weaken the ability of start-ups and scale-ups to expand and compete globally. Policy mechanisms that guarantee stable, long-term funding and harmonised reimbursement schemes are essential to reduce volatility and ensure sustainable growth across the digital health ecosystem.
- **Regulatory complexity.** While EU regulations such as the EHDS Regulation, AI Act, and MDR/IVDR provide critical frameworks, they are widely perceived as both enablers and barriers to change within the digital health ecosystem. Over 60% of providers report that digital health solutions support compliance, yet 38% highlight data privacy concerns and 13% point to broader compliance issues. On the supply side, half of vendors identify overlapping frameworks as a major barrier, with different national implementations adding further cost and complexity. Clearer guidance and stronger harmonisation between Member States are needed to unlock the full potential of EU digital health innovation.
- **Skills gap.** Workforce readiness remains a persistent challenge. 34% of providers cite digital skills shortages, and one in five highlight staff resistance to change as barriers to digital health adoption and investments. Vendors confirm that entrenched clinical workflows and limited digital maturity within client organisations hinder adoption. Without targeted investment in digital skills, both clinical and administrative staff may lack the capacity to integrate new technologies effectively. EU-level programmes supporting training, change management, and workforce adaptation will be crucial to

ensure the success of digital health investment.

- **Equity risk.** Executive interviews reveal that digital health adoption is uneven across patient populations, raising concerns about equity. Current solutions are more widely adopted by younger, urban, and well-educated groups, whereas older and rural populations frequently encounter barriers linked to digital literacy, affordability, and access. Without policy intervention, such dynamics risk exacerbating inequalities in healthcare delivery. Policymakers should ensure that digital transformation continues to uphold the EU principle of universal healthcare coverage by embedding accessibility and inclusivity in procurement, design, and funding frameworks.
- **Sustainability.** Sustainability is emerging as an increasingly relevant dimension of digital health, though its integration remains partial. 45% per cent of providers recognise environmental benefits, particularly through telemedicine and paperless workflows, but vendors have not yet prioritised sustainability systematically. Growing Environmental, Social, and Governance (ESG) pressures and government-led initiatives are beginning to shape procurement decisions, especially around device lifecycle management and energy efficiency. However, the wider environmental footprint of digital health still requires a more structured and strategic response.

The EU digital health supply landscape

- The market segmentation and mapping exercise revealed a fragmented vendor ecosystem across the EU. Vendors remain highly localised, with Germany and France leading in numbers, while 15 Member States host fewer than five active firms. This underscores substantial disparities in market maturity across Europe and highlights the difficulties of scaling digital health solutions across borders.
- EU vendor portfolios are dominated by core IT solutions, with 67% focusing on health data management and workflow systems and 18% on administrative tools. By contrast, emerging technologies (7%), cybersecurity (6%), and genomics (2%) remain marginal, although artificial intelligence is increasingly integrated into core applications such as EHRs, clinical documentation, and diagnostics. Artificial intelligence (AI) is increasingly becoming a strategic differentiator in the EU market. According to the Digital Health Technology Vendors Survey, 46% of vendors are prioritising AI/ML investments to enhance competitiveness and expand into advanced digital health applications. Within the broader category of emerging technologies, AI stands out as a key strategic focus, with 23% of vendors investing in AI/ML and 20% in Generative AI specifically. Vendors primarily target secondary and tertiary hospitals, while preventive care, home care, and public health applications are underrepresented. This hospital-centric approach restricts the potential of digital health to support community-based and preventive healthcare models, which are central to the EU's value-based care agenda.
- The uneven distribution of market maturity across Member States constrains EU-wide scale-up and risks entrenching structural disparities. Simultaneously, innovation in frontier technologies such as AI diagnostics, genomics, and cybersecurity appears disproportionately concentrated outside Europe, creating strategic dependency risks for the EU's long-term competitiveness and technological sovereignty. According to the market mapping exercise, non-EU vendors account for around 37% of all firms operating in the EU digital health market, dominated by suppliers from the United States (60%) and the United Kingdom (18%). These non-EU27 vendors lead in several critical enabler segments: nearly 49% of their offerings focus on health data management and workflows, and 24% on cybersecurity and compliance. AI- and GenAI-enabled clinical assistants also feature prominently, underscoring non-EU leadership in clinical AI, diagnostics, and decision-support tools. Overall, the findings point to growing EU reliance on non-EU vendors across cybersecurity, clinical AI, and genomics, highlighting the urgency of strengthening strategic autonomy and resilient digital health ecosystems.

