



World Health
Organization

European Region

The ongoing journey to commitment and transformation

Digital health in the
WHO European Region
2023





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Abstract

Digital health has experienced a period of accelerated growth in recent years. The critical role of digital health in attaining universal health coverage and in supporting efforts to make health care more efficient, accessible and effective is now clearly recognized. At the same time, the pressures that have resulted from COVID-19 have thrown into sharp relief the varying abilities of countries to digitally transform their health-care systems. Drawing on the data gathered through the 2022 Survey on Digital Health in the WHO European Region, this report presents an overview of the situation in the Region. It provides evidence of the substantial progress made and where improvement is still necessary. It highlights a number of policy options, facilitators and barriers to guide the successful implementation of digital health in Member States. The report includes case examples provided by countries, illustrating a range of digital health applications and practices in various national contexts. Through the proposed priority actions and considerations WHO reaffirms its commitment to support Member States in fulfilling the strategic objectives of the Regional digital health action plan for the WHO European Region 2023–2030.

Keywords

DIGITAL HEALTH; MOBILE HEALTH; TELEHEALTH; ELECTRONIC HEALTH RECORDS; ARTIFICIAL INTELLIGENCE; HEALTH INFORMATION EXCHANGE

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Contents

Foreword	vi
Acknowledgments	vii
Abbreviations	viii
Executive summary – The developing story	ix
Key findings from the survey data	xii
Considerations to help us move forward together.....	xvii
Chapter 1 – The new frontier	1
The digital lifeline in a global crisis.....	1
WHO’s role in charting the course.....	2
Chapter 2 – The blueprint (methodology)	5
Comparing the 2015 and 2022 surveys	6
Understanding the limitations	7
Chapter 3 – The pillars of transformation	9
Part 1 : the leaders – national digital health governance	9
Part 2: the lifelines – EHRs	31
Part 3 : bridging distances – telehealth	49
Part 4 : health in your hands – mHealth and mApps	68
Part 5: The power of knowledge – big data and advanced analytics for health	83
Part 6 : sharing is caring – access to and sharing of data	94
Chapter 4 – The road ahead	103
References	107

Foreword

Presented within these pages are an exploration and documentation of progress in the emerging field of digital health in Europe. What you are about to use is more than just a description of technological advancements. Instead, it serves as a story of change, resilience and innovation, encapsulating the spirit of 53 Member States of WHO in the Region, each with its own unique digital health journey.

The year 2022, marked by the residual effects of the COVID-19 pandemic, will be remembered as a significant milestone on the path to comprehensive digital health. It was a year of exploration and discovery, where the WHO Regional Office for Europe conducted a survey on the progress of digital health. In our mission to map this progression, we found ourselves immersed in a narrative filled with hope, determination and innovation. What stood out was the profound influence of the pandemic, acting as a catalyst – accelerating the adoption of digital health solutions.

It became clear that digital health was not solely about technology; it was about strengthening health systems, improving accessibility and driving the cultural transformation towards sustainable care and public health.

The following chapters provide a detailed analysis of our discoveries, following the thematic framework utilized in our 2022 survey. You will gain insights into the foundations of transformation, the role of leadership in national digital health governance, the crucial function of Electronic Health Records, and the expanding realm of telehealth. Additionally, we delve into the increasingly relevant mobile health sector, the power of big data and analytics for health, and the vital conversation surrounding data accessibility and privacy.

However, our narrative does not solely consist of triumphs. It also acknowledges the obstacles ahead, the uneven progress and the disparities that still require attention. We observed gaps in

the system, from the incomplete implementation of interoperability standards to the inadequate evaluation of the impacts of digital health interventions. The digital inclusion plan, designed to ensure disadvantaged populations are not left behind, has yet to be universally adopted.

These are areas that demand our focus and resources as we continue to advance. Member state responses to our survey, provide a diverse and abundant repository of knowledge, unveiling a multidimensional narrative of digital health in the Region.

The insights from this report are not the end of our journey, but rather guiding principles pointing us towards the future.

We welcome you to explore this report, to comprehend, to reflect, and to join us on this expedition. Together, we can advance this story of change and strength, guiding our workforce and citizens towards technologically empowered health.

Finally, this is not merely a technical document, but a confirmation of our commitment to guide and support the cultural transformation of health care and public health.



Dr Hans Henri P. Kluge

WHO Regional Director for Europe

Acknowledgments

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The main authors were Elettra Ronchi (Senior consultant in digital health and data governance, WHO Regional Office for Europe), Keyrellous Adib (Technical officer for Data Science and Digital health, WHO Regional Office for Europe), Andrea de Panizza (Senior research manager, Italian National Institute of Statistics), David Glance (Adjunct academic, University of Western

Australia), Abhinav Devaria, (Master's student in public policy, Sciences Po) and Stefan Buttigieg (Consultant, WHO Regional Office for Europe) all of whom were involved in data collection, data analysis, report writing and review. Furthermore, the following colleagues from the WHO Regional Office for Europe provided technical review and feedback during the development of this document: Helen Caton-Peters, Ryan Dos Santos, Govin Permanand and Clayton Hamilton.

WHO Regional Office for Europe's deepest gratitude is extended to the nominated experts and survey participants, whose invaluable contributions and provision of case examples have been instrumental in the actualization of this report.

For further information please contact the WHO Data and Digital Health Unit (EUDigitalHealth@who.int).

Abbreviations

AI	artificial intelligence
app	application
ATC	anatomical therapeutic chemical
CT	computerized tomography
DHS	digital health strategy
DICOM	Digital Imaging and Communications in Medicine
DTAC	Digital Health Technology Assessment Criteria
eHealth	electronic health
EHR	electronic health record
ePrescription	electronic prescription
EU	European Union
GDPR	General Data Protection Regulation
GP	general practitioner
HIS	health information system
HL7	Health Level Seven
ICD	International Classification of Diseases
ICF	International Classification of Functioning, Disability and Health
ICNP	International Classification of Nursing Practice
ICT	information and communication technologies
mApp	mobile health application
mHealth	mobile health
NCCID	National Covid Chest Imaging Database
NDS	national data strategy
NEHR	national electronic health record
NHS	National Health Service
SDGs	sustainable development goals
UHC	universal health coverage

Executive summary

The developing story

In the unfolding narrative of digital health in Europe, the year 2022 marked an important chapter. We undertook a journey of exploration and discovery, traversing all 53 Member States of the WHO European Region to take the pulse of digital health progress. What we found is a story of transformation, resilience and innovation.

This report serves as a narrative map of our journey. It draws upon the insights gathered from a survey conducted between May and October

2022 – the 2022 Survey on Digital Health in the WHO European Region – during a crucial period of emergence from the global COVID-19 pandemic. Our mission was to understand the evolution of digital health, the infrastructural backbone that supports it, how it is being championed and utilized, and the barriers that might impede its widespread adoption. The digital health themes used in the survey are reflected in the chapter structure of this report.

Chapter 1. The new frontier

Brings together and clearly defines the role of WHO in this evolving story, providing a clear segue to the next chapters.

Chapter 2. The blueprint (methodology)

Focuses on the critical role that this survey played in bringing out the relevant insights that were needed to deeply understand the current state of play of digital health in the European Region. It eloquently outlines the step by step approach that was needed to truly understand what is currently going on.

Chapter 3. The pillars of transformation

This chapter is divided into six parts

Part 1: the leaders – national digital health governance

Presents the significance of national digital health strategies and policies in unlocking the potential of digital health. This part of the chapter is informed by Strategic Priority 1 of the Digital Health Action Plan for the WHO European Region 2023–2030 and focuses on aspects like accessibility, quality, safety and efficiency, in addition to health information sharing and interoperability. Additionally, it emphasizes the role of national government agencies in supervising the uptake and application of digital health, the availability of funding, and the promotion of health literacy and digital inclusion.

Part 2: the lifelines – electronic health records (EHRs)

Carries forward the discussion on EHRs, touching upon the specificities of their use and implementation.

Part 3: bridging distances –telehealth

Delves into the utilization and advancement of telehealth services in the face of the recent pandemic. It expounds on the use of telehealth across Member States, reporting on national strategies, evaluations and barriers to telehealth implementation. It also examines the impact of the COVID-19 pandemic on the initiation or enhancement of telehealth services.

Part 4: health in your hands – mobile Health (mHealth) and mobile health applications (mApps)

Describes the role of mHealth and mApps in delivering various health services. It assesses the regulatory measures, challenges and impacts of the pandemic on the commencement or improvement of mHealth services.

Part 5: the power of knowledge – big data and advanced analytics for health

Reviews the employment of big data and sophisticated analytics in health services, as well as the challenges and regulations surrounding them.

Part 6: sharing is caring – access to and sharing of data

Data assesses the approaches Member States have employed to enable access to and sharing of health data, with a focus on privacy protection and control over health data.

Chapter 4. The road ahead

Offers concluding insights on the report and the vital takeaways for WHO and Member States, arising from the analysis of the 2022 WHO European Region digital health survey data.

Looking back at all the work that has been done, we witnessed first-hand the powerful catalyst that the pandemic has become for digital health. The questions we posed in the survey aimed to capture whether the pandemic had expedited the adoption of digital solutions, particularly in the realms of health monitoring, surveillance, telemedicine and mobile health solutions.

Our journey led us to encouraging vistas of progress. We discovered drivers that have been instrumental in solidifying digital health as a cornerstone in the Region, aligning with Member States' strategic priorities. Every Member State acknowledged digital health as a strategic asset

in the pursuit of expanding health coverage and enhancing access, quality and efficiency. They recognized the power of digital health solutions to ensure the sustainability of their health systems, particularly in the face of aging populations and increasing chronic disease burdens.

In our exploration, we found technological advancements, especially in data analytics and artificial intelligence, offering significant opportunities for health-care improvements. A majority of Member States reported having developed national data strategies and policies regulating the use of big data and advanced analytics in health.

A positive outcome of the pandemic was its role as an accelerant for digital health policies and programmes. We noted substantial progress in establishing governance and regulatory frameworks, as well as national bodies overseeing digital health. Yet, the road ahead is not without its challenges.

Efforts are underway to educate and train health-care and social care professionals, yet only about half of Member States in the Region have developed policies for digital health literacy. Fewer still have implemented a comprehensive digital inclusion plan, leaving disadvantaged populations at risk of falling behind.

While strides have been made, the landscape also revealed areas of uneven progress. Standards for data exchange and interoperability, and systematic monitoring and evaluation have not yet been fully implemented. Evaluation of the impacts and benefits of digital health, vital for efficient resource allocation, is not being conducted systematically.

In this summary of the digital health survey conducted in 2022, we share the key findings that guide the narrative to follow. They are the distilled essence of the definitive responses from all 53 Member States of the European Region. This report tells their story – the story of a Region embracing the digital health revolution, celebrating its victories, acknowledging its challenges and committed to advancing its journey to transformation.



Key findings from the survey data

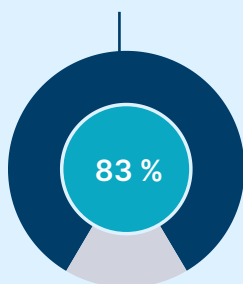
Survey participation

All 53 Member States of the European Region participated in the survey. However, as some of

the questions were not mandatory, there was a range of response rates across different areas.

National digital health governance

83 % of reporting Member States (44 out of 53) have a national digital health policy or strategy.



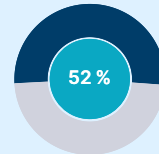
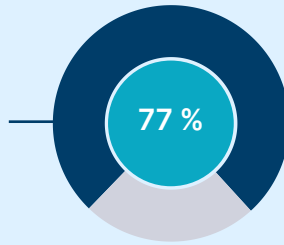
98 %

98% of these Member States (43 out of 44) reported improving accessibility, quality, safety and efficiency and an equal number improving health information sharing /interoperability as strategic priorities.

93 %

93% (41 out of 44) also identified enhancing access to and reuse of data as a strategic priority.

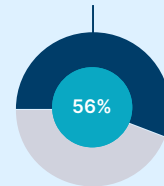
77% of reporting Member States (39 out of 51) reported having established a national government agency or organization responsible for the monitoring of the adoption and use of digital health.



52% of the reporting Member States (27 out of 52) reported having developed policies and strategies for digital health literacy while another 56% (25 out of 45) also reported that they had developed a digital inclusion plan.

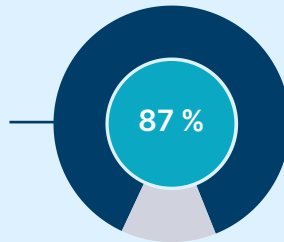


100% of reporting Member States (52 out of 52) declared that public funding is available for the implementation of digital health programmes.

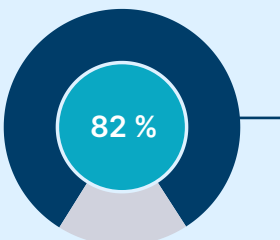
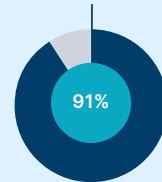


EHRs

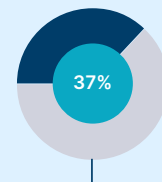
87% of Member States (45 out of 52) report having either a national EHR system (NEHR), interconnected regional EHRs or a patient portal.



91% of Member States (48 out of 53) have legislation supporting the use of their NEHR



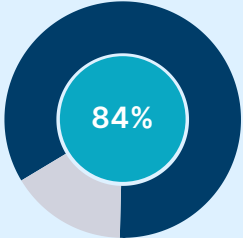
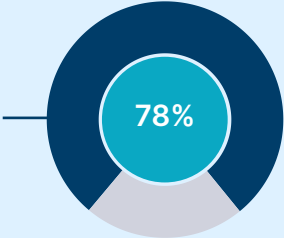
82% of Member States (37 out of 45) routinely make the prescription electronically available to pharmacies.



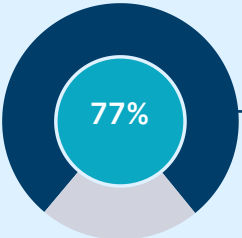
37% of Member States (19 out of 52) report insufficient funding as the most important barrier to EHR system implementation.

Telehealth

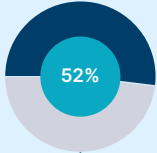
78% of Member States (40 out of 51) directly address telehealth in their policies or strategies.



84% of Member States (43 out of 51) use teleradiology.

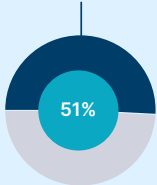


77% of Member States (39 out of 51) use telemedicine or remote patient monitoring.



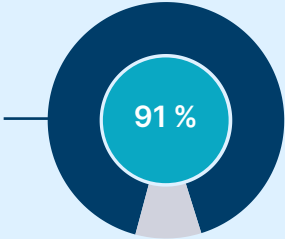
Over half of Member States use teledermatology (52%; 24 out of 46) and telepsychiatry (51%; 23 out of 45).

59% of Member States (30 out of 51) introduced a new law, legislation or policy to support telehealth during the COVID-19 pandemic.

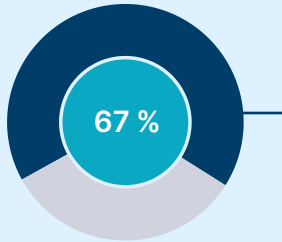


mHealth and mApps

91% of Member States (38 out of 42) reported having at least one government-sponsored mHealth programme.

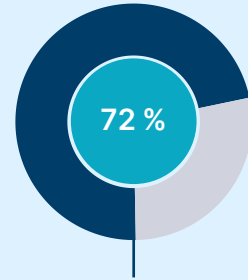
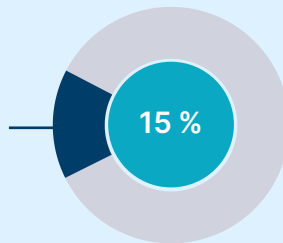


The COVID-19 pandemic had a significant positive impact on the introduction and improvement of existing mHealth services.



67 % of Member States (31 out of 46) have established mHealth services providing access to an EHR.

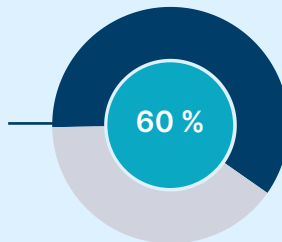
Only 15% of responding Member States (six out of 39) reported the evaluation of government-sponsored mHealth programmes.



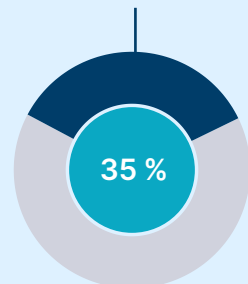
72% of Member States (34 out of 47) reported not having an entity that is responsible for the regulatory oversight of mApps for quality, safety and reliability.

Big data and advanced analytics for health

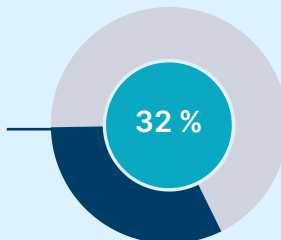
60% of Member States (30 out of 50) report having developed an overarching national data strategy regulating the use of big data and advanced analytics in the health sector.



35% of Member States (17 out of 48) stated that they had a national policy on the use of big data and advanced analytics in the health sector.



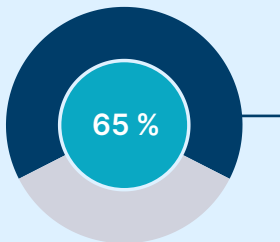
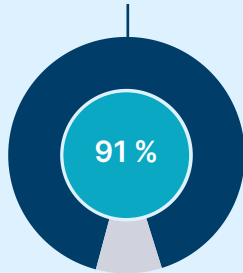
32% of Member States (13 out of 41) have a national policy or strategy regulating the use of big data by private companies.



Access to and sharing of data

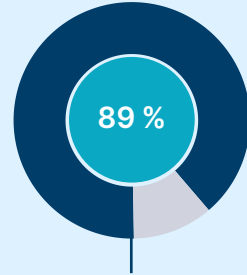
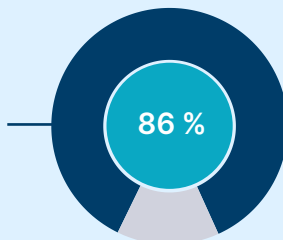


All Member States have passed privacy legislation and 91% (48 out of 53) report having legislation to protect the privacy of an individual's health-related data in an EHR.

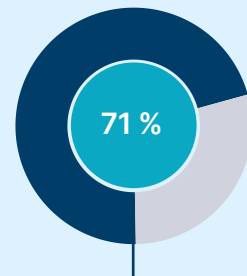


65 % of Member States (31 out of 48) report that individuals have the right to specify which health-related information in their EHR can be shared with health professionals of their choice.

86% of Member States (44 out of 51) have legislation that allows individuals electronic access to their own health data in their EHRs.



89% of Member States (46 out of 52) report having implemented secure identification of patients and health-care providers.



71% of Member States (34 out of 48) reported they had laws or policies that permitted the public authorities to extract data from EHR systems for the creation of regional/local or national registries and databases.



Considerations to help us move forward together

1 Establish effective governance

The first consideration is to construct effective governance of digital health, which involves establishing and expanding national bodies and agencies dedicated to this pursuit. Intersectoral national policies and strategies could be created, promoting shared commitment, universal relevance and a focus on achieving health objectives.

2 Develop robust evaluation guidelines and increase digital health literacy

An evidence-based approach should be employed in the development of guidelines for evaluating digital health interventions. Simultaneously, increasing both digital and health literacy among health-care professionals and the general public is desirable, towards making it a core component of national health objectives.

3 Ensure sustainable financing and collaboration

Amid the lessons learned from the COVID-19 pandemic, sustainable financing strategies are paramount. Member States should strengthen collaborations between the public and private sectors, enabling funding barriers to be overcome and the acceleration of the acceptance and implementation of digital health strategies.

4 Address interoperability and standardize health data

Another crucial step is to fully implement health data standards and address interoperability issues. This could be achieved by establishing a quality management system for interoperability testing, and devising suitable testing tools and certification procedures. A national health data strategy for the use of big data and advanced analytics is a potential way forward, emphasizing standardization of data formats and the development of data standards to resolve interoperability issues.

5

Promote patient-centred care and digital inclusion

The final consideration is to promote patient-centred care and digital inclusion. Clear policies and strategies are required to integrate technologies effectively into the health-care system. Moreover, steps to bridge the digital divide for example, by developing capacity-building and digital inclusion strategies, ensuring universal access to digital technologies, are crucial. Guidelines to address patient data access, ownership and risk awareness, aiming to strengthen national health information systems would be complementary elements.

Chapter 1

The new frontier

In the heart of Europe, a transformation is taking place; a digital revolution is sweeping across the health-care systems of the Region. The WHO Regional Office for Europe has been working to document this change. This report is a testament to this journey; a chronicle of the emerging trends and the current state of digital health care in the Region.

The narrative of this report is woven from the threads of data collected in the 2022 Survey on Digital Health in the WHO European Region and is enriched by the contributions of numerous national contacts. To bring the story to life, we have included case studies from Member States, showcasing their triumphs and the practical application of digital health in diverse settings.



The digital lifeline in a global crisis

Over the past few decades, digital technologies have been quietly reshaping the health sector. They have changed how we approach health, how patients and health professionals communicate, and how populations access health services. Today, digital technologies stand as a key determinant of health, both directly and in their interaction with traditional health determinants (1).

The COVID-19 pandemic has brought into sharp focus the critical role of digital technologies. They have been our allies in maintaining essential health services and in emergency preparedness and response. The document *Health system transformation in the digital age during the*

COVID-19 Pandemic (EUR/RC71/7) (2) and the 2021 report of the Pan-European Commission on Health and Sustainable Development, *Drawing light from the pandemic: a new strategy for health and sustainable development (3)*, bear testament to this.

However, the pandemic has also laid bare the disparities in digital transformation across Member States. While some Member States, equipped with mature digital infrastructure and robust privacy and health data governance frameworks, were able to swiftly adapt to the demands of the pandemic, others struggled to harness the full potential of digital technologies.



WHO's role in charting the course

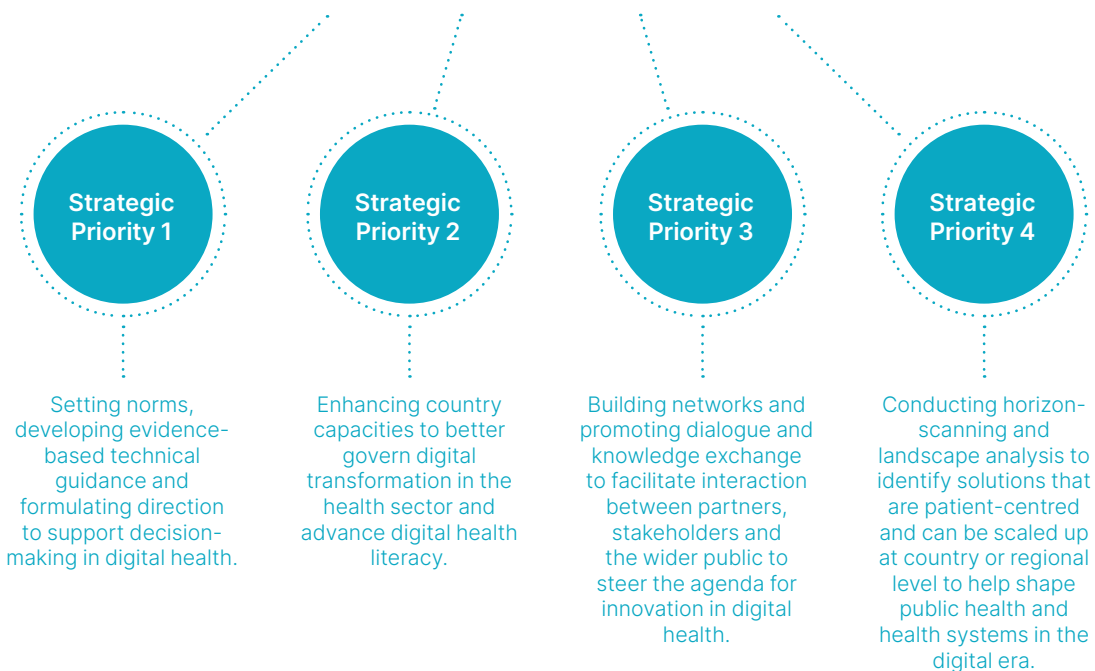
Recognizing the value of digital health and its potential to accelerate progress towards universal health coverage (UHC), the WHO Regional Office for Europe launched the Empowerment through Digital Health flagship initiative (4). This initiative, part of the European Programme of Work, 2020–2025 – “United Action for Better Health” (5), was established to coordinate and support the strategic implementation of digital health initiatives in the WHO European Region.

The Digital Health flagship initiative provides a platform for Member States to capitalize on the momentum that COVID-19 has brought to the

digital transformation of health systems. It also provides a framework for the implementation of WHO's Global Strategy on Digital Health 2020–2025 (6) and the World Health Assembly resolutions on digital health in the Region (7).

The *Regional digital health action plan for the WHO European Region 2023–2030* (8) intends to support Member States in leveraging and scaling up digital transformation for better health and in aligning digital technology investment decisions with their health-system needs, while fully respecting the values of equity, solidarity and human rights. The action plan identifies four strategic priorities (see Fig.1).

Fig.1. Four strategic priorities:





The 2022 survey on digital health in the WHO European Region

In order to determine and observe benchmarks in the adoption and progress of digital health at the national, regional and global levels WHO has conducted a number of global surveys. The first survey, in 2005 (9), focused on national-level information to establish a baseline on electronic health (eHealth) use, with the second, in 2009 (10), containing more detailed questions, further building on the acquired knowledge base and including a focus on eHealth themes. The third survey in 2015 developed by the WHO Global Observatory for eHealth with consultation and input from relevant eHealth partners, examined eHealth in the context of its role in supporting UHC (11).

The 2022 Survey on Digital Health in the WHO European Region (henceforth the WHO Regional

Survey 2022), on which this current report is primarily based, is a continuation of the 2015 WHO Global Observatory on eHealth (11) but it has been updated to reflect recent progress and policy priorities, with the digital health landscape having changed remarkably since 2015. The WHO Regional Survey 2022 adopted the term “digital health”, expanding the concept of eHealth to include the growing role of mobile devices and other digital technologies for health such as telehealth, artificial intelligence (AI) and big data, and the wider range of smart and connected devices. The term also more adequately reflects the growing importance of health data and a person-centric digital health ecosystem, and the strategic relevance of digital technologies as a “field of knowledge and practice” to improve health (6).

Chapter 2

The blueprint (methodology)

The WHO Regional Office for Europe initiated the WHO Regional Survey 2022 in April 2022, maintaining an open channel for responses until October. Two formats of the survey were provided: a digital version for widespread online access and a paper version for those Member States requesting a traditional medium. Recognizing language diversity, the instructions and questions were available in both English and Russian.

All Member States were formally invited to partake in this initiative and each was recommended to nominate a national survey coordinator. The coordinators' roles were crucial in identifying relevant national digital health experts and ensuring their input was incorporated into the survey.

The data-processing stage marked a significant milestone in this journey of understanding the status of digital health in the WHO European Region. Every single one of the 53 Member States of the WHO European Region participated in the WHO Regional Survey 2022 – a noticeable increase from the 46 participants in the 2015 survey. However, as some of the survey's questions were not mandatory, there was a range of response rates across different question areas. In some instances, Member States chose not to respond, or indicated they didn't know or that

the question wasn't applicable. For the analysis, these instances were excluded from the number of respondents on which percentages were computed. The analytical process was handled by staff at, and consultants of, the WHO Regional Office for Europe, employing Microsoft Excel and SPSS Statistics.

For the purposes of this report, references to "Europe" and the "European Region" denote the WHO European Region. In order to identify further trends, the data were also analysed based on additional subregional groupings (Table 1) – a departure from the 2015 survey but aligned with the geographic subregions as defined by the United Nations Statistics Division (12) – and by the European Union (EU) 27 Member States (EU27). It is important to clarify that the United Kingdom's survey responses represent only England (the United Kingdom).

Finally, this report includes various case examples of digital health in practice. These case examples were collected as a follow-up request from the survey respondents, after the completion of the main survey. The purpose of this was to give examples of successful digital health applications in different national settings. Therefore, these examples should be understood as responses from the respective Member States, and might reflect their specific opinions and perspectives.

Table 1. Member States by subregion

Subregion	Member States
central Asia	Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan
western Asia	Armenia, Azerbaijan, Cyprus, Georgia, Israel, Türkiye
eastern Europe	Belarus, Bulgaria, Czechia, Hungary, Poland, Republic of Moldova, Romania, Russian Federation, Slovak Republic, Ukraine
northern Europe	Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, United Kingdom
southern Europe	Albania, Andorra, Bosnia and Herzegovina, Croatia, Greece, Italy, Malta, Montenegro, North Macedonia, Portugal, San Marino, Serbia, Slovenia, Spain
western Europe	Austria, Belgium, France, Germany, Luxembourg, Monaco, Netherlands (Kingdom of the), Switzerland

Note: For Member States of the WHO European Region the geographic subregions are as defined by the United Nations Statistics Division and used in all United Nations publications and databases. The official United Nations Member State names are also used as these are not standard across all the data sources used. In the case of the western Asian subregion, only those Member States that are part of the WHO European Region are considered (others are part of the WHO Eastern Mediterranean Region and are excluded as not being within the remit of this report).

Source: (12)



Comparing the 2015 and 2022 surveys

The analysis of the WHO Regional Survey 2022 data invites comparisons with its global predecessor, the 2015 survey, where relevant and feasible. This comparative lens enhances the significance of the findings, grounded in a consistent approach to the treatment of missing, “not applicable”, and “do not know” responses across both surveys.

However, it is important to bear in mind that the structure of the 2015 and 2022 surveys were not identical. For instance, in the 2015 survey,

questions pertaining to telehealth and mHealth asked Member States to pinpoint the operational level of the initiatives – local, intermediate, national, regional, or international, whereas the 2022 edition didn’t draw these geographical distinctions, rather inviting responses about any project or service within the country’s purview. Moreover, the 2015 survey allowed multiple selections for maturity levels of telehealth or mHealth initiatives, a feature that was streamlined in the 2022 version to allow only one maturity level selection.



Understanding the limitations

Moving on to the limitations of the survey, challenges were primarily linked to the variability of definitions of terms used in the questions. These terms, many of which were defined as per the 2015 survey and are standard WHO definitions, may be subject to varying interpretation across participating Member States.

One such example concerns the definition of a national electronic health record (NEHR) in the original 2015 survey instrument, which may not have fully encapsulated the intricate variations in EHR implementation approaches. Recognizing this, supplementary questions were introduced in the 2022 survey for Member States to report EHR systems at national, regional or local levels, and inquired whether these systems are linked or federated at the national level. Furthermore, Member States were asked about

the implementation of patient portals. For future surveys, the recommendation is to move away from distinguishing levels of EHR implementation and rather focus on the functionality of systems and the degree of access for patients and health-care providers. A similar issue arises in the distinction between mobile health (mHealth) and mobile health applications (mApps), as some Member States perceive them as synonymous.

Non-responses also pose a limitation, as they impair the robustness of interpretations and comparisons that can be drawn from the collected data. To mitigate this, future surveys may consider making definitive answers mandatory, possibly encouraging respondents to dedicate the necessary time and effort to gather the required data.

Chapter 3

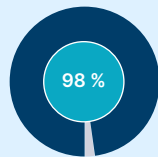
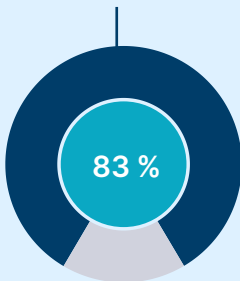
The pillars of transformation



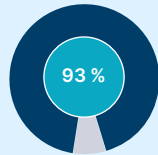
Part 1 : the leaders – national digital health governance

Data highlights: key insights from survey responses

83 % of reporting Member States (44 out of 53) have a national digital health policy or strategy.

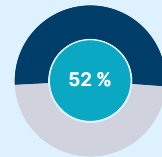
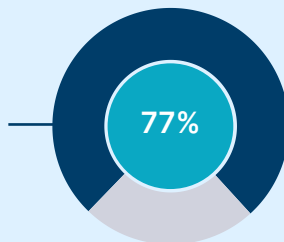


98% of these Member States (43 out of 44) reported improving accessibility, quality, safety and efficiency and an equal number improving health information sharing / interoperability as strategic priorities.



93% (41 out of 44) also identified enhancing access to and reuse of data as a strategic priority.

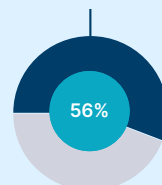
77% of reporting Member States (39 out of 51) reported having established a national government agency or organization responsible for the monitoring of the adoption and use of digital health.



52% of the reporting Member States (27 out of 52) reported having developed policies and strategies for digital health literacy while another 56% (25 out of 45) also reported that they had developed a digital inclusion plan.



100% of reporting Member States (52 out of 52) declared that public funding is available for the implementation of digital health programmes.





Digital health solutions are an essential component and enabler of sustainable health systems and UHC. To realize their potential, digital health initiatives must respond to health needs and be part of the wider health ecosystem. They should be guided by a robust national digital health strategy (DHS) or equivalent regional strategy documents.

The form, content and governance of national DHSs vary significantly across Member States, and questions still arise regarding what incentives and measures an effective DHS should include and address. Indeed, the provision of support to Member States in the articulation of their DHS to deliver successful digital transformation of health systems has been identified as an important strategic objective of the Regional digital health action plan for the WHO European Region 2023–2030 (8).

The WHO global strategy on Digital Health 2020–2025 (6) acknowledges that each country's DHS should be developed in a way that enhances the level of a country's digital health maturity and achieves positive health outcomes in line with national health plans. Prominent overarching goals of a national DHS should be to promote a country's highest health policy priorities and support efforts in working towards UHC.

Furthermore, as laid out by WHO (6), a DHS should play a key role in achieving policy coordination and coherence by setting out infrastructural, legal, financial, organizational, human and technological objectives. This includes securing

sustainable funding for: initial resources and the continued maintenance and development of digital health systems; capacity-building to ensure digital health literacy among citizens and, vitally, in the current and upcoming workforces; strong governance structures, laws and policies to promote the engagement and trust of multiple stakeholders.

The WHO Regional Survey 2022 aimed to measure DHS comprehensiveness, providing insights into whether Member States in the Region have built and maintained foundations for digital health through clear policies and strategies, their key features and the progress made since 2015. It surveyed respondents on the key elements of their country's DHS – many of which are described in the WHO National eHealth Strategy 2012 Toolkit (13). The toolkit, although published over a decade ago, provides a valuable framework and method for the development of a national digital health vision, action plan and monitoring framework. It is a resource that can be applied by all governments that are developing or revitalizing a national DHS, whatever their level of advancement.

Having DHS and action plans in place are not sufficient, however, for change to be successful. Monitoring progress over time helps to ensure that efforts are effective and enables the understanding of what works and what does not. The survey therefore also examined how Member States monitored and evaluated progress in the implementation of their DHS and digital health interventions.