EU digital health tech financial trends

- Health technology investment in the EU continues to lag behind the United States, particularly in high-growth segments such as AI and cybersecurity. While the US maintains a decisive lead in scale, the UK benefits from a more agile regulatory and venture capital environment, and China is rapidly accelerating through state-backed investment. This persistent gap risks slowing innovation and weakening Europe's global competitiveness.
- SMEs and start-ups face significant barriers to accessing growth funding, with many reporting persistent

difficulties in scaling. Survey results show that 26% of smaller vendors struggle to secure growth capital, and only a minority attract private-equity or institutional investors. The EU27 investment landscape remains dominated by venture capital (over 70% of total funding), with limited late-stage or public financing. Between 2019 and 2024, the EU's share of global digital-health investment averaged just 7%, compared with 72% in the United States and 3% in China, underscoring Europe's constrained funding capacity. These financial constraints limit international expansion and consolidate innovation among larger, established firms. In contrast, start-ups in the US and China benefit from deeper, risk-tolerant capital pools, enabling faster growth trajectories and earlier international reach.

- Without targeted financial mechanisms, the EU risks perpetuating a cycle in which limited access to capital slows SME growth, reduces innovation diversity, and entrenches dependency on large non-EU players. This would directly undermine Europe's ambition to build a competitive and sovereign digital health ecosystem.

International comparison

- The United States dominates the global digital health landscape, accounting for 63% of all identified vendors. This concentration underscores the EU's relatively modest presence and highlights structural imbalances that reduce Europe's global influence.
- The US and Asia-Pacific regions are advancing more rapidly than the EU in AI adoption, cybersecurity, and genomics platforms, technologies that will define the next generation of healthcare. Europe's comparatively slower pace raises concerns regarding competitiveness and long-term digital sovereignty.
- The US benefits from a dynamic venture capital environment that enables start-ups to scale rapidly despite regulatory uncertainties. The United States benefits from a highly dynamic venture capital environment, capturing 72% of total global digital health investment between 2019 and 2024 and 51% of all deals, enabling start-ups to scale rapidly despite regulatory uncertainties. Europe, by contrast, faces persistent funding gaps and delayed scaling. Financial trends analysis shows that the EU27 accounts for only 7% of global capital but 15% of deal activity, indicating a strong base of early-stage innovation constrained by smaller deal sizes and limited late-stage funding. While the EU prioritises safety, privacy, and equity, strengthening trust among patients and providers, this often comes at the expense of deployment speed and agility.
- The EU's regulation-driven model builds trust through safeguards on safety, privacy, and equity, but slows technology roll-out. Conversely, the US's market-led approach enables rapid scaling and vendor-defined standards. To remain competitive, Europe should balance its strong regulatory framework with faster adoption of emerging technologies; otherwise, it risks continued reliance on non-EU players for critical digital health innovations.

Economic impact of digital health technology

- Digital health is delivering measurable value for European healthcare systems. Survey results show that 64% of providers report efficiency gains, 52% cite cost savings, and 60% indicate productivity improvements associated with digital solution adoption. These benefits reinforce both clinical outcomes and operational resilience, particularly in areas such as EHRs, telemedicine, and AI-enabled decision support. Beyond efficiency, digital health also strengthens patient engagement and compliance, while facilitating regulatory adherence. Building on these positive impacts will require sustained investment, enhanced interoperability, and a stronger workforce readiness to ensure long-term transformation.
- The economic impact analysis assesses the financial cost savings of five digital health technologies for EU healthcare systems. It showcases a positive net cost avoidance for three use cases: clinical decision support systems (CDSS), automated medical image analysis, and mental health platforms. These findings demonstrate strong financial potential, making a compelling case for vendors to further develop these technologies, healthcare providers to adopt them, and policymakers to create enabling environments that support their scalable deployment.
- The net cost avoidance (monetary benefit) of the use cases (in the full implementation scenario) relative to the expected healthcare expenditure over ten years is: 0.3% – 1.0% for clinical decision support systems, 0.5% – 0.8% for automated medical image analysis, and 0.5% – 0.7% for mental health platforms. Over this ten-year period, the cumulative cost savings in the full implementation scenario are

estimated at €252 billion for clinical decision support systems, €192 billion for automated medical image analysis and €164 billion for mental health platforms. In the partial implementation scenario, the respective savings are €71 billion, €126 billion and €136 billion.