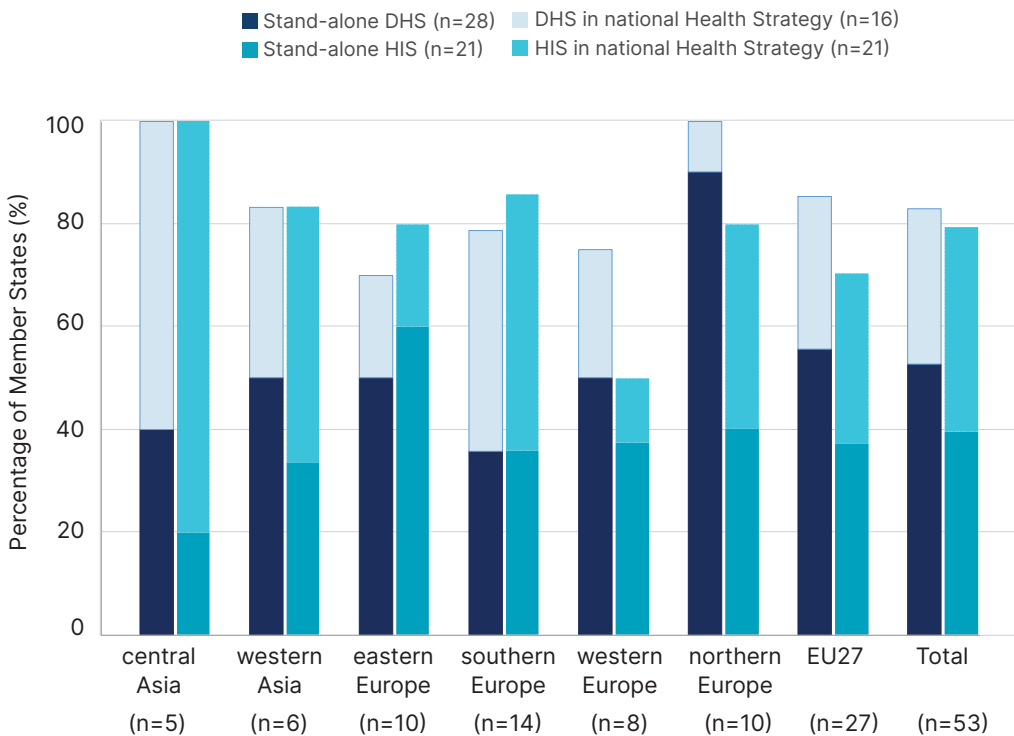


National digital health policies and strategies

In 2022, 83% of Member States (44 out of 53) reported having a DHS and 79% a health information system (HIS) strategy (42 out of 53). Of the 44 Member States who reported having a DHS, 28 had developed a dedicated or stand-alone DHS and another 16 reported that their DHS was addressed within the scope of their national health strategy or policy or broader digital strategy (Fig. 2). An example of the latter is reported in Case Example 1, which briefly

describes the DHS in Uzbekistan. The highest rates of having a national DHS or policy were seen in the central Asian and the northern European subregions, with all but one in this latter region having a stand-alone national DHS. When asked, 11 Member States had revised their national DHS since its first adoption (of which nine had carried out revisions in 2021–2022), 12 were currently revising it and 12 had plans to revise it.

Fig. 2. Member States with policies or strategies addressing digital health and HISs, by subregion



Note: the number of responding Member States varies for telehealth and data sharing.

Case Example 1.



The “Digital Uzbekistan-2030” strategy

The national “Digital Uzbekistan-2030” strategy, approved by presidential decree in 2020, aims to strengthen digital governance structures and create reliable integrated platforms for the development of information systems, as well as the necessary broadband network infrastructure. The strategy is a comprehensive document including a five-year action plan for the digital transformation of the health-care system covering health data governance, HIS architecture and digital health initiatives.

The roadmap includes five action areas including infrastructure, core eHealth, central software infrastructure, national eHealth applications and health-care facilities.

In February 2021 the Ministry of Health formed a limited liability company (referred to as IT-Med (LLC203)) for the digitalization of the health sector.

In a relatively short time, IT-Med was able to deliver information systems for hospitals, polyclinics and other medical institutions. It also launched a number of pilots, including two flagship initiatives.

1

The “Medical Information System”, best known as the MIS project, is to provide universal coverage throughout the country by 2023. It is being tested in the Syrdarya region where IT-Med will act as an implementing body.

2

“103-Ambulance” is aimed at optimizing ambulance services. Launched in Tashkent, the pilot project allows patients to reach hospital much more quickly – vital for life-threatening conditions. It is expected that by September 2023, this system will be implemented throughout the country.

Table 2 shows the trends in eHealth/digital health policy or strategy adoption in the Region, based on results from previous global eHealth surveys. The data are considerably more robust for 2022 than for earlier years given the 100% participation

rate, yet despite the wider respondents' base, Member States indicating that they had an eHealth/digital health policy or strategy rose from 70% (30 out of 43) to 83% (44 out of 53) in 2022.

Table 2. Trends in Member States with digital health policies and strategies (2005–2022)

Percentage of Member States with a national eHealth/digital health policy or strategy	2005	2009	2015	2022
	73% (19 out of 26)	89% (32 out of 36)	70% (30 out of 43)	83% (44 out of 53)

Source: (9–11).

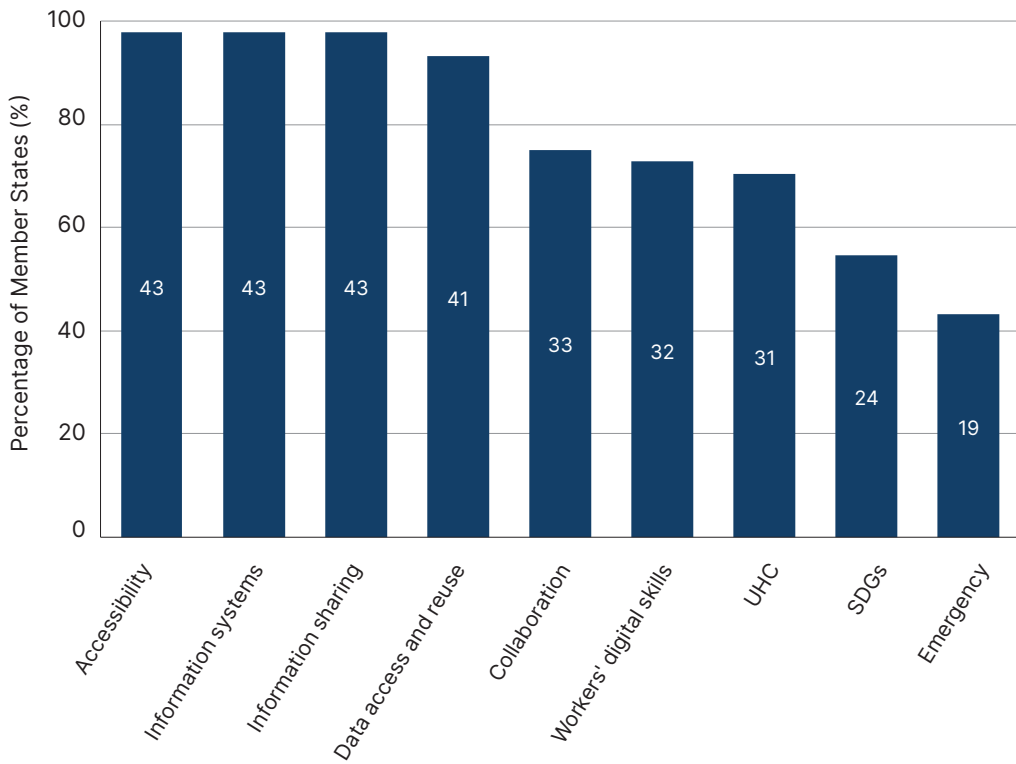


Main strategic priorities

As shown in Fig. 3, 71% of responding Member States (31 out of 44) reported that their DHS specifically mentioned UHC, although all but one of the reporting Member States reported improving accessibility, quality, safety and efficiency as strategic priorities – which cover the main elements of UHC. Furthermore, 93% of responding Member States (41 out of 44) also identified enhancing access to and reuse of data, and 98% (43 out of 44) information sharing and interoperability of data as strategic

priorities. Surprisingly, however, less than half of the Member States replied that their DHS recognized the protection of the public in times of emergencies as a strategic priority. This latter result indicates that in developing their DHS, less than half of Member States had recognized the crucial role of digital health technologies in public health emergency preparedness and response. Table 3 presents examples of digital solutions that played this crucial role in the emergency response to the COVID-19 pandemic.

Fig. 3. Priorities mentioned in national DHSs (n=44)



Information sharing and interoperability of data is a strategic policy priority and shared challenge cited by 98% of Member States.

Table 3. Examples of digital technologies used in the COVID-19 pandemic response

COVID-19 context	Example technologies
Awareness, prevention and tracking	<ul style="list-style-type: none">• Apps and websites for risk communication and dissemination of public health information• COVID-19 dashboards, mapping and forecasting utilities• Social media-based chatbots and online community forums• Case management software for contact tracing• Digital contact tracing apps• Infodemic management tools• Voluntary reporting tools• Self-management tools
Diagnosis, diagnostics and therapeutics	<ul style="list-style-type: none">• Symptom assessment apps and online utilities• AI-based remote vital signs monitoring using devices or smartphone cameras• AI-powered computerized tomography imaging interpretation tools• Temperature-based diagnostic screening for border control
Management of contacts with the health system	<ul style="list-style-type: none">• Online chat triage services• Online or app-based access to polymerase chain reaction test results• Telehealth or telemedicine use in primary health care
Surge management and protection in hospital settings	<ul style="list-style-type: none">• Intensive care unit surge simulation tools• Inventory resource mapping and supply chain management tools• Telemedicine use in intensive care settings• E-learning platforms for health-care worker orientation• Robots (for disinfection, isolation ward communication and companionship, and medical waste transfer)• Volunteer databases
Testing and research	<ul style="list-style-type: none">• Support to accelerated testing regimes• AI support to adaptive clinical trials
Recovery and re-establishment	<ul style="list-style-type: none">• Smart vaccination certificates• Augmented reality-based temperature monitoring in public spaces

Source: (2).

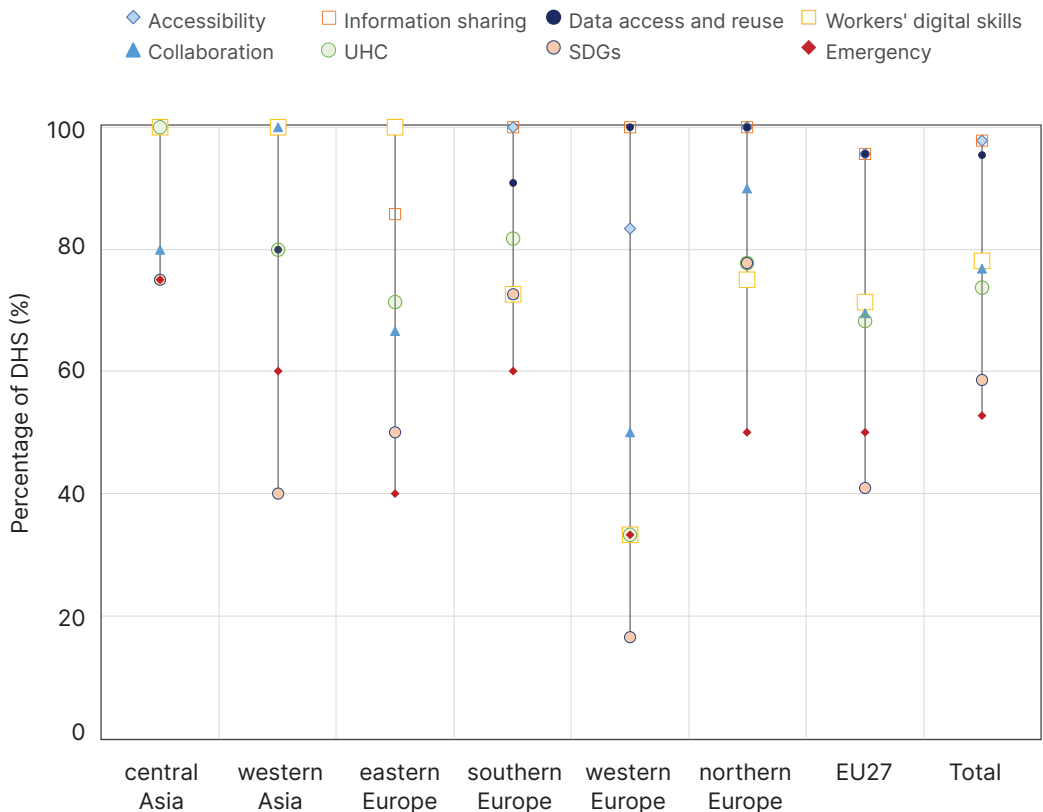


Main strategic priorities by subregion

When analyzed by subregion, responses uncover substantial subregional trends in policy priorities (Fig. 4). As an illustration, 100% of the six responding Member States of the western European subregion have a DHS targeting improving information sharing and data access and reuse but only 17% of responding Member States (one out of six) include sustainable development goals (SDGs) as a policy priority

and only 33% of responding Member States (two out of six) strengthening digital literacy skills. The landscape is different in the central and western Asian subregions, where 100% of the responding Member States report strengthening digital literacy skills as a strategic priority and 75% of responding central Asian Member States (three out of four) also include SDGs as a policy priority.

Fig. 4. Priorities mentioned in national DHS by subregion





Measures to ensure equity in access to digital health-care services

While the uptake and development of DHSs have the potential for widespread benefits through more efficient and targeted health care, as highlighted in a recent WHO report (15), digital health technologies are not accessible to all communities and areas in Europe equally.

Digital exclusion is a major driver of inequality and can lead to poor health outcomes. Those in greatest health need (for example, older people, marginal groups and people with an existing disability) are often those less likely to have access to digital platforms. In particular, the WHO European Region is experiencing ageing-related challenges that are hindering the move to a digitally inclusive society (16). In the United Kingdom, a recent study showed that health information that combines words and numbers is too complex for 61% of adults aged 16–65 in

England (the United Kingdom) (17) (See Case Example 2). Additionally, it is estimated that 11.9 million people do not have the essential digital skills to use online health information and tools. In Member States where access to information, services and support is increasingly via online portals, a lack of digital skills and internet access risks excluding substantial numbers of people (18). The WHO Regional Survey 2022 therefore asked Member States to report whether their national digital health policy or strategy includes measures to ensure equity in access to digital health-care services – 75% of Member States with a DHS (33 out of 44) reported they had. Unsurprisingly, a majority of these Member States listed improving digital literacy and access to fast, safe and reliable access to the internet (21 and 22 out of 33 respectively) as priorities (Table 4).

Table 4. Most cited measures to ensure equity in access to digital health-care services

Measure	Number of Member States
Improvements in connectivity (broadband) and ICT infrastructure	22
Digital literacy and digital health promotion	21
Expanding geographical coverage and the range of care services using telemedicine solutions	19
Improving patient access to digital health data and health information	14
Assistance to vulnerable populations (aid to the elderly/ physically impaired etc)	5
Development of guidelines	1

Note: ICT: information and communications technology.

Case Example 2.



Engaging the public with digital health literacy in public libraries

Leeds, with a population exceeding 790 000, is one of the largest cities in the United Kingdom and has high levels of digital exclusion. The health literacy challenge is slightly above the national average, with 64.7% of the population struggling to use health information that combines words and numbers, compared to 61% nationally. To make active health choices and to access health services, citizens need both health literacy skills and to be able to use digital tools, but many are excluded by skills, access and motivational barriers. Across the city, 34 public libraries provide free access to computers, wi-fi, tablet lending, data gifting and social interaction to combat social isolation. Digital champion-trained staff deliver skills sessions and motivation to help library users overcome digital exclusion barriers and reap the benefits of being online.

The 100% Digital Leeds programme, which started in Leeds Libraries, is now led by the digital inclusion team in the council's Integrated Digital Service. The team works with partners across the city to strengthen the digital inclusion infrastructure in communities and to develop a network of organizations committed to combatting digital exclusion. Building on the existing digital champions network, Leeds Libraries are working with Health Education England and the Chartered Institute of Library and Information Professionals to embed health literacy skills development into digital access interventions. As an example, to overcome motivational barriers, digital skills are socialized through in-person events that include digital options alongside non-digital, such as digital collage within arts and crafts sessions. Conversations about well-being are broadened into health conversations and usage of the national health service (NHS) app. This soft approach increases confidence to pick up and use tablets and smartphones as the first step towards using digital access for health services. The social interactions are followed by a series of learning opportunities offered by Leeds Libraries, providing training in community settings or from home – to be as accessible as possible for all citizens. During the first 8 months of the pilot (March–October 2022), 795 people were involved in health and digital literacy activities, of whom 500 were shown how to download the NHS app and 100% increased their confidence in their health literacy skills.



Growth in the establishment of national digital health agencies

As presented in previous sections, today, most Member States in the WHO European Region have policies or strategies outlining digital health goals, measures and implementation objectives. The growth in the establishment and expansion of national agencies that oversee the implementation and operation of the national digital health policy or strategy is a further indication of the commitment of Member States in the Region to addressing these issues. Out of the 44 Member States that reported having a DHS, 37 also reported having established a government agency, seven – an independent body funded by government, nine – a government advisory board and 12 – a multistakeholder network. Case Example 3 reports, as an illustration, France's digital health governance system.

This growth in national agencies is of particular significance in the context of the newly proposed

European Health Data Space regulation (21) – the implementation of which requires strong governance and coordination at both EU and Member State level. The regulation mandates all EU Member States to establish digital health authorities as separate organizations or as part of the currently existing authorities, for the planning and implementation of standards for electronic health data access, transmission and enforcement of rights of citizens and health professionals. Similar recommendations are made within the Regional digital health action plan for the WHO European Region 2023–2030 (8). The plan encourages Member States to prioritize advancing digital health to help achieve national health goals and improve health system performance. Under Strategic Priority 2, it proposes that they do so by enhancing country capacities to better govern digital transformation in the health sector.

Case Example 3.



Governance of digital health in France

Driven by the desire for closer coordination between all stakeholders, both public and private, a single Ministerial Delegation for Digital Health was created in 2019 for all eHealth activities within the Ministry of Health. In addition, the Agence du Numérique en Santé [digital health agency] was established in December 2019 from its predecessor ASIP Santé [ASIP health] to operationalize the government's eHealth strategy. In February 2020, the Agency published the overarching technical policy framework for eHealth services and platforms foreseen by the new legislation. Additionally, the Conseil du Numérique en Santé [Digital Health Council] is a first-of-its-kind multistakeholder forum that has hosted six working groups focused on the following themes: medico-social issues, training, the benefits of eHealth, digital divides and eHealth ethics.



Funding sources

To advance the implementation of national DHSs, in the resolution approved by ministers and delegates at the 72nd session of the WHO Regional Committee for Europe on 12 September 2022 (24), Member States, among other actions, agreed to mobilize adequate funding. Such funding is needed to support the cost of acquisition or licensing, implementation and maintenance of necessary hardware infrastructure, of software, for workforce capacity building and other technical resources as required. Funding can come from any combination of sources including: public funding, private funding, donor/non-public funding or public-private partnerships.

The WHO Regional Survey 2022 shows that public funding is the most available type of funding in the Region. All responding Member States (52 out of 52) declared that public funding is available for digital health programmes (Table 5), confirming that governments in the Region are systematically investing in digital health. Despite public funding sources being the most widely available and used type of support, 39% of Member States (20 out of 52) also report funding through public-private partnerships – referred to in the survey as joint ventures between public organizations and private sector companies.

Interestingly, of the 20 Member States reporting public-private partnerships, 11 are in higher

income subregions (EU27) while none of the eastern European Member States report its use. In the 2022 survey, in-kind support (understood as the donation of goods or services) was treated as a separate category from donor and non-public development funding. Donor financial funding was reported by 19 Member States, and in-kind support by nine Member States – neither of these types of funding were available in western Europe. Funding as financial support by the private or commercial sector (private or commercial funding) was available in 18 reporting Member States, of which one third are in the EU.

When compared with survey data from previous years, similar trends in funding sources were observed (Table 6) with public funding being the most common across all years.

In addition to available funding types, the survey also asked if Member States could report the budget specifically allocated to digital health in their country for the most recent year data were available, and what percentage of total national health expenditure was allocated to digital health. Five Member States reported that 1% of their national health expenditure was allocated to digital health, one Member State reported 2% and one 7%.

All responding Member States report public funding for digital health. Over one third of Member States also report donor funding.

Table 5. Type of funding available for digital health programmes (by subregion)

Source of funding	central Asia	western Asia	eastern Europe	southern Europe	western Europe	northern Europe	EU27	WHO European Region
Public	100% (5 out of 5)	100% (5 out of 5)	100% (10 out of 10)	100% (14 out of 14)	100% (8 out of 8)	100% (10 out of 10)	100% (27 out of 27)	100% (52 out of 52)
Private or commercial	40% (2 out of 5)	60% (3 out of 5)	60% (6 out of 10)	7% (1 out of 14)	38% (3 out of 8)	30% (3 out of 10)	37% (10 out of 27)	35% (18 out of 52)
Donor/non-public	60% (3 out of 5)	40% (2 out of 5)	50% (5 out of 10)	36% (5 out of 14)	0 (0 out of 8)	40% (4 out of 10)	22% (6 out of 27)	37% (19 out of 52)
Public-private partnerships	60% (3 out of 5)	60% (3 out of 5)	0 (0 out of 10)	29% (4 out of 14)	63% (5 out of 8)	50% (5 out of 10)	41% (11 out of 27)	39% (20 out of 52)
In-kind or other	20% (1 out of 5)	40% (2 out of 5)	20% (2 out of 10)	14% (2 out of 14)	0 (0 out of 8)	20% (2 out of 10)	15% (4 out of 27)	17% (9 out of 52)

Note: the totals may not equal 100% as Member States report a mix of funding.

Table 6. Trends in available funding for digital health programmes

	2005	2009	2015	2022
Public	81% (21 out of 26)	97% (35 out of 36)	93% (42 out of 45)	100% (52 out of 52)
Private or commercial funding	50% (13 out of 26)	47% (17 out of 36)	49% (22 out of 45)	35% (18 out of 52)
Donor/non-public development funding^a	N/A	36% (13 out of 36)	53% (24 out of 45)	40% ^a (21 out of 52)
Public-private partnerships	42% (11 out of 26)	31% (11 out of 36)	47% (21 out of 45)	39% (20 out of 52)

Note: N/A: not applicable.

^a donor and non-public development funding was defined in the 2015 survey as both financial and in-kind support. In the 2022 survey, financial or in kind were treated as separate questions. For the purpose of comparison, responses to the two questions in 2022 were considered jointly with only one reply/Member State computed in the table.

Source: (9–11).

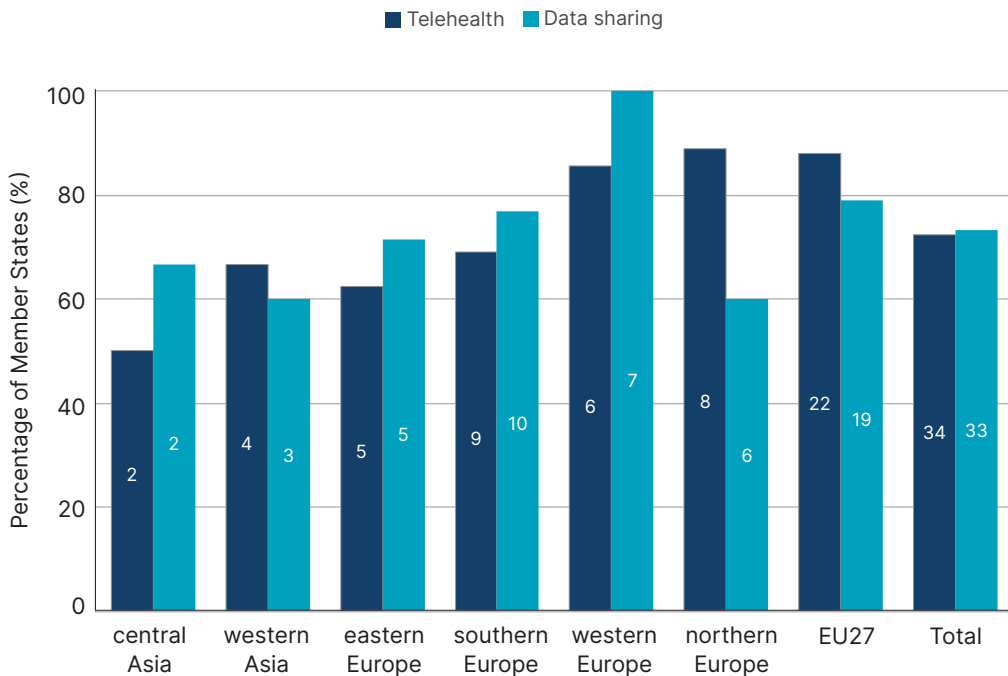


Special funding allocations during the COVID-19 pandemic

As reported in the 2021 joint report of the WHO and Pan-European Commission for Health and Sustainable Development (3), one of the reasons why the impact of the COVID-19 pandemic was so severe was the failure of governments to invest in preparedness. In particular, the pandemic revealed the costs of underinvestment in digital health – where only countries with strong digital health systems were capable of harnessing real-time information for decision-making, and were able to use technologies such as telehealth to reduce the burden on health-care systems. The survey therefore asked Member States

to report whether special funding had been allocated to digital health during the COVID-19 pandemic. Out of 47 responding Member States, 34 reported having allocated special funding to extend telehealth services during the pandemic and, of 45 responding Member States, 33 – for data-sharing and data interoperability platforms (Fig. 5). As discussed further in Part 3, during the COVID-19 pandemic, many Member States introduced new telemedicine services and schemes to pay for them, which did not previously exist.

Fig. 5. Special funding allocations during the COVID-19 pandemic



Note: the number of responding Member States varies for telehealth and data sharing.



Frameworks for monitoring and evaluating digital health interventions

The Regional digital health action plan for the WHO European Region 2023–2030 (8) recognizes the need to monitor developments and trends in new and emerging digital solutions with the potential to enhance health systems and improve people's health, and encourages the development of a measurement framework to monitor digital health in the European Region. As highlighted in a recent report by the WHO Regional Office for Europe (25), digital health programmes and interventions are often not monitored or evaluated.

The survey revealed that 77% of Member States (39 out of 51) reported having established a national government agency or organization responsible for the monitoring of the adoption and use of digital health interventions, with five Member States reporting that they were about to establish one and a further eight Member States reporting having a local organization. Out of the 39 Member States with an established agency for monitoring and adoption of digital health interventions, only 19 report having developed guidance for evaluating digital health interventions.

Furthermore, 71% of Member States (31 out of 44) replied that they had engaged internal or external evaluations of digital health interventions.

These results indicate progress in the Region – in 2015 there were very few examples of Member States having adopted a systematic approach to the monitoring and evaluation of national eHealth implementations – this had indeed been identified as an area in need of further political support and technical development.

As an example of a monitoring and evaluation framework for digital health interventions, the National Health Service (NHS) in England (the United Kingdom) is working with the National Institute for Health and Care Excellence to build the Evidence Standards Framework for digital health technologies (26), which describes the level of evidence needed to demonstrate effectiveness and value for digital technologies that have different functions and risks. Moreover, as reported in Case Example 4, NHS England has developed the Digital Health Technology Assessment Criteria (DTAC) (27) to provide clear direction to innovators on how to build good digital health technologies and to people working in the NHS and social care on what common baseline criteria in terms of safety and security are to be assessed for procurement. The criteria are not intended to be the complete question set for procurements and are supplemented with additional specifications including policy and regulatory requirements.

Case Example 4.



The DTAC for health and social care

Digital health technologies continue to transform the NHS through improved outcomes, patient and staff experience and both cash and non-cash releasing benefits. The NHS's mission is to ensure digital health technologies meet the DTAC for health and social care. Launched in February 2021 by NHSX – the then joint unit of NHS England and the Department for Health and Social Care – DTAC is the national baseline criteria for digital health technologies in the NHS. The criteria were launched in beta to ensure that innovators, NHS organizations and interested stakeholders could give their views prior to the full launch. Over 1000 individuals participated in the consultation and confirmed that the DTAC was an appropriate minimum bar, with the exception of ISO:27001 which was removed for version 1.0.

DTAC brings together legislation, standards and good practice in the following five areas (with areas one to four being Pass or Fail and area five being scored):

- 1 Clinical safety including validation of the compliance with Medical Device Regulation
- 2 Information governance
- 3 Cyber security
- 4 Interoperability
- 5 Accessibility and usability.

Bringing together these essential criteria into one place enables innovators to understand the baseline safety standards for products to be used in the NHS and for a consistent criterion to be reviewed. It ensures that both providers and NHS organizations deploy technology that is lawfully compliant and protects patients' safety and data in the way that they expect.

There are now over 400 technologies that have met the criteria. Their introduction has supported innovators in understanding what is required and has made significant strides in embedding clinical safety standards within the NHS, protected patient data and helped drive the cyber security agenda.

Case example 4. contd

In October 2022, the NHS launched the first national NHS Digital Health Technology Standards Audit, asking NHS organizations to provide details of deployed digital health technologies and whether they have assessed them to the DTAC standards – at the time of writing this Audit is still open. This will provide the first national picture of technologies deployed across the NHS and the compliance of technologies. For products that are deployed but do not meet standards, non-compliance will be resolved and all digital health products used will be fit for purpose.

DTAC is now internationally recognized as one of the world's leading health assessment criterion, with Member States, including the United States of America in conjunction with their partner the Organisation for the Review of Health and Care Apps, basing their own criteria on DTAC.

Source: (27, 28).

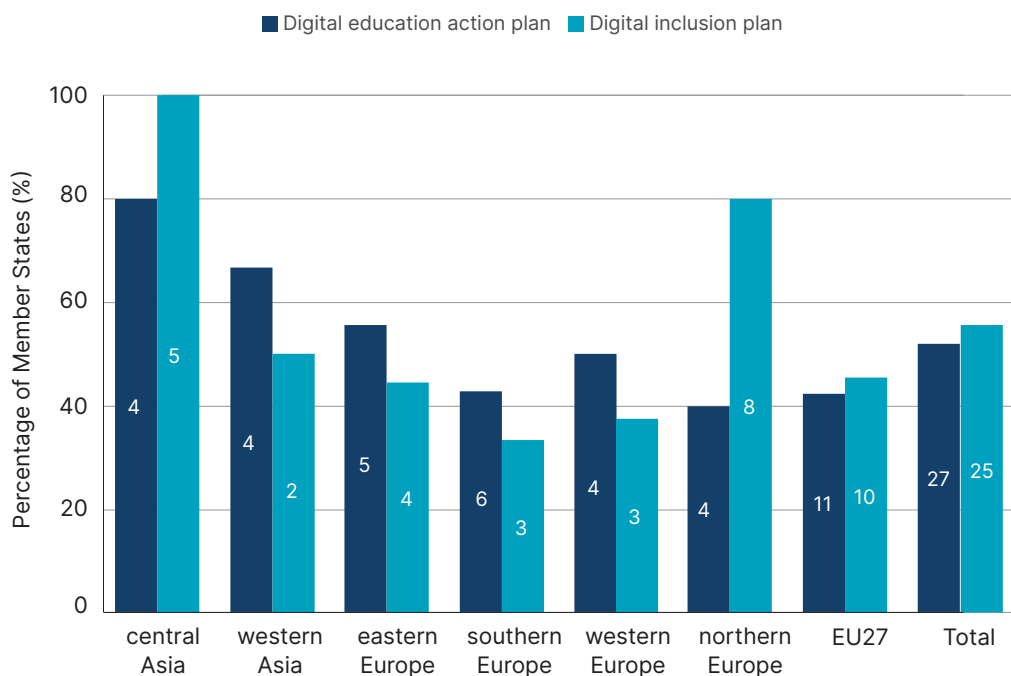


Digital health literacy and capacity-building

Digital health literacy is the ability to search, find, understand and evaluate health information from electronic resources and to use the knowledge gained to solve health-related problems. The digital health literacy of health and social care students and health professionals is fundamental to furthering any national DHS. The importance of digital literacy has been clearly recognized by 52% of responding Member States (27 out of 52), with 17 reporting having developed digital health education action plans, policies and strategies and 10 having reported that these were in development. Additionally, 56% of responding

Member States (25 out of 45) reported that they had developed a digital inclusion plan (for example, a digital literacy programme for disadvantaged populations), although responses varied substantially across subregions. All five central Asian Member States and eight out of the 10 northern Member States reported digital inclusion plans, but in the other subregions less than 50% of the responding Member States reported such plans. A similarly uneven picture across subregions emerges from the responses on digital health education action plans, policies and strategies (Fig. 6).

Fig. 6. Digital health literacy action and inclusion plans



Recent Eurostat data indicates that on average little over one in two adults (people aged 16–74) across the EU27 showed basic or above basic proficiency across five components of digital skills (information and data literacy, communication and collaboration, digital content creation, safety and problem-solving) (29). Digital skills indicators are some of the key performance indicators in the context of the Digital Decade,

which sets out the EU’s vision for digital transformation (30). The Digital Compass sets out an aim for 80% of EU citizens aged 16–74 years old to have at least basic digital skills by 2030 (30). Case Example 2 is an illustration of how local communities in the United Kingdom are developing a network of organizations committed to “fighting” digital exclusion.



Education and training of health and social care students

The survey asked Member States whether their tertiary institutions such as universities provided certified education in digital health for students of health sciences, to assess whether health students are taught how digital health can be used to increase quality of care, support

their work functions and provide assistance to patients. Sixty percent of Member States (28 out of 47) reported they had universities or technical colleges providing students with certified education in digital health.