- The net cost avoidance of a use case is strongly influenced by how broadly the technology can be applied to patients within a healthcare organisation. CDSS is the most broadly applicable use case, as it can be used across nearly all patients in a hospital, resulting in the highest cost savings. In contrast, medical image analysis is limited to radiology departments and mental health platforms affect a limited set of conditions (i.e. psychiatry). Overall, narrower scopes can lead to lower estimated cost savings.
- Across use cases, the most common value drivers are time savings for clinicians, particularly through reduced administrative tasks, as well as decreased use of other healthcare resources due to having a quicker and better understanding of patients' medical information and their associated medical needs that leads to more personalised, effective and timely interventions.
- The costs savings calculated in this study are estimates and ultimately depend on how healthcare providers translate time savings into actual resource savings, e.g. by reducing staff numbers or increasing service capacity. Therefore, realising cost savings from these value drivers would not necessarily be automatic but would require other organisational changes.

Barriers and facilitators for effective and full implementation

- Cost savings are only realised when digital health technologies are integrated into existing healthcare processes. Without such integration, technologies risk operating alongside existing practices rather than replacing or complementing them, limiting their effectiveness and ultimately this economic impact.
- To fully benefit from digital health technologies, certain foundational conditions should be sufficiently developed. The study accounts for differences in healthcare systems (such as AI readiness[202], eHealth maturity[203], and digital literacy[204]) that directly influence implementation of the use case. Lower maturity in these areas might limit the financial and operational benefits that technologies can deliver.

[202] Oxford insights (2024)
[203] Digital Decade eHealth indicator study (2025)
[204] Eurostat (2019)

2 Recommendations

This section presents twelve targeted recommendations proposed by the study authors to advance digital health technologies across the EU. Based on evidence gathered through extensive market analysis, survey data, expert interviews and economic analysis, these proposals aim to address key barriers in realising the full potential of digital health technologies in Europe, including market fragmentation, gaps in interoperability, gaps in investment, and barriers to the adoption of such technologies. These recommendations also aim to promote frontier innovation, support SMEs, and strengthen workforce readiness. Each recommendations includes examples of KPIs that could be used to measure the actions proposed under each recommendation.

Recommendation 1 – Strengthen EU digital health market integration and procurement alignment. Promote joint procurement frameworks, harmonised certification, and cross-border market entry pathways to reduce fragmentation and enable EU-wide scaling of digital health solutions.

The study highlights that the European digital health market remains highly fragmented, with most EU vendors confined to domestic markets and non-EU suppliers holding a significant share. Vendor mapping and financial analyses show that fragmentation, limited access to capital, and heterogeneous procurement and certification systems restrict cross-border scaling. According to the Digital Health Vendors Survey, regulatory complexity is the most frequently cited barrier (50 %), followed by limited market access caused by dominant incumbents (36 %) and high local adaptation costs (27 %). Expert interviews confirm that fragmented public procurement remains a key bottleneck for innovation diffusion, while on the demand side healthcare providers face difficulties integrating smaller or new vendors' solutions into existing systems.

A more integrated EU market can contribute to achieving the Digital Decade 2030 targets for interoperable health records and cross-border digital services. Aligning procurement and certification frameworks could:

- reduce market fragmentation;
- enable cross-border scaling of EU vendors; and
- strengthen Europe's strategic autonomy in digital health.

It is recommended that EU digital health market integration and procurement alignment are facilitated by developing a common framework for joint procurement and mutual recognition of certifications. This could include, for example:

- Voluntary Joint Procurement Mechanism for pre-validated and compliant digital health solutions.
    - KPI: at least # cross-border procurement initiatives launched by 2028.
- EU Cross-Border Validation and Certification Programme for SMEs to enable mutual recognition of clinical validation and conformity assessments and support the cross-border deployment of innovative digital-health solutions.
    - KPI: ≥ # of validated digital-health solutions deployed in three or more Member States by 2028.

Implementing this alignment mechanisms could help reduce duplication, improve vendor competitiveness, and accelerate equitable access to innovation across the EU27.

Recommendation 2 – Accelerate interoperability and data infrastructure. Accelerate adoption of EHDS, EEHRxF, and open international standards, while upgrading IT infrastructures to support seamless data exchange and advanced analytics across Member States.

The study confirms that interoperability remains one of the critical bottlenecks to scaling digital health across the EU. Survey results show that 45 % of healthcare providers cite interoperability gaps and 30 % outdated IT infrastructure as barriers to adoption, while 43 % of vendors report that fragmented data standards and high integration costs limit deployment across Member States. Expert interviews confirm that uneven implementation of interoperability frameworks and specifications, such as FHIR standards and openEHR-based architectures, combined with differing levels of digital maturity continues to hinder seamless data exchange and continuity of care.

These shortcomings constrain Member States' eHealth maturity and readiness to adopt advanced technologies such as AI, genomics, and advanced cybersecurity solutions. Strengthening interoperability and data infrastructure is therefore essential to achieving the European Health Data Space (EHDS) and Digital Decade 2030 targets for secure cross-border data use and secondary data reuse.

It is recommended to support the adoption of internationally recognised interoperability standards and architectures and accelerate EHDS implementation, for example:

- Digital health Maturity and Readiness Framework, to benchmark interoperability progress, data quality, and infrastructure connectivity across Member States.
    - KPI: At least # % of healthcare providers connected to interoperable national or regional health-data exchanges / data hubs by 2030.
- Voluntary technical validation schemes to test interoperability of digital health solutions prior to market entry.
    - KPI: Reduction of reported vendor integration costs by # % by 2029.

Enhanced interoperability and modern digital infrastructure could help enable secure data exchange, support advanced analytics and AI deployment, and accelerate the creation of an integrated European digital health ecosystem.

Recommendation 3 – Support investment and reimbursement stability. Facilitate coordination and best practice exchange among Member States to promote predictable reimbursement and financing approaches. Guidance and collaboration could help increase the sustainable uptake of digital health technologies and reduce investment volatility across health systems.

The study finds that disparities in investment capacity continue to hinder the scale-up of digital health across the EU. The EU digital health market is projected to grow at around 15 % CAGR to €51 billion by 2027, yet investment levels and growth remain uneven due to differences in infrastructure maturity and financial resources. Survey data show that nearly half of healthcare providers (48 %) cite financial constraints as a barrier. Although survey results show that most providers expect some degree of budget growth, this expansion is unlikely to meet the financing needs of comprehensive digital transformation.

On the supply side, 39 % of vendors report economic pressures linked to constrained margins and market fragmentation, while 24 % identify misaligned reimbursement frameworks as a major challenge. Smaller vendors and start-ups continue to face difficulties in accessing growth capital, limiting their ability to scale beyond national markets. Reimbursement mechanisms remain inconsistent across Member States, and expert interviews confirm that the absence of harmonised reimbursement pathways and limited financial incentives slows the integration of digital technologies into clinical workflows, especially for new and innovative solutions.

It is recommended to consider strengthening financial predictability through coordinated investment and reimbursement mechanisms that balance innovation support with fiscal sustainability. This could include, for example:

- An EU-wide knowledge-sharing platform to support Member States in developing fast-track reimbursement pathways for digital health technologies, building on successful models such as DiGA.
    - KPI: At least # Member States with operational digital-health reimbursement schemes by 2028.
- EU-wide Cost-Benefit Evidence Repository to collect and validate real-world data on efficiency gains and outcomes supporting reimbursement and investment decisions.
    - KPI: Repository populated with validated data by 2028.

Stable and predictable financing could help reduce fragmentation, encourage the adoption of proven solutions, and strengthen Europe's long-term competitiveness in digital health innovation.

Recommendation 4 – Enhance SME and Scale-up support. Provide targeted EU-level instruments, such as dedicated growth funds, cross-border validation facilities, and reduced compliance costs, to support SMEs and scale-ups in expanding across EU27, beyond domestic markets.

The study highlights that small and medium-sized enterprises (SMEs) and start-ups form the backbone of Europe's digital-health ecosystem but continue to face persistent barriers to growth and cross-border expansion.

Vendor mapping shows that most EU firms operate mainly within domestic markets, with few active across multiple Member States. For example, of 25 EU-headquartered companies analysed in frontier technologies (Digital Therapeutics, Virtual Human Twins, and AI-powered diagnostics) 22 were SMEs, typically employing fewer than 500 people and generating under €50 million in revenue. Over one-third operate solely within the EU, while more than half have established a presence in the United States or the United Kingdom to access investment, partnerships, and relatively faster regulatory pathways.