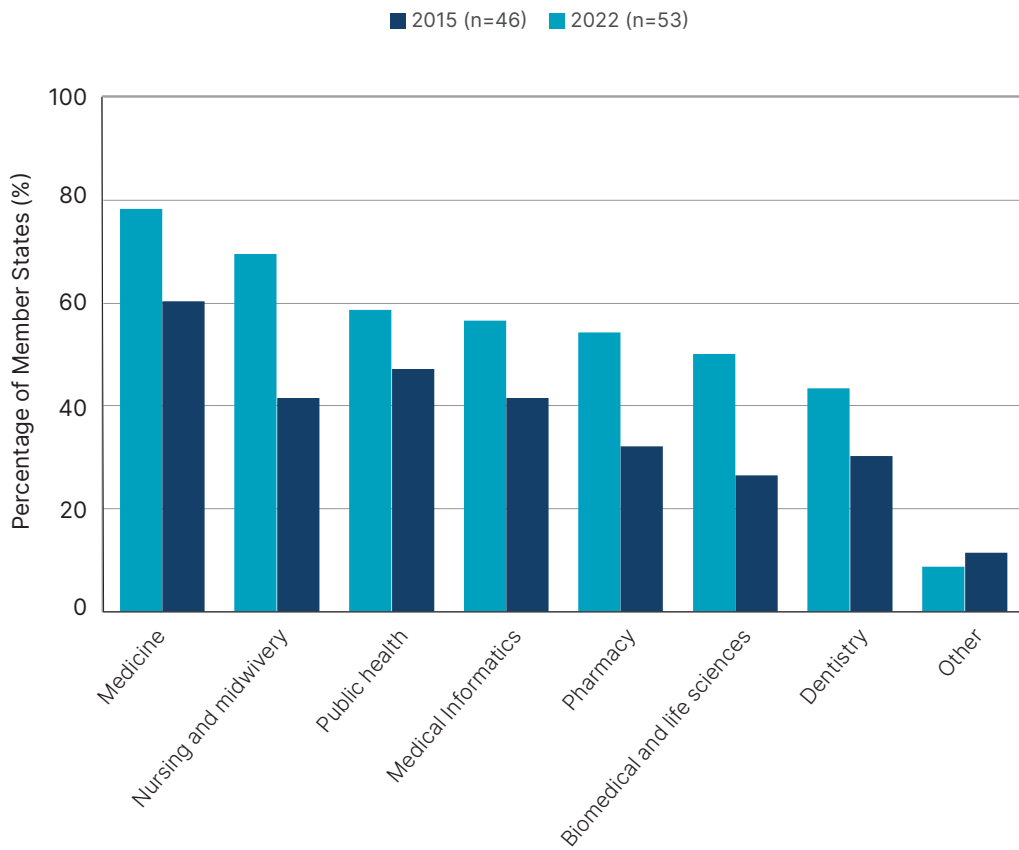
Education and in-service training of health-care professionals

Digital health can be key to improving health outcomes provided that health-care workers are adequately trained to use these technologies. This intensifies the need for capacity building and continuous professional development. As acknowledged in the Regional digital health action plan for the WHO European Region 2023–2030 (8), developing the digital literacy of the existing health-care workforce is as important as the education and training of those at the start of their careers. There has been minimal research into health-care staff digital literacy levels, with the findings of the studies that have been conducted generally demonstrating that while most health-care professionals use digital health solutions in clinical settings, such as EHRs, many of them still do not feel competent in their overall digital health skills (31, 32). This highlights the necessity of integrating digital health training into medical education curricula and for it to be a mandatory part of continued professional education. However, when asked, only 71% of the responding Member States (29 of the 41) report that in-service training in digital health is offered as part of continued professional education and even fewer Member States (10 out of 41) consider this training mandatory.

The WHO Regional survey 2022 also asked to which professional groups the training was offered (Fig. 7). Replies cover all seven of the groups listed in the survey, with the majority of Member States offering in-service training to medical professionals followed by nursing and midwifery and public health specialists. Few Member States offer in-service training for pharmacists. Several other professional groups were also mentioned: allied medical professionals, and those working in mental health and occupational medicine.

Compared to 2015, the questions posed in the 2022 survey were limited to digital health education and did not include information and communication technology (ICT) training, as most of this training today typically takes place in primary and secondary schools. Nonetheless, when the two surveys were compared (Fig. 7), no major change over time in the type of in service training available to health professionals was observed.

Fig. 7. Training for health professionals on digital health



Note: "Not applicable" answers to this question were considered as "no".



Summary

In the unfolding narrative of digital health systems within the WHO European Region, this section serves as a waypoint, providing insights into the evolution of these systems since 2015.

By 2022, it became evident that a paradigm shift was well underway. The majority of Member States, each with their unique perspectives and needs, had articulated their own visions and strategies for digital health. Financial resources, the lifeblood of these initiatives, were reported as readily available, reinforcing the commitment demonstrated in 2015, with public funds standing as the primary source.

Strategic priorities were as diverse as the Member States themselves, yet common threads wove through their narratives. Goals centered around improving UHC, accessibility, quality, safety and efficiency emerged as prevalent themes.

Equally prominent was the aim for data interoperability and seamless information sharing, underscoring the growing appreciation for collaborative approaches in digital health.

As Member States navigate the digital health landscape, many have established their own

national authority, serving as custodians for the implementation and utilization of digital health initiatives. Yet, there was often a notable absence of tailored guidance for stakeholders in the development and implementation of digital solutions.

Despite the strides made, gaps in the narrative persist. Only half of Member States in the Region had crafted policies and strategies promoting digital health literacy, and even fewer had implemented comprehensive digital inclusion initiatives, particularly for disadvantaged populations.

The critical importance of a competent health workforce was well recognized. However, while over half of the Member States offered digital health training as part of continuous professional development, only a few made this a compulsory aspect.

This section, therefore, provides a snapshot of the journey so far, marking milestones in national digital health governance while also signposting areas that still demand attention.



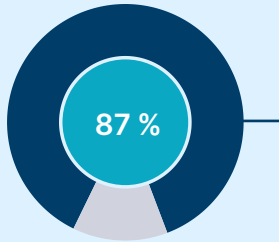
Considerations

- ▶ Effective governance of digital health through the establishment and expansion of national agencies or dedicated bodies should be a priority action for Member States. National policies and strategies should be developed using an intersectoral approach that ensures relevance to all stakeholders and promotes shared action in achieving health objectives. These policies should also recognize the crucial role of digital health technologies in public health emergency preparedness and the importance of information sharing and interoperability as strategic priorities.
- ▶ There are still gaps in the evidence base on digital health, and there is a role for the WHO Regional Office of Europe to work with Member States to encourage the development of guidelines for evaluating digital health interventions. National policies and strategies must be accompanied by rigorous assessment mechanisms that analyse the clinical effectiveness and the cost-effectiveness of digital health practices. The WHO and International Telecommunication Union National eHealth strategy toolkit by Member States (13) is strongly encouraged for developing a framework for monitoring and evaluating digital health programmes.
- ▶ Both digital and health literacy are crucial for health-care professionals and the general public to effectively engage with digital health technologies and make informed health-care decisions. Therefore, it is essential to incorporate digital and health literacy education into national health objectives. Educational institutions and relevant professional organizations should increase in-service mandatory training and education on digital health for health workers and students of health sciences. To bridge the digital divide between those who have access to and can use digital technologies and those who do not, efforts should be made by Member States to develop capacity-building and digital inclusion plans, policies or strategies to ensure that everyone, regardless of background, has access to and can effectively use digital technologies.
- ▶ The COVID-19 pandemic has revealed the costs of underinvestment in data and digital health. Efforts should be made by Member States to create sustainable financing strategies for the continued development and implementation of digital health. In addition to maintaining public funding for digital health programmes, Member States should strengthen public-private collaborations to surmount any funding obstacles. Establishing national partnerships between civil society, the civil service and private-sector entities could be a useful approach to mobilize resources and accelerate the acceptance and implementation of digital health strategies.



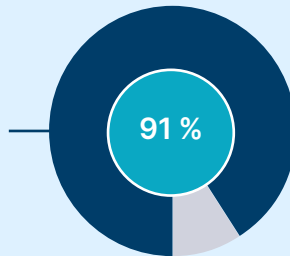
Part 2: the lifelines – EHRs

Data highlights: key insights from survey responses

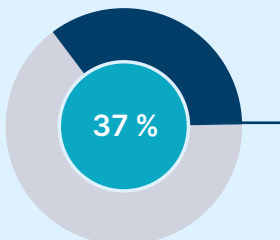
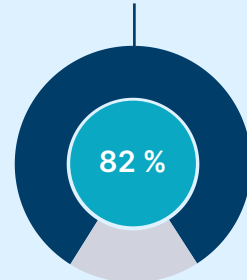


87% of Member States (45 out of 52) report having either a national EHR system (NEHR), interconnected regional EHRs or a patient portal.

91% of Member States (48 out of 53) have legislation supporting the use of their NEHR.



82% of Member States (37 out of 45) routinely make the prescription electronically available to pharmacies.



37% of Member States (19 out of 52) report insufficient funding as the most important barrier to EHR system implementation.



Background

EHRs are real-time, patient-centred records that provide immediate and secure information to authorized users. EHRs typically contain a record of the patient's medical history, diagnoses and treatment, medications, allergies and immunizations, as well as radiology images and laboratory results. They expand on the information in a traditional paper-based medical record by making it digital and thus easier to search, analyse and share with other authorized parties. A well designed, patient-centred and interoperable EHR system can play a vital role in improving access, efficiency and quality of care.

An NEHR system is most often implemented under the responsibility of the national health authority and will typically make a patient's medical history available to health professionals across the health-care system and provide linkages to related services such as pharmacies, laboratories, specialists and emergency and medical imaging facilities. By providing access to medications, laboratory and medical imaging results, an NEHR reduces the need for duplication of testing and speeds up the assessment process in emergency settings.

In Member States with decentralized organization of health care, different EHR systems may be in use at regional/local level. In such cases, Member States may establish a national health information exchange platform or patient portal in order to facilitate communication between the different EHR systems. As an illustration, the Netherlands (Kingdom of the) does not have a centralized NEHR system, and many different providers offer EHR systems. However, general practitioners (GPs) and pharmacists can share information through the Landelijk Schakelpunt [National Switch Point], provided patients have given permission (33).

In practice, in most, if not all, Member States, an NEHR system coexists with a regional/local EHR system and/or a patient portal. An NEHR system

can be a record that all health-care sectors in a country across the provider spectrum can access and update. In this respect, it is the equivalent of an EHR system used by an organization or primary care provider but accessible at a national level. A further variation of the NEHR system is an EHR system that is established at a regional level by regional/local governments or by medical insurers or health maintenance organizations, which can then be interconnected or federated to enable sharing of health information between them.

A patient portal provides secure patient access to their electronic health information and is mostly utilized for retrieval of lab results, updating administrative information and contacting health-care professionals and insurance providers. Some of these systems also allow patients to pay bills or book appointments. A hybrid web-based patient portal/EHR system allows patients to view aspects of their EHR and communicate electronically with clinicians in their health-care system.

To accommodate the number of possible architectures for sharing EHRs and their contents, the 2022 survey expanded on the 2015 survey by asking a range of additional questions on country EHR systems including on the establishment of an NEHR system, EHR systems at the local/regional level and whether Member States operate a patient portal. The 2022 survey further asked whether the EHR systems at the local/regional level were connected or federated.

To avoid erroneous conclusions, when considering the number of Member States that are able to share EHRs or the information contained within them across health providers at national level, all variants of connected systems are taken into account and not simply one architecture type. This is especially important when considering that what is commonly referred to as an NEHR system is often a hybrid system that is an NEHR system and patient portal. Austria, for example, has the

elektronische Gesundheitsakte (ELGA) [electronic health records] (see Case Example 5) (34), which can be considered a hybrid NEHR/portal system allowing the patient to control who has access to the stored health information and opt-out entirely. Denmark responded negatively to the question about having an NEHR even though they have a comprehensive portal system called

Sundhed.dk [health] (35), based on a federated ICT architecture launched in 2003, that integrates with the local EHR systems and consolidates relevant information from all parts of the health-care service. Similarly, Sweden, whose system, the Patient Accessible Electronic Health Record is a hybrid federated system (36), reported that it did not have an NEHR.

Case Example 5.



Austria's NEHR (ELGA)

The Austrian EHR System (ELGA) was anchored in law in 2012 and since then gradually put into operation, starting in the inpatient sector. Besides medical eReports, which are most important for the continuity of health care (i.e. discharge letters, laboratory findings and diagnostic imaging findings), ELGA also offers the eMedication service, providing an overview of a patient's prescription and non-prescription medicines that are relevant for interaction. Since then, the experience gained has been used for continuous technical optimization. The results to date show an ongoing increase in the use of ELGA, especially its eMedication service. The rollout of ELGA to physicians in private practice and pharmacies was completed in 2019 in accordance with the legal requirements. The work of the last few years has been dedicated to the expansion of ELGA to the laboratory, radiology and private hospital sectors as well as the inclusion of telemonitoring reports and living wills as additional services. Moreover, with the further expansion of the technical ELGA infrastructure, prerequisites were created to make it also usable for other eHealth applications, such as the eVaccination certificate. This not only contributes to the further modernization and sustainability of the Austrian health-care system, but also creates economic added value for investments already made.

Source: (34).

There are several possible secondary uses of data held in EHRs that include: patient safety, regulation, quality assurance/improvement and surveillance, research, public health and policy support. A significant benefit of the secondary use of EHR data is for clinical and epidemiological research purposes. EHR data can also be used for training machine/deep learning models for

the purposes of creating clinical AI systems that provide predictive and decision support functions. A barrier to this use, however, can be the unstructured format of much of the data held in EHRs. Progress in natural language processing will be needed before the full value of EHR data reuse can be realized (37).



Results of the survey

NEHR Systems

When asked about the EHR systems in place, 67% of responding Member States (35 out of 52) reported having an NEHR according to the definition given in the survey. Moreover, 69% of Member States (36 out of 52) reported that they had local or regional EHR systems and of these Member States, 69% (25 out of 36) said that their local or regional EHR systems were connected or federated at a national level. When looking at the total number of Member States that had either an NEHR, interconnected regional EHRs or a connected patient portal, compared to those having an NEHR by the definition in the survey, the number of Member States with health information sharing at national level increases from 35 to 45 out of 52 Member States or 87% of all survey respondents. This is a substantial increase from the 2015 survey on eHealth where 59% of Member States (27 out of 46) reported having an NEHR.

Member States that reported having an NEHR in the 2022 survey were further asked the percentage of health-care institutions in their country that were linked to or have access to the NEHR. Twenty-six of the 35 reporting Member States having an NEHR stated that at least 90% of all health-care institutions had access to the NEHR.

Expanding on the point made above regarding the difference between an NEHR and nationally connected regional EHR, Israel reported having implemented the latter and did not consider it to qualify as an NEHR. The situation in the Netherlands (Kingdom of the), which reported regional/local level EHRs, is similar to Israel. In 2011, the Dutch government proposed legislation to install a national system for the uniform exchange of medical data but it was not adopted (33, 38). Nonetheless, virtually all GPs in the Netherlands (Kingdom of the) use EHRs and can order prescriptions (which since 2012 have to be electronic) and receive laboratory results electronically. Nictiz, the Dutch Centre of Expertise for Standardization and eHealth, established in 2002, plays an important coordinating role in this ecosystem (33). Nictiz is an independent national competence centre responsible for setting standards and monitoring developments. It is continuously developing and refining national standards for electronic communications and supports the sector by finding functional ICT solutions that can be used nationwide (33). Switzerland also reported a complicated decentralized EHR infrastructure (see Case Example 6).

Case Example 6.



The Swiss national EHR architecture

The first Swiss eHealth strategy was approved in 2007 with the main goal of establishing an NEHR. As of November 2022, the NEHR is running, but implementation activities are still ongoing.

The main activities after the approval of the first eHealth strategy were the establishment of a broad stakeholder management addressing all relevant groups. The newly founded national coordination body for eHealth, eHealth Suisse, took on this role and started to elaborate a design (architecture) for the future national system. The Swiss parliament approved the Federal Act on Electronic Patient Record (EPRA) in 2015, which was granted an initial CHF 30 million budget. The Swiss EHR has a complicated decentral infrastructure, which is based on Integrating the Healthcare Enterprise technology and contains patients' most important health data, which only defined health-care providers and patients themselves can access. Hospitals had three years to connect to the EHR, and nursing homes and birthing centres five years. Patients have the choice to open an EPR (opt-in).

As of November 2022 only a part of the aforementioned health-care institutions are technically connected to the EHR. There are seven certified EHR providers where patients can open an EHR and around 12 000 have been opened so far. The main reasons for this slow start are the elaborated technical EHR architecture, the complex Swiss health-care domain and deficient funding and governance structures. Two EPRA revisions are being initiated now: one short-term for an intermediate financing system and a mid-term revision bringing clear governmental responsibilities regarding the EHR and sustainable funding.

National EHR projects are long-term "culture change" projects set up on the existing structures of the health-care system. So far, a unique nationwide technical EHR infrastructure has been established, and it can be used for any new use cases in the future. This is a big success despite all remaining issues, which are located at the political level. As "big bang" top-down projects are not realistic in a highly federated country like Switzerland, an incremental approach is likely to be the only way forward: to do what is politically possible at a certain moment, and to slice the complexity step-by-step based on lessons learned.



Sharable EHRs by subregion

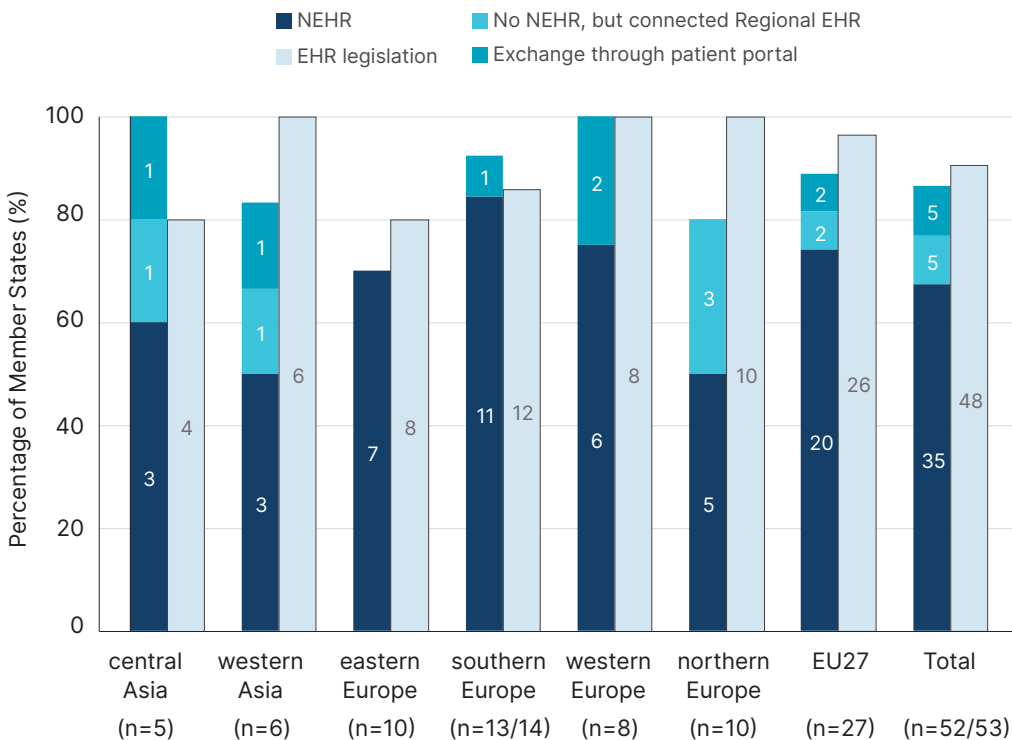
Fig. 8 summarizes the distribution of Member States by subregion that have implemented one of the aforementioned approaches (implementation of an NEHR system, regional/local EHR systems connected through a health information exchange system, and/or through a patient portal) in order to enable the sharing of EHR information.