Findings from the Digital Health Technology Vendors Survey and expert interviews show that compliance, certification, and reimbursement costs weigh disproportionately on SMEs, leading to duplication, higher costs, and slower scaling. Access to finance and validation pathways remains uneven, with 26 % of smaller firms citing limited access to growth capital versus 14 % across all vendors. Executives from MedTech networks and start-up hubs confirm that fragmented EU regulatory and reimbursement systems deter early commercialisation, prompting many innovators to prioritise U.S. market entry, where approval processes and investor incentives are perceived as more favourable. Within Europe, national initiatives such as Belgium's mHealth validation, Germany's DiGA, France's PECAN demonstrate effective innovation pathways but also highlight the need for a more harmonised EU-wide framework.

To strengthen Europe's capacity to retain and scale high-potential digital-health ventures and promote the development of European digital health ecosystem, it is recommended to reinforce targeted instruments that reduce compliance costs and expand access to finance. This could include, for example:

- EU Cross-Border Validation and Testing Network, building on initiatives such as TEF-Health, to enable mutual recognition of clinical validation results.
    - KPI: Average SME validation time reduced by #% by 2029.

Reducing fragmentation and improving SME access to finance could help accelerate innovation diffusion, strengthen Europe's competitiveness, and ensure that the benefits of digital transformation extend across the entire Single Market. Complementary to Recommendation 1 and 3, these measures should ensure that procurement certification and reimbursement alignment efforts also directly benefit early-stage innovators, enabling smoother market access and faster cross-border scaling.

Recommendation 5 – Boost frontier technology innovation. Prioritise funding for innovative technologies (AI, Genomics, and Cybersecurity), reinforcing Europe's competitiveness and reducing reliance on external markets.

The study shows that while demand for frontier technologies such as AI, genomics, and advanced cybersecurity is rapidly increasing across the EU, the supply from EU vendors remains limited and uneven. Market mapping indicates that only 7 % of EU vendors focus on emerging technologies, 6 % on trust-enabling solutions, and 2 % on genomics-related tools - evidence of constrained capacity in critical innovation areas. With 63 % of global digital-health vendors active in Europe originating from the United States, the EU remains heavily reliant on non-EU suppliers in strategic domains such as AI diagnostics, genomics platforms, and cybersecurity, raising long-term risks for Europe's technological sovereignty and resilience.

The healthcare provider survey reveals that AI investment is nearly universal: 94 % of providers are using or planning to adopt AI within four years, mainly for clinical decision support (58 %), early diagnosis (53 %), and remote monitoring (44 %). While the vendor survey shows that many European companies are incorporating AI into their product strategies, expert interviews confirm that EU-developed AI-driven solutions face delayed market entry due to fragmented evaluation, certification, and reimbursement frameworks. Stakeholders noted that Europe performs strongly in research and pilot development yet struggles to translate innovation into clinical practice and large-scale deployment (unlike the United States and Asia,

where stronger investment flows and clearer approval pathways accelerate scaling). Financial-trend analysis corroborates this pattern, showing that EU digital-health investment volumes between 2019 and 2024 were less than half those of the United States, particularly in deep-tech areas such as AI and genomics.

To close these gaps and strengthen Europe's technological sovereignty, it is recommended to establish targeted funding and coordinated governance actions, for example:

- Funding to accelerate the translation of AI, genomics, and cybersecurity research into deployable healthcare solutions.
    - KPI: At least # frontier-technology projects reaching large-scale deployment by 2029.
- Building on the EU Action Plan for the Cybersecurity of Hospitals and Healthcare Providers, exchange best practices to strengthen cybersecurity maturity across healthcare systems, regional data hubs, and digital-health providers.
    - KPI: By 2030, at least # % of healthcare organisations achieving an advanced cybersecurity maturity level under the framework to be developed within the EU Action Plan on the Cybersecurity of hospitals and healthcare providers.

Strategic, long-term investment in frontier technologies could help reduce reliance on non-EU vendors, enhance healthcare-system resilience, and ensure that Europe captures the full economic and clinical value of the next generation of digital-health solutions.

Recommendation 6 – Diversify the adoption of digital health technologies beyond hospitals.

Focusing the adoption of digital health technologies solely on hospital care limits system-wide transformation and financial impact within the healthcare system. The analysis consistently shows that the offering of digital health investment and solutions is concentrated in secondary and tertiary hospital care, with far fewer solutions in outpatient, community, or preventive settings. This prevents system-wide transformation and underserves populations that rely on community care, preventive services, and mental health support. Expert interviews emphasise that isolated implementation within individual organisations fails to leverage interoperability and collaboration across the broader healthcare ecosystem.

To address this, digital health adoption should be diversified beyond hospital settings. Expanding investment to include community-based care, prevention, and mental health services would ensure that benefits are more equitably distributed across populations and organisations. At the same time, strengthening coordination across the healthcare value chain could help to unlock system-wide impact, improve care integration, and fully realise the value of digital health technologies. This could include, for example:

- Incentivise research, innovation, and deployment of digital health solutions in preventive care, community care, and public health, and fund pilot projects in non-hospital settings.
    - KPI: # of EU-supported pilots implemented in non-hospital settings by 2030
- Support Member States in developing integrated digital health strategies across care settings.
    - KPI: # of Member States with multi-setting digital health strategies supported by the EU by 2030
- Facilitate cross-sector collaboration to improve interoperability and care integration.
    - KPI: # of cross-sector digital health initiatives supported by the EU by 2030

Expanding digital health adoption beyond hospitals could help improve equity, unlock system-wide benefits, and strengthen care integration, and support EU health objectives.

Recommendation 7 – Strengthen organisational readiness and workforce.

The study confirms that organisational readiness and workforce capacity are critical enablers for the successful adoption of digital health across the EU. The analysis shows that 34% of healthcare providers report digital skills shortages, and 20% cite resistance to change. Expert interviews further highlight that overburdened staff often lack the time and capacity to adopt new tools. The economic impact analysis confirms that the full financial benefits are only achieved when technologies are fully embedded into clinical operations.

Indeed, effective adoption of digital health technologies depends not only on the availability of innovative solutions but also on the readiness of healthcare organisations and their workforce to integrate these tools into daily practice. Without sufficient support for digital skills, change management, and workflow integration, the full value of digital health investments may remain unrealised.

It is recommended to invest in workforce development and organisational transformation to accelerate digital health integration, including for example:

- Facilitate peer exchange and technical assistance on effective integration strategies across healthcare providers.
    - KPI: # of healthcare providers participating in EU-supported integration and change management initiatives by 2029
- Conduct EU-level assessments to identify common implementation barriers across Member States.
    - KPI: # of Member States participating in barrier assessments coordinated by the Commission by 2027

Strong workforce capacity and organisational readiness could help ensure that digital health technologies are effectively embedded into clinical and operational workflows.

Recommendation 8 – Promote sustainability and green digital health. Integrate eco-design, energy efficiency, and green procurement requirements into funding and procurement processes to reduce the environmental footprint of digital health solutions.

The study identifies environmental sustainability as an emerging priority for Europe's digital-health ecosystem. While digital health can reduce carbon emissions by limiting paper use, optimising logistics, and reducing patient and staff travel, its growing reliance on energy-intensive data infrastructures introduces new environmental challenges.

Evidence from the surveys and expert interviews shows that providers increasingly recognise the environmental benefits of digital solutions, particularly through telemedicine and paperless workflows, yet vendors rarely prioritise sustainability in their innovation strategies. This disconnect highlights the need for EU-level action to integrate environmental criteria into the design, procurement, and operation of digital-health solutions.

It is therefore recommended to promote sustainability by embedding environmental performance into digital-health policy and investment instruments through actions such as:

- Integrate eco-design and energy-efficiency standards into funding calls for digital-health projects and health-data infrastructures.
    - KPI: #% of new digital-health projects demonstrating compliance with EU eco-design and energy-efficiency guidelines by 2028.
- Adopt Green Public Procurement criteria for health IT and digital-health systems, ensuring lifecycle-based assessment of energy use, device durability, and recyclability.
    - KPI: At least #% of public tenders for digital-health infrastructure and solutions including sustainability requirements by 2030.
- Develop a European Green Digital Health Toolkit, to provide best practices, metrics, and methodologies for measuring and reducing the environmental footprint of digital-health operations.
    - KPI: Toolkit published by 2027 and adopted by at least # Member States by 2029.

Embedding sustainability into the digital-health agenda could help reduce the sector's environmental footprint, drive eco-innovation, and ensure that Europe's digital transformation of health contributes directly to EU climate-neutrality goals.

Recommendation 9 – Ensure digital health initiatives address disparities by embedding accessibility, equity, and usability criteria.