Northern Europe stands out as being the subregion with the most decentralized, albeit connected, EHR systems, while eastern and southern European Member States exclusively report NEHR systems. Fig. 8 also indicates the distribution of Member States by subregion that have implemented legislation that governs the sharing of EHR information. The data illustrates

that even though the overall percentage of Member States in each subregion with the ability to share EHR information is already high, ranging from 70–100%, the percentage of Member States reporting legislation is higher still, suggesting that the groundwork for governing these systems, as will be further discussed in Part 6, is already in place in over 90% of the Member States in the Region.

Central and western Asia were the subregions reporting the most significant number of barriers to EHR system implementation but despite this, almost all of the Member States in these subregions had implemented shared EHRs through an NEHR system, patient portal or connected regional EHR system.

Fig. 8. EHR implementations and EHR legislation by subregion



Note: where two denominators are given, the first represents the number of Member States responding to having an EHR and patient portal and the second the number responding to having the respective legislation. Where one number is given, the same number of Member States replied for each question.



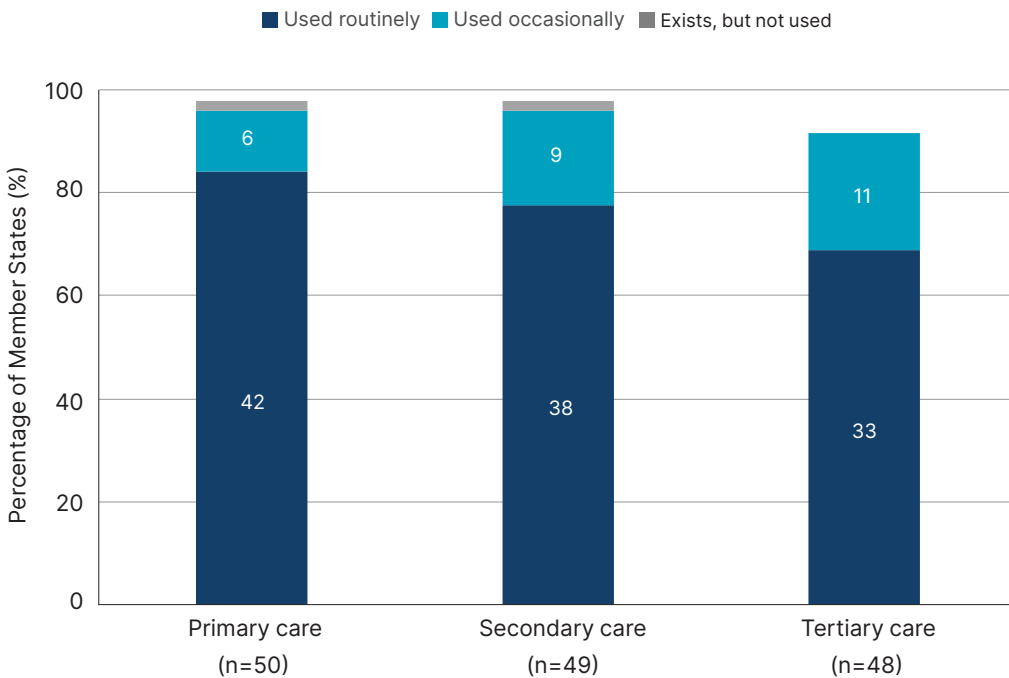
Use of EHR by health providers

Member States were asked about the use of EHRs in primary, secondary and tertiary care. Primary health care is defined by WHO as care that supports a person's health needs from health promotion to disease prevention, treatment, rehabilitation, palliative care and more (40). The health practitioners working to provide this care include GPs, nurses, allied health workers and others. Secondary care is that provided by specialists and tertiary care is the care provided by specialists and nurses within a hospital setting. In some cases, EHRs that are used in these secondary and tertiary settings have distinct features from NEHRs as their functionality is tailored to the health care setting and health-care provider that is using them. These EHRs will nonetheless normally interface directly with an

NEHR through health information exchange by secure messaging or through direct application programmatic interfaces (known as APIs).

Fig. 9 shows the utilization of EHRs by primary, secondary and tertiary health care in responding Member States. EHRs are routinely used in primary care by 84% of the responding Member States (42 out of 50), routinely in secondary care by 78% of Member States (38 out of 49) and routinely in tertiary care by 69% of Member States (33 out of 48). The EHR in primary practice is routinely used in 84% of responding Member States (42 out of 50), with occasional use reported in 12% of Member States (six out of 50).

Fig. 9. Use of EHR systems in primary, secondary and tertiary health care



When the EHR system is used to prescribe medications, 82% of Member States (37 out of 45) routinely make the prescription electronically available to pharmacies. This was a two-fold increase from that observed in the 2015 survey, where 41% of Member States (19 out of 46) had reported that their EHR system was linked to a pharmacy information system for electronic prescription (ePrescription), despite the 2022

survey limiting the question to primary practice settings. As illustrated below for Poland (Case Example 7), ePrescription improves patient safety and the quality of health care, especially for vulnerable groups of society. It contributes to system efficiencies by reducing the number of medical appointments and increasing the availability of services.

Case Example 7.



Poland's ePrescription service

From January 2020 ePrescription became mandatory in Poland. It proved to be an efficient and useful tool particularly in the COVID-19 pandemic, bringing benefits both to medical staff and patients. By November 2022 more than 1338 million e-prescriptions had been issued.

The service is available for all patients, regardless of gender, age or place of living. Patients can get ePrescription not only during physical visits but also during teleconsultations. Introducing ePrescription in Poland has made access to health-care more available, especially for vulnerable groups of society. It saves time for patients and doctors, contributes to reducing the number of medical appointments and therefore to better availability of services, increased resistance to epidemiological threats and improved continuity of care. From September 2022 Poland has joined the group of countries using the MyHealth@EU information technology system and has gone live with cross-border ePrescription.

The success of ePrescription would not be possible without the Patient Internet Account – a tool that facilitates access to digital services and organizes dispersed medical information about a patient's condition in one place. Through the Patient Internet Account, patients can verify information about their, and their childrens' ePrescriptions, electronic referrals, health-care visit and medication history as well as medication dosage and any sick leave. Patients can also easily and quickly schedule a COVID-19 vaccination appointment and download an electronic Digital COVID-19 Certificate confirming that the vaccination has been received. In 2019 there were 1 million Accounts established, and as of November 2022 there are a 16.4 million Accounts.



Barriers to implementing EHR systems

The WHO Regional Survey 2022 examined 10 specific barriers to implementing EHR systems, which were rated by respondents on a scale from “not a barrier” to “extremely important barrier” (Member States could select one or more barriers and were asked to specify the degree of importance for each). The responses to these questions are shown in Fig. 10. Funding was reported as the most prevalent barrier with 37% of Member States (19 out of 52) rating funding as very or extremely important. This was followed by capacity or trained human resources and/or technical support for EHR programmes and competing health funding priorities with 31% of Member States (16 out of 51) and 29% of Member States (15 out of 51 Member States) rating these barriers as very or extremely important. Notably, 22% of Member States (11 out of 51 Member States) reported that legal concerns are extremely or very important.

The responses to these questions grouped by subregion are shown in Table 7. Overall, funding and EHR standards were reported as important to moderately important barriers by all subregions followed closely by capacity or trained human

resources. Central Asia reported the widest range of barriers to the implementation of EHR systems with every category of barrier being rated as moderately, very or extremely important. Infrastructure and capacity/human resources were the most significant barriers in central Asia. Western Europe reported the fewest barriers to implementing EHRs with only funding and standards being rated as moderately important. Northern European Member States followed western Europe in reporting barriers for only 50% of the categories but unlike western Europe, health priorities was reported as being an extremely important barrier, a factor potentially influenced by the COVID-19 pandemic.

Cost-effectiveness and effectiveness of EHRs were not considered barriers by most subregions, highlighting the general acceptance of the utility and benefits of EHRs for country health systems. Of the most significant barriers faced by all subregions, dealing with standards is likely to be the easiest barrier to overcome, with funding, capacity and priorities being more significant challenges for Member States across all of the WHO European Region.

Nineteen Member States reported funding as a very important or extremely important barrier to the implementation of their national EHR. Capacity, competing health system priorities and legal uncertainty were rated as the next most important barriers.

Fig. 10. Barriers to implementing EHR systems

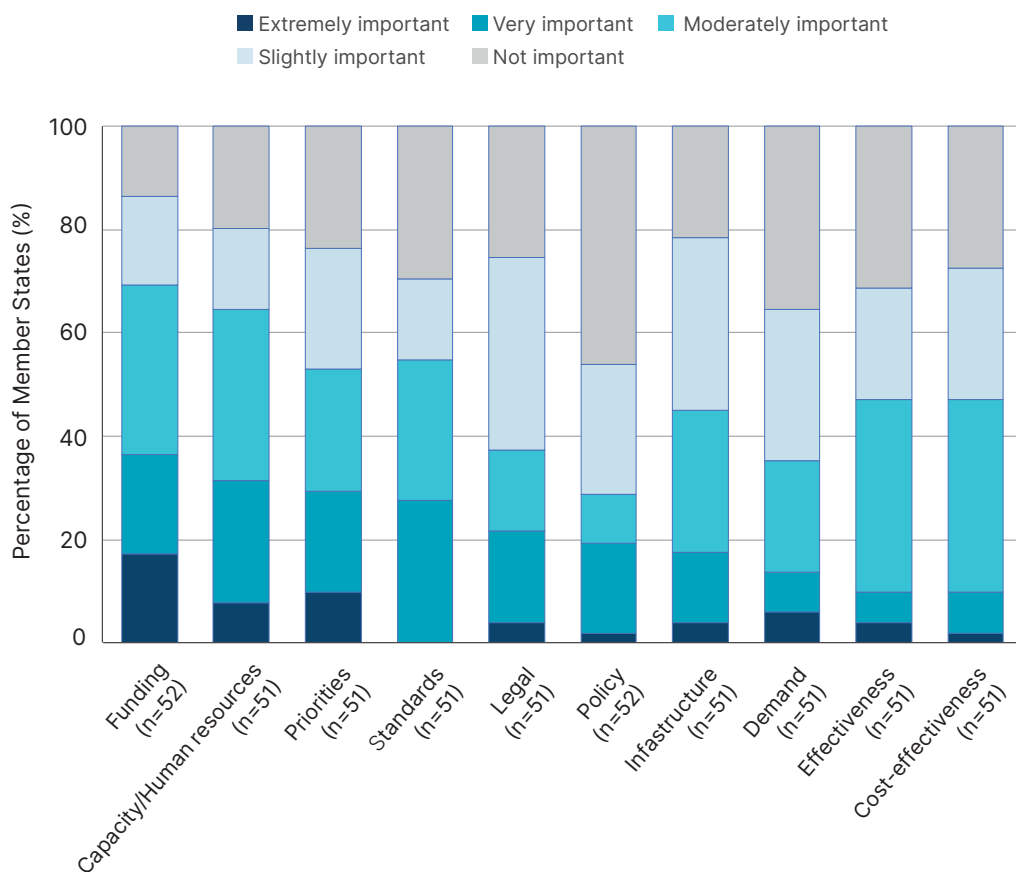
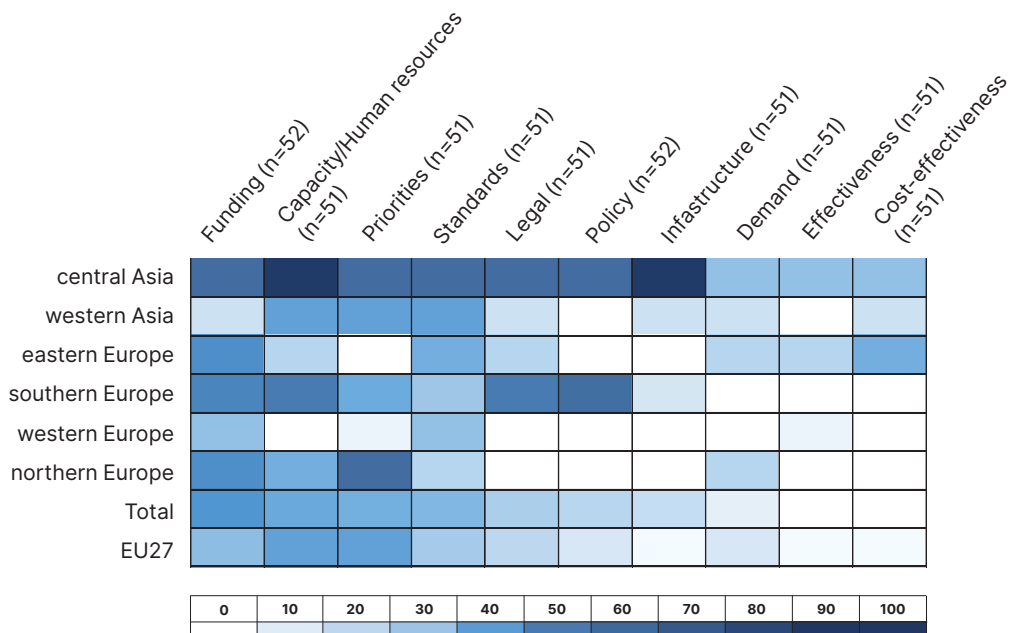


Table 7. Barriers to implementing EHR systems by subregion





Standards and interoperability of EHRs

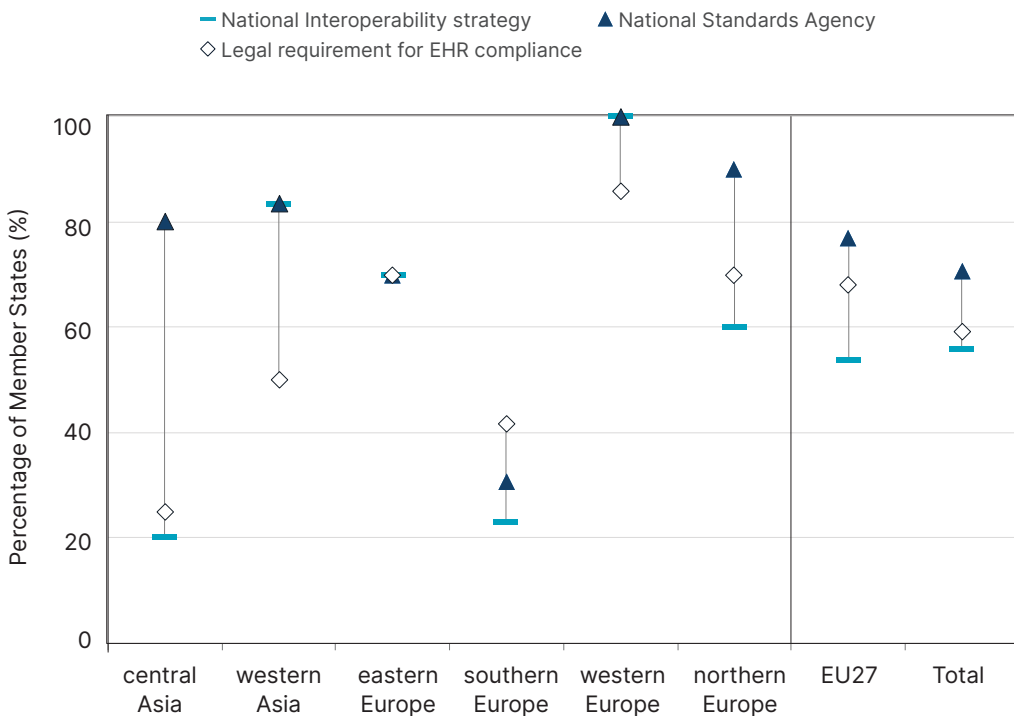
Integrated care requires data interoperability and information sharing across the health-care sector. Of the 50 Member States surveyed, 28 (56%) stated that they have a standalone interoperability strategy or policy to ensure coordination and common standards for secure information sharing across health-care services. Of these 28 Member States, 20 (71%) have implemented these strategies or policies since the 2015 survey. Additionally, 71% of Member States (36 out of 51) responded that they had a national organization or agency responsible for setting national clinical terminology and electronic messaging exchange standards.

When analysed by subregion (Fig. 11), responses indicate that only 20% of Member States (one out of five) in central Asia have a standalone interoperability strategy or policy, although 80%

(four out of five) report a national organization or agency responsible for setting national standards. In southern Europe, a similar share of 23% of Member States (three out of 13) report having a standalone interoperability strategy or policy but only one third (four out of 13) have established a national organization or agency responsible for setting national standards.

Of 49 responding Member States, 29 (59%) had set legal requirements for health-care providers to adopt an EHR system (software) that conforms with national standards for both clinical terminology and electronic messaging (exchange). Most of these Member States are concentrated in eastern Europe, western Europe and northern Europe, with these requirements less seen in central and western Asian Member States (Fig. 11).