The study highlights that healthcare providers widely acknowledge the social value of digital health technologies, with 57% survey reporting benefits in terms patient engagement and experience. However literature evidence also indicates that these tools are predominantly used by younger, urban, and more

educated populations, raising concerns about restricted access for older, rural, and low-digital-literacy groups. Without targeted inclusion strategies, digitalisation could deepen health inequalities and undermine universal coverage. Interview with patient associations and experts highlighted the need for early patient involvement and for vendors to embed accessibility, inclusiveness, and ergonomic design from the outset, ensuring that digital-health solutions are intuitive, equitable, and usable for all citizens.

Ensuring that the digital transformation of health supports universal and equitable access requires embedding accessibility, equity, and usability principles across the entire policy and implementation cycle, from design and procurement to funding and evaluation.

Inclusivity should be strengthened and integrated into programmes and funding mechanisms through the following actions:

- Integrate accessibility and usability standards into funding calls for digital-health projects to ensure inclusive design.
    - KPI: #% of funded digital-health projects demonstrating compliance with EU accessibility standards by 2027.
- Promote digital-literacy initiatives to improve user capability and confidence among vulnerable populations.
    - KPI: At least # targeted digital-health literacy programmes by 2028.
- Support co-design and participatory innovation models, involving patients, carers, and community organisations in the development of digital-health services.
    - KPI: Share of EU-funded projects including user co-design processes reaches # % by 2029.

Embedding inclusivity and accessibility across digital-health policies could help ensure that the digital transformation of healthcare promotes equity, strengthens social cohesion, and upholds the principle of universal access to quality care.

3 Limitations and further research needs

Strengths and achievements

This study has delivered a systematic EU-wide classification of digital health technologies, encompassing 45 subcategories across five domains. This coherent taxonomy provides a solid foundation for monitoring the market and supports comparability across Member States.
By integrating multiple sources of evidence, including surveys of healthcare providers and vendors, vendor mapping, financial data, and expert interviews, it has produced a multidimensional perspective on the European digital health ecosystem. This framework enables continuous monitoring of adoption trends, vendor dynamics, investment flows, and comparative benchmarking with key global regions and countries. It also facilitates a richer understanding of the impact of major EU policy and regulatory measures, such as the European Health Data Space, the AI Act, and the Medical Devices Regulation.

For the economic impact analysis, this study applies a structured and transparent approach to assessing the cost savings enabled by digital health technologies. Clear criteria guide each step, ensuring objectivity and robustness. A diverse set of relevant use cases was investigated, covering several costly medical conditions and various healthcare stages. Despite the emerging nature of these technologies, the study captures initial estimates of their financial impact. Multiple data collection methods (e.g. workshops, interviews, desk research, validation sessions) were used. The analysis incorporates key factors influencing the implementation and adoption of the use cases across the EU and provides both quantitative and qualitative insights into how technologies affect healthcare processes and can lead to cost savings.

Challenges and gaps

This study has also revealed important limitations. Fragmented and heterogeneous data sources created evidence gaps, particularly in vendor mapping, where overlaps between EHR, HIS, and emerging solutions generated complexity. Financial trends data remain scattered and opaque, limiting visibility on SME and start-up scale-up performance beyond national or anecdotal insights. International benchmarking proved more feasible against the United States but was less robust for the Asia-Pacific region due to weaker data availability.

The study has nonetheless established a strategic EU evidence base that can support harmonised policymaking, guide investment strategies, and monitor frontier technologies. However, persistent data fragmentation may leave blind spots regarding SME competitiveness, regulatory compliance pathways, and the adoption of high-impact technologies such as genomics, AI diagnostics, and digital twins.

The economic impact analysis has several limitations across data collection, assumptions, and scope. In terms of data collection, stakeholder input that was gathered through interviews and workshops may reflect biased perspectives, as participants often represent specific interests, which can affect the representativeness of the findings. For the partial scenarios, experts were asked to assess the applicability of benefits, but the task was time-bound in the context of the workshops and proved challenging for the experts especially due to the emerging nature of the technologies, which may have impacted the validity of the results. Although majority opinion was used to determine the degree to which value drivers are assumed to be present in the partial scenario, some experts still expressed dissenting views regarding some estimates. Experts were also interviewed to support quantification; although they are knowledgeable, there is limited evidence available to independently validate their estimates. This includes that some input values are derived from a single interview (see the mental health platform use case). Although these values were shared in the validation session, they could not be cross-checked against values collected from another interview conducted with a similar depth and specificity of questions. Their input therefore remains an informed estimate that inherently involves uncertainty. In addition, the estimates rely on a small sample size of interviewees.