Fig. 11. Standards and interoperability of EHRs by subregion



Of 46 responding Member States, 34 (74%) had engaged software vendors to develop EHR systems to the required specifications and standards and 47% (20 out of 43) have quality label and certification processes in place for the required specification and standards implementation. Forty-four per cent of Member States (19 out of 43) have a quality management system for interoperability testing and 69%

(34 out of 49) reported clinical terminology standards consistent between EHR systems in different regions, or different settings of health care. Furthermore, 96% of Member States (50 out of 52) had adopted international terminology standards for diagnoses, medications, laboratory tests and medical images and 48% (22 out of 46) regularly assess the state of EHR interoperability.

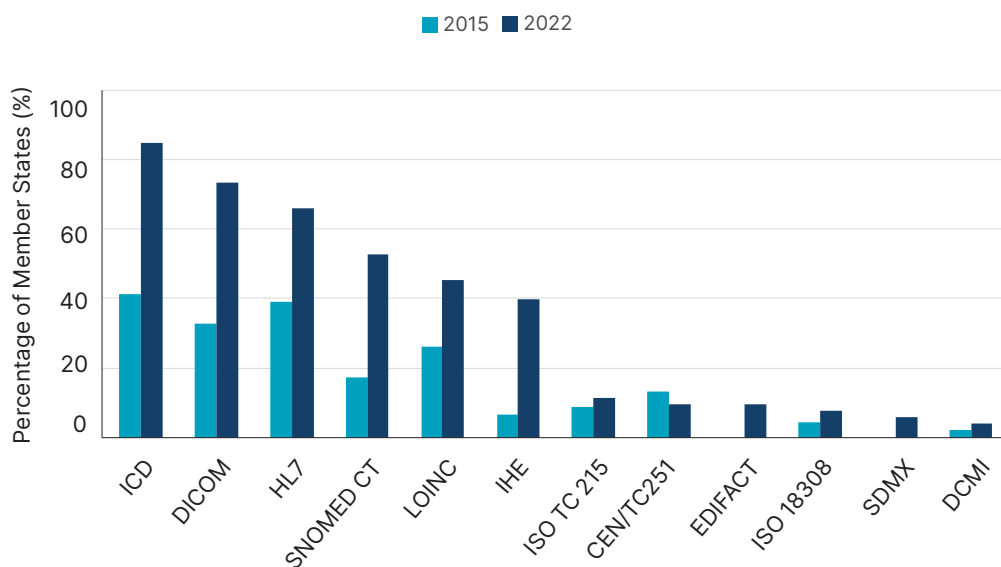


Use of international standards to support NEHR systems

The use of international standards for data classification and data representation in support of NEHR system implementation was also examined, with the results shown in Fig. 12. The International Classification of Diseases (ICD) (42), Digital Imaging and Communications in Medicine (DICOM) (43) and Health Level Seven International (HL7) Messaging (44) are the most prevalent standards adopted by the surveyed Member States, used by 45, 39 and 35 Member States respectively, and these are the most

common international standards used across all subregions (Fig. 13). Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) (45) is also frequently used across all subregions with the exception of eastern and southern Europe where only about 40% of Member States report the use of this standard. ICD, HL7 and DICOM were also reported as the widely used standards in the 2015 survey, albeit to a lesser extent (Fig. 12).

Fig. 12. Standards used to support NEHR systems

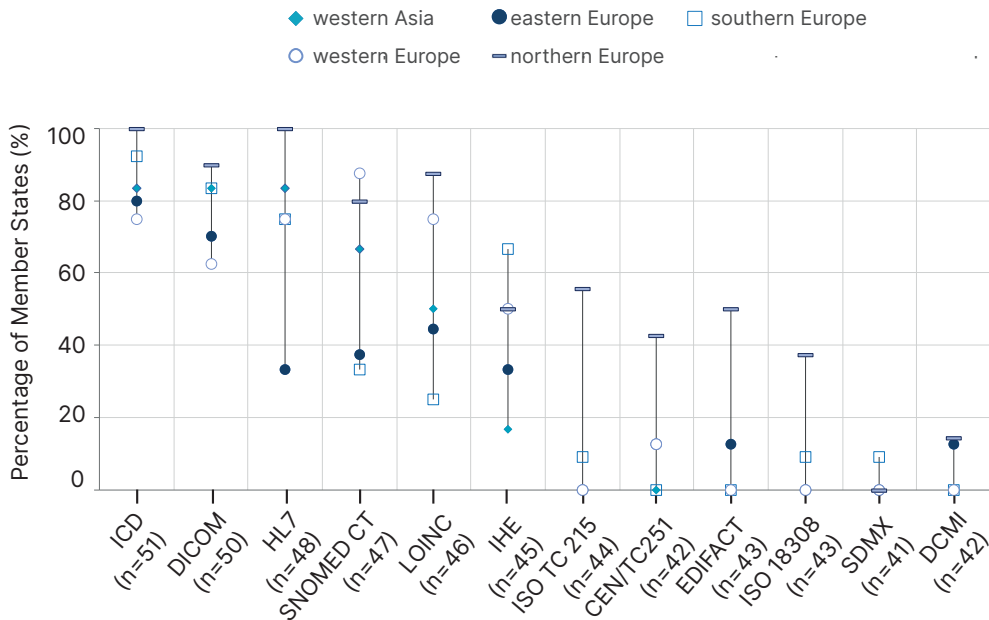


Notes: LOINC: Logical Observation Identifiers Names and Codes; IHE: Integrating the Healthcare Enterprise; ISO TC 251: International Organization for Standardization Technical Committee 251; CEN/TC251: European Committee for Standardization Technical Committee 251; EDIFACT: Electronic Data Interchange for Administration, Commerce and Transport, ISO 18308: International Organization for Standardization 18303; SDMX: Statistical Data and Metadata eXchange; DCMI: Dublin Core Metadata Initiative.

The increased use of these standards also reflects the move by health software developers in incorporating these standards in their products. A review of publications featuring SNOMED CT showed a marked increase in the quantity and levels of maturity of its use from 2013 to 2020 (46). In the 2022 survey, Iceland commented that it was implementing SNOMED-CT and the International Classification of Nursing Practice (ICNP) (47) within the next 3 years. Half of the responding Member States reported additional standards: Poland reported using WHO International Classification of Functioning, Disability and Health (ICF) (48) and ICNP. Estonia,

Hungary and North Macedonia reported using the WHO Anatomical Therapeutic Chemical (ATC) classification system for drugs (49). Belgium and Finland reported the use of Fast Healthcare Interoperability Resources 1 (FHIR) (50) which is a messaging protocol that is part of the HL7 standard, with Finland also specifying that it is using the ISO/HL7 Clinical Document Architecture Release 2 (CDA) standard (51). Montenegro reported using the International Classification of Primary Care (ICPC-2) standard (52). Norway is using the Electronic Business using eXtensible Markup Language (ebXML) standard (53).

Fig. 13. Standards used to support NEHR systems by subregion



Notes: LOINC: Logical Observation Identifiers Names and Codes; IHE: Integrating the Healthcare Enterprise; ISO TC 251: International Organization for Standardization Technical Committee 251; CEN/TC251: European Committee for Standardization Technical Committee 251; EDIFACT: Electronic Data Interchange for Administration, Commerce and Transport, ISO 18308: International Organization for Standardization 18303; SDMX: Statistical Data and Metadata eXchange; DCMI: Dublin Core Metadata Initiative. Central Asia is not shown because there were only two valid answers.



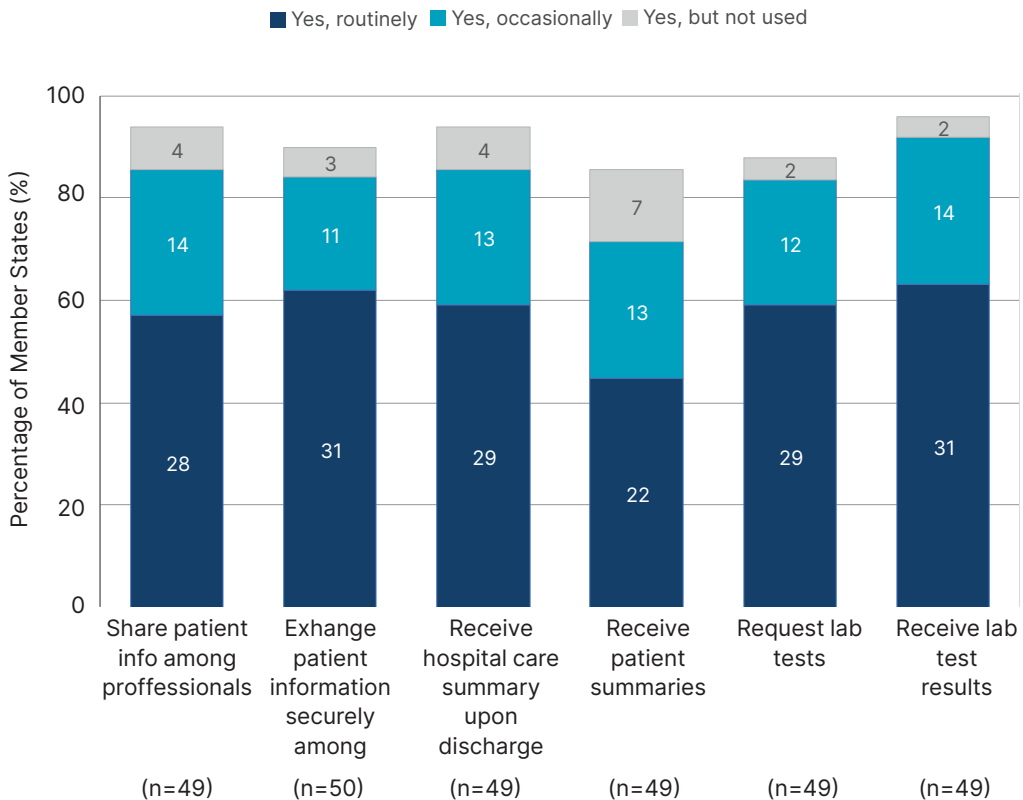
Health information exchange

Providing effective patient care involves communication and sharing of health information between multiple parties, often with the patient performing a controlling and coordinating role. Digital health systems provide a way of making this process of communication efficient and secure, ensuring that privacy and confidentiality is always preserved.

The 2022 survey asked Member States whether EHR systems used in primary practice settings could exchange health information across a number of health-care professionals and also to

specify the information shared between them. As shown in Fig. 14, 86% of Member States (42 out of 49) reported that patient information was shared from EHRs in primary practice with other health professionals either routinely or occasionally. The same number reported that EHRs received patient information from other professionals and following hospital care (patient discharge summary). Furthermore, 71% of Member States (35 out of 49) reported that EHRs received general patient summaries, 84% (41 out of 49) could send lab test requests and 92% (45 out of 49) could receive the results of these tests.

Fig. 14. Health information exchange





National digital health portals

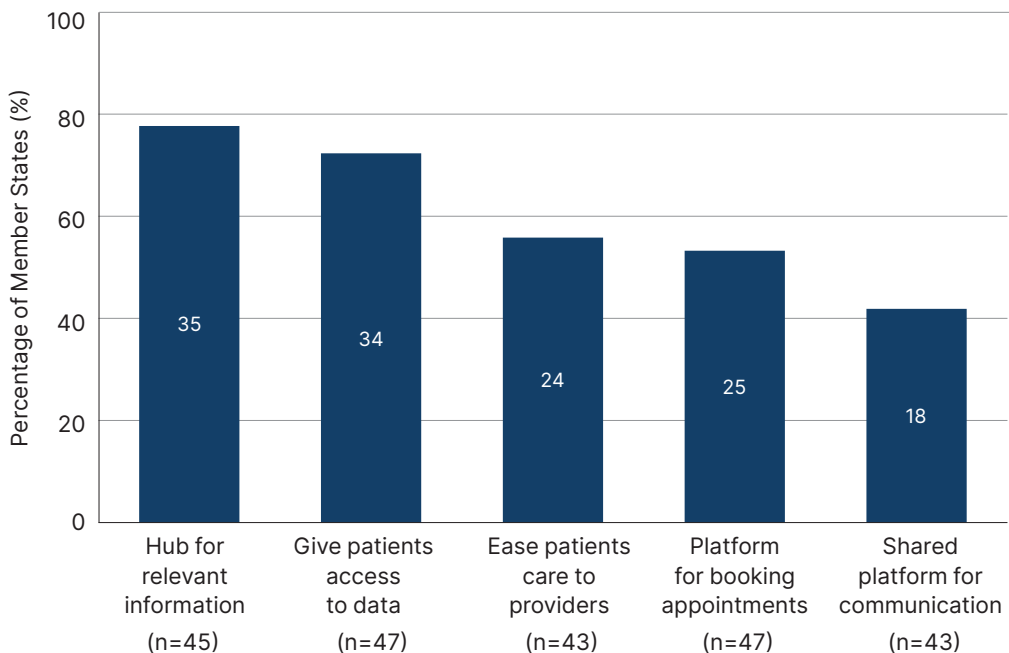
As previously mentioned, a patient portal is a secure online website that gives patients convenient, 24-hour access to personal health information from anywhere with an internet connection. By providing patients full access to their health information and control over their data and with whom it is shared, patient portals can enable greater patient engagement and care coordination. It is acknowledged that the benefits of patient portals are an increase in self-care, decision making, adherence to medications and preventative measures (54). This is particularly important when dealing with chronic disease management where there is likely to be a care team that requires coordination. Case Examples 8 and 9 provide illustrations of how portals are being used in Denmark and Lithuania respectively.

Patient portals are sometimes regarded as being synonymous with an NEHR, depending on whether health providers have access to the record through the portal. However, they do not function in the same way as an NEHR in that the information available on a portal is not as

comprehensive and patients may not be able to determine who gets to access what information. Despite the similarities, a patient portal cannot therefore replace an NEHR.

The responses of Member States surveyed on the functionalities of their national digital health patient portals are shown in Fig. 15. Out of 51 responding Member States, 36 (71%) had established a national digital health patient portal, while 35 out of 45 (78%) responding Member States stated that the patient portal was being used as a hub for relevant information. Furthermore, 72% of Member States (34 out of 47) reported that the portal empowered patients by giving them access to their health data, 53% (25 out of 47) that the portals offered the opportunity to book appointments and 56% (24 out of 43) that the aim of the portal was to ease access to patients' information by care providers. Under half (42%, 18 out of 43) of Member States stated that their portals offered a means of communication.

Fig. 15. Reported uses of national digital health portals



Case Example 8.



Danish digital health portal Sundhed.dk [health]

Denmark is considered a global frontrunner, having developed a very high level of digital health maturity, and is seen as a role model for digital health innovation in Europe. e-Journalen [the e-Record] was introduced in 2007 and gives citizens and health-care professionals digital access to information on diagnoses, treatments and notes from EHR systems in all public hospitals. Clinicians at hospitals have access to e-Journalen directly through hospital EHR systems, while GPs and citizens can access the system through sundhed.dk.

The health portal sundhed.dk, based on a federated IT architecture, launched in 2003, integrates with local EHR systems and consolidates relevant information from all parts of the health-care service. The portal serves as a central access point for doctors and citizens to make appointments and view images, laboratory results, clinical reports, medications, treatment plans and bills. The sundhed.dk digital health portal collates medical information and data for all Danish citizens aged 15 years or older. Sundhed.dk displays data from more than 120 different sources without storing or duplicating data. Accessibility to the portal across different end-user platforms (personal computers, tablets and mobile phones) is high and requests to display citizen health data are dealt with in a timely, efficient and secure manner. Besides increasing the efficiency and effectiveness of health-care delivery, the information recorded and collected feeds automatically into national population-based databases and registries. This data generates most of the available statistics on citizens' and health professionals' use of the system. Additionally, the Danish Centre for Health Informatics, Aalborg University, conducts annual surveys of health professionals and biennial surveys of citizens' use of health IT.

Source: (55).

Case Example 9.



Appointment booking through the Patients e-services portal in Lithuania

The Patients e-services portal was created in 2019. It provides medical history and allows patients to send and receive documents and book appointments with doctors and specialists – previously, patients were required to use a number of different booking systems. Appointments can also be made for out-patient visits in managed health services. Patient history and electronic referrals are provided by the integration of the portal with the national database of patient EHRs. The system is currently used by more than 400 clinics – including the largest university and regional clinics – which are principally government and municipality owned clinics, as well as health service private clinics that are financed by the State health insurance fund. In all, information from 1400 GPs (70% of Lithuania’s GPs) and 5000 specialists (60% of all specialists) is managed in the system. Patients can also see approximate waiting times for appointments with doctors and specialists. The success of the system and acceptance by patients has facilitated the development of new systems including telehealth services.

Source: (56,57).



Summary

Under this section, the significance and evolution of NEHR systems have been explored. These systems, built on a standards-based infrastructure, are pivotal in ensuring interoperability, secure communication, patient and service identification, and the overall tracking and auditing of activities.

The 2022 survey found that 87% (45 out of 52) of the surveyed Member States, confirmed the presence of either an NEHR, an interconnected regional EHR system, or patient portals. This denotes a significant increase from the 59% of Member States reporting the same statistic in the 2015 survey.

The data indicate a widespread adoption of EHRs, which are now the primary method for managing patient information and clinical practice within primary and secondary health-care facilities. A significant number of Member States also report regular usage of EHRs in tertiary care settings. In terms of medication prescriptions, two-thirds of the Member States have adopted an electronic system, making the prescriptions readily accessible to pharmacies.