Furthermore, the economic impact analysis relies on several assumptions and simplifications. Due to limitations in the availability of granular data, it was not possible to account for all relevant factors, which constrain the depth and precision of the approach. To support the analysis, methods were used to aggregate, convert and extrapolate data. Although reputable sources such as WHO and Eurostat were used, differences in definitions and reporting standards may affect consistency. Another limitation arises from the use of

healthcare expenditure as a proxy to consolidate cost categories when monetising cost savings (i.e. the value drivers). This approach assumes that fixed costs are uniform across Member States, which may not reflect actual conditions. In particular, differences in labour costs are underrepresented.

The quantification and monetisation of value drivers and costs are based on simplified models that exclude certain secondary effects, such as reduced productivity during the transition period in which the use case is being implemented. During such transition periods, the use case is being integrated into standard workflows and clinicians are being trained to use the technology, which takes time and effort. Moreover, one-off and recurring costs are calculated for the use case overall, but the use case can in reality represent a collection of specific solutions from vendors with a more complex cost structure. Furthermore, EU-level estimates rely on average hospital numbers per Member State, which oversimplifies the diversity in hospital size and structure. Additionally, some value drivers were extrapolated using data from a reference country, such as average commuting distance to work, which may not accurately represent conditions in other Member States.

Furthermore, the economic analysis used in this study relies on the identification of value drivers that can have a direct impact through cost savings from the healthcare provider perspective. In cases where the identified value drivers are indirect in nature from the perspective of a healthcare provider, such as for the next generation sequencing use case, extended economic modelling was not performed. Relying on cost savings to the healthcare provider results in a conservative estimate of benefits.

The analysis additionally relies of cost estimates that reflect the implementation and use of the technology in a healthcare provider setting, which assumes that the technology is mature enough for some case studies from clinical practice to be available. In cases where verifiable data (from hospital settings) for cost estimates are lacking, such as for virtual human twins, extended economic modelling was not carried out.

Another possible limitation is that adoption rates are based on survey expectations and may be overly optimistic, as real-world uptake is typically slower and depends on proper integration of the technology into current processes and change management. The cost-benefit model assumes immediate and full realisation of benefits, whereas in practice, these benefits often emerge gradually and may be delayed.

Lastly, the scope and perspective of the analysis introduce further limitations. The analysis is conducted from the healthcare provider perspective, which means certain costs and benefits fall outside the scope of analysis. These include patient out-of-pocket expenses, broader social costs, and indirect effects. Indirect costs, for example, may arise when time savings lead to increased demand (such as more imaging reports to review) or workload (such as more patients to deliver care to or more time needed for clinicians to improve their digital skills), which can carry additional implications. Also, quality of care or patient satisfaction is not considered. Moreover, the provider-focused approach does not fully account for the broader healthcare ecosystem, even though the effectiveness of many technologies depends on health data sharing across different provider types. By scoping the analysis to one provider, the interdependencies within the wider healthcare landscape are not fully captured.

Recommendations on future research

To remain relevant and impactful, further research could producea living tool, continuously updated with structured data from EU initiatives such as the European Health Data Space, EUDAMED, and the Digital Decade indicators.

Closer collaboration with industry, SMEs, and research institutions will be needed to close evidence gaps on investment flows and frontier innovation. Future research should also enhance global benchmarking, building a more balanced comparative perspective beyond the United States. With these improvements, the Observatory could become a long-term strategic instrument to guide EU policy, investment, and competitiveness in digital health.

Possible actions - European digital health market observatory

1. Strengthen integration with EU data infrastructures (Digital Decade monitoring, EUDAMED for medical devices, EHDS data access bodies) to ensure consistency, improve comparability, and reduce duplication of effort.

2. Expand visibility of SMEs and start-ups by establishing an EU-level reporting mechanism for health tech investment and performance.
3. Enhance global benchmarking by building structured collaborations with OECD and WHO, and by extending comparative analysis to Asia-Pacific markets (China, Japan, South Korea).

Possible actions - Economic impact analysis

1. Conduct studies to collect real-world evidence of the benefits and costs of digital health technologies identified in this analysis from healthcare providers that implement the technologies in practice.
2. Conduct targeted research into the underlying barriers and facilitators that influence successful implementation and adoption of digital health solutions across healthcare settings.
3. Broaden future evaluations beyond financial impact to include quality of care, patient outcomes, and satisfaction, ensuring investment decisions reflect the full value of technologies.

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