International standards such as ICD, DICOM, HL7 and SNOMED-CT were reported to be extensively utilized to support NEHRs and the incorporation of these standards is typically overseen by a national organization or agency responsible for establishing norms for infrastructure, clinical terminology and electronic messaging exchange.

Over two-thirds of Member States reported having such an agency. Additionally, around half of Member States revealed the presence of a distinct interoperability strategy or policy for ensuring common standards for information sharing across health-care services. Most of these Member States have put these strategies into action since the 2015 WHO survey.

Nonetheless, the implementation of EHR systems continues to face obstacles. As per the data from both 2015 and 2022, financial constraints are still the primary hurdle, closely followed by issues related to capacity, lack of adequate training and technical support.



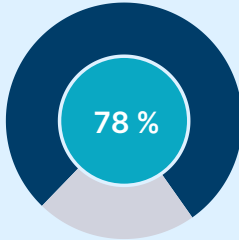
Considerations

- ▶ Member States are encouraged to define appropriate national legislation governing EHR systems and their use, as well as to integrate local and regional EHR systems with national systems, where applicable. In addition, sustainable funding should be allocated for the development and maintenance of EHR systems.
- ▶ Member States should strengthen their efforts to develop a comprehensive roadmap for the full implementation of health data standards and address interoperability issues at the local/regional level within Member States to facilitate integrated HISs. The development of a quality management system for interoperability testing, a suite of appropriate testing tools, and quality label and certification procedures are critical aspects to consider while developing a national roadmap for implementation.
- ▶ Member States are encouraged to conduct monitoring and evaluation activities to determine whether the EHR and patient portal/NEHR are contributing to achieving national health-related objectives and demonstrating benefits for patients in access and outcomes.
- ▶ To support a more patient-centred approach to care, Member States should engage patients and intersectoral partners in the development and expansion of the EHR system, in efforts to expand the sharing of health information beyond the traditional health and social services borders. Allowing patients to participate in this development allows health-care providers to gain valuable insights into, and to ensure that the system meets, patient needs and expectations.

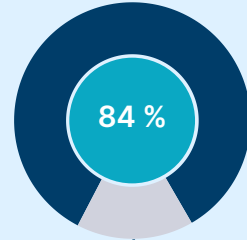


Part 3 : bridging distances – telehealth

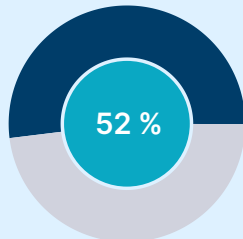
Data highlights: key insights from survey responses



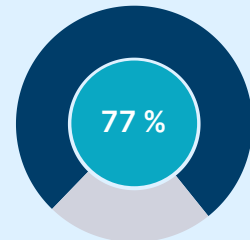
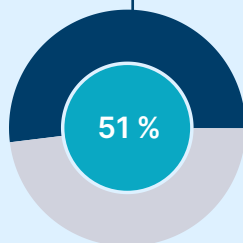
78% of Member States (40 out of 51) directly address telehealth in their policies or strategies.



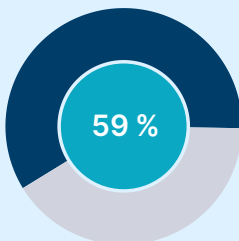
84% of Member States (43 out of 51) use teleradiology.



Over half of Member States use teledermatology (52%; 24 out of 46) and telepsychiatry (51%; 23 out of 45).



77% of Member States (39 out of 51) use telemedicine or remote patient monitoring.



59% of Member States (30 out of 51) introduced a new law, legislation or policy to support telehealth during the COVID-19 pandemic.



Background

The WHO defines telehealth as the delivery of health-care services, where patients and providers are separated by distance. Telehealth uses ICT for the exchange of information for the diagnosis and treatment of diseases and injuries, research and evaluation, and for the continuing education of health professionals (58). In this context, telehealth is the broader term that encompasses the approach to providing specific services in medical domains including:

- ▶ **telemedicine or remote patient monitoring** – where patients, often at home, transmit information about their condition from sensors and monitoring equipment to external monitoring centres;
- ▶ **telepsychiatry** – using ICT to provide mental health services;
- ▶ **teleradiology** – using ICT to transmit digital radiological images for diagnosis or consultation;
- ▶ **telepathology** – using ICT to transmit digitized pathological results, such as microscopic images of cells, for the purpose of diagnosis or consultation; and
- ▶ **tele dermatology** – using ICT to transmit medical information concerning skin conditions for the purpose of diagnosis or consultation.

Although telehealth has been available for decades, its capabilities have been significantly boosted through the advent of smartphones and 5G networks. The main aim of telehealth in Member States has traditionally been to provide services to people in remote locations who have limited access to health-care services. Prior to the COVID-19 pandemic, the uptake and use of telehealth by Member States was constrained by a range of barriers, some of the most significant being technological and infrastructure challenges, resistance to procedural and work-flow changes, and financial and legal barriers (59).

During the COVID-19 pandemic, telehealth became an effective alternative to face-to-face consultation for the provision of safe care whilst limiting the spread of the disease. Reductions in the number of in-person health-care services were partly offset by an unprecedented scale-up of telehealth services, following the adoption by governments of policies and special resource allocations to promote remote care (60). As Member States transition to a post-pandemic world, telehealth's importance as a mode of care provision is likely to stay significant because of the efficiencies it brings and the overcoming of barriers that limited its growth in the past (61).



Results of the survey

National strategy and policies

The survey asked whether Member States had dedicated national telehealth policies or strategies. As shown in Fig. 16, 78% of Member States (40 out of 51) stated that their country had either a national telehealth strategy or that

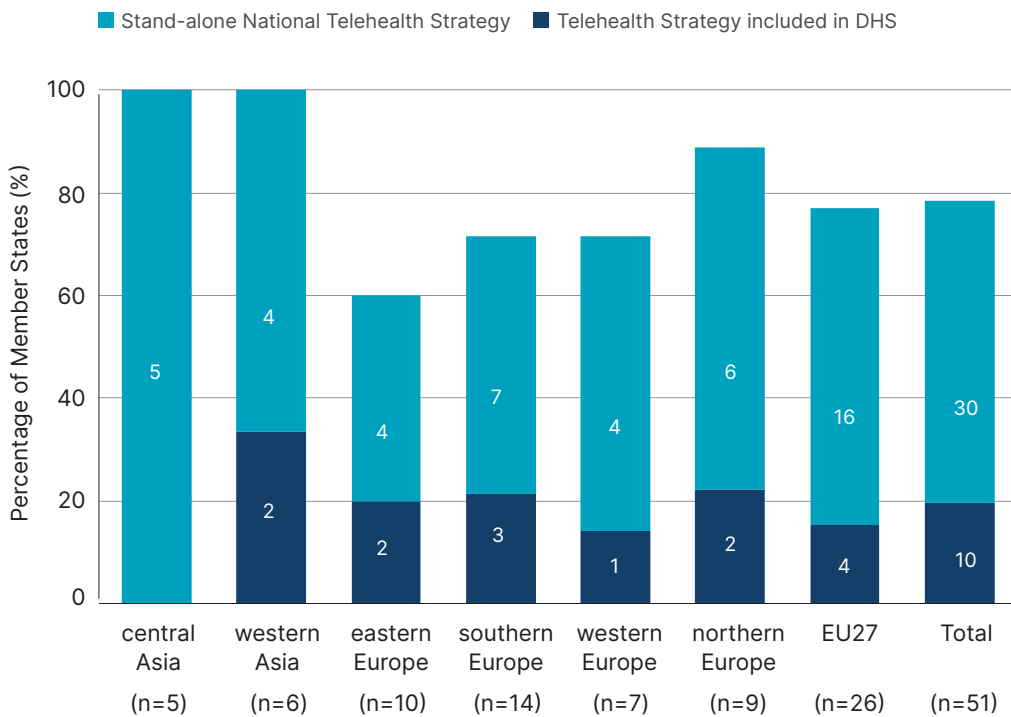
telehealth was part of a broader national DHS. This represents an increase from 2015 where 61% of Member States (28 out of 46) reported that they directly address telehealth in their digital health policies or have stand-alone telehealth strategies. In 2022 Member States

were, however, less likely to have a standalone telehealth strategy with a greater proportion incorporating telehealth into their overall DHS – particularly evident in central Asian Member States, which all report addressing telehealth in their digital health policies or strategies. Over one third of the eastern European Member States (4 out of 11) and about one third of southern

European Member States (4 out of 14) reported they do not have any telehealth strategy.

It should be noted that in some Member States, the use of telehealth is considered a regional or local purview, as is the case in Denmark and Spain, where regions or municipalities are responsible for these services.

Fig. 16. Member States reporting national telehealth strategies or policies by subregion



Telehealth programmes

Member States were asked to provide an overview of the maturity of services offered through telehealth that were operating in their country. Service maturity was classified as informal (early adoption of telehealth but with no formal processes or policies available), pilot

(telehealth is tested and evaluated in specific situations) or established (telehealth programmes have been running for at least two years and are expected to continue for at least another two years). The responses from Member States are summarized in Fig. 17.

In the 2022 survey, teleradiology was the most prevalent service, with 84% of Member States (43 out of 51) having an service (informal, pilot or established) and 53% of Member States (27 out of 51) having an established service. Teleradiology in its established form was also reported by the largest number of Member States in the 2015 survey.

The next most established initiatives as identified in the 2022 survey were telepsychiatry and telemedicine, established in 42% (19 out of 45) and 35% (17 out of 48) of Member States, respectively.

A comparison of established, pilot and informal services in 2015 against those available in 2022 is shown in Fig. 18. For all services, the number of Member States offering established initiatives in 2022 increased from 2015 – for teleradiology,

from 28% to 52%; for telepsychiatry, from 7% to 42%; for telemedicine/ remote monitoring, from 7% to 35%; for teledermatology, from 9% to 28%; and for telepathology from 13% to 26%.

In the case of pilot or informal services, the number increased for teledermatology, telemedicine and teleradiology. In the case of telepsychiatry, the number of Member States offering pilot or informal programmes declined from 13% in 2015 to 9% in 2022. However, this might be due to previous pilots or informal programmes converting into established ones.

Overall, there have been significant improvements in the maturity of telehealth initiatives being offered in Member States. Unsurprisingly, the biggest relative growth has been in telemedicine and telepsychiatry, partly to be attributed to the disruption of care during the COVID-19 pandemic.

Fig. 17. Maturity of telehealth services offered by Member States

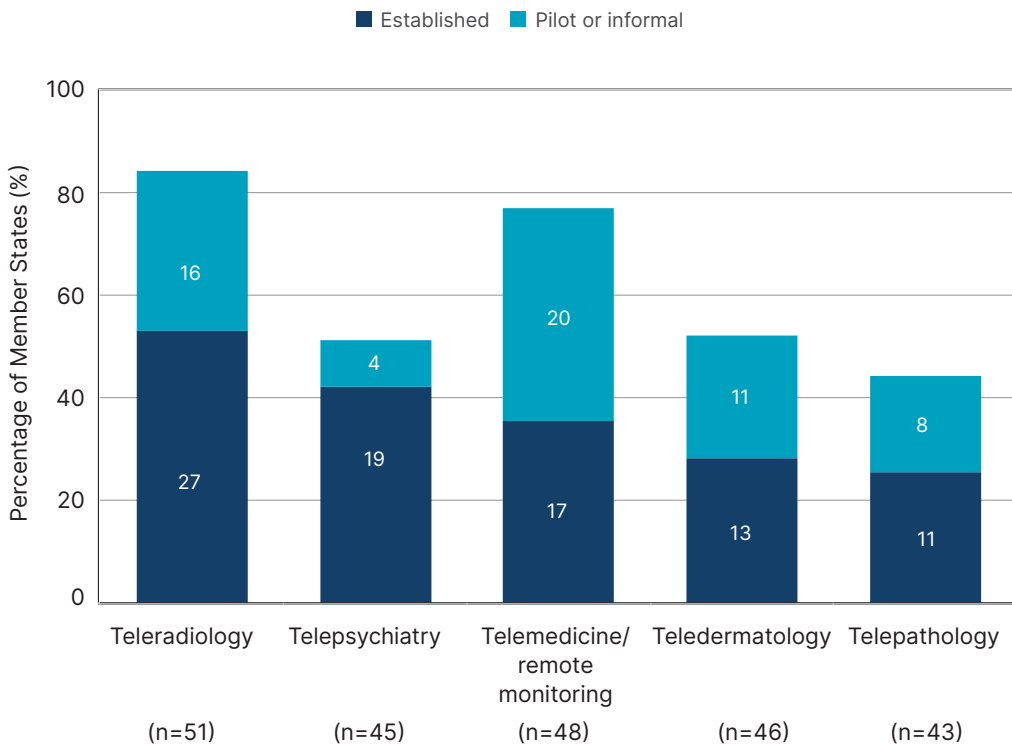
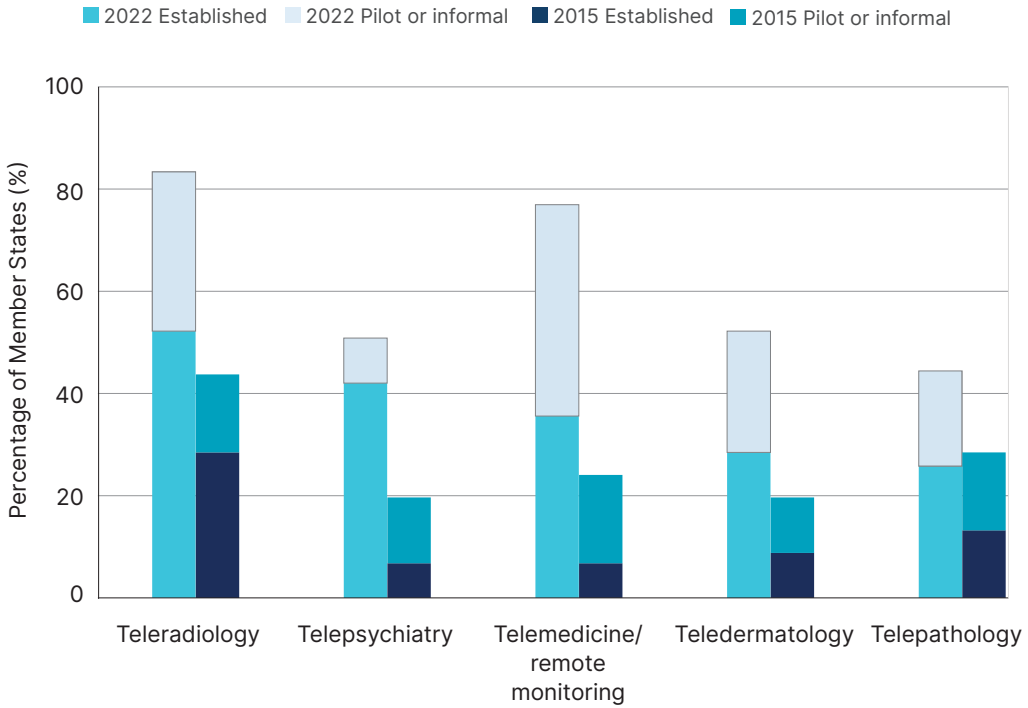


Fig. 18. Maturity of telehealth initiatives in 2015 and 2022



Note: there were some differences in structures between the 2015 and 2022 surveys (see methodology).

The most prevalent telehealth programme in the Region is teleradiology with 53% of Member States having established programmes and a further 31% of Member States having pilot or informal programmes.



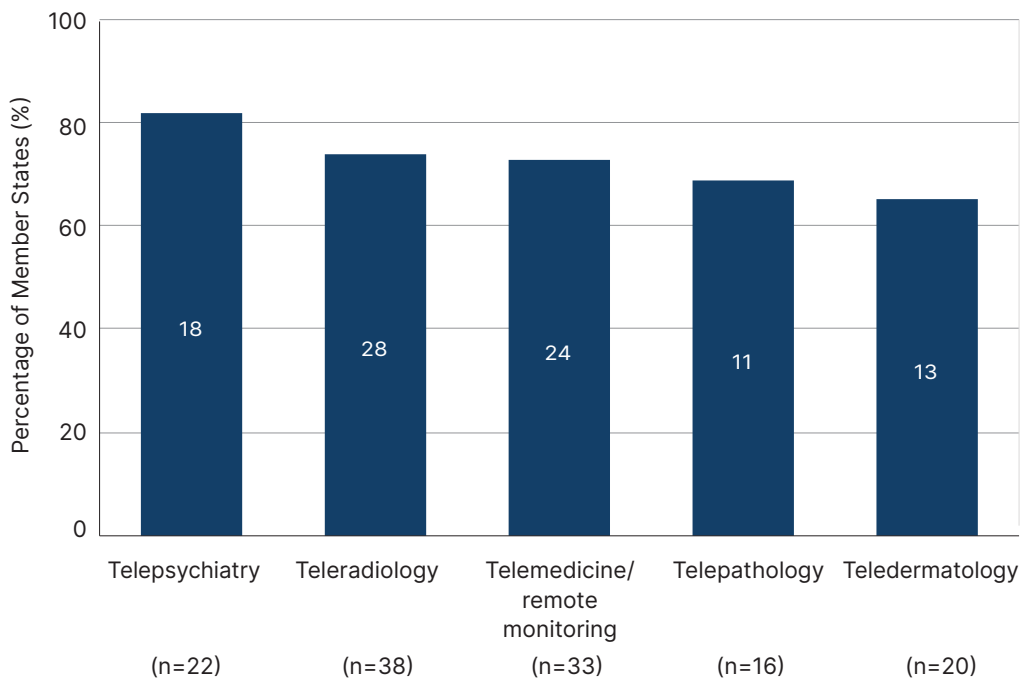
Financing of telehealth programmes

The proportion of telehealth services covered by government or compulsory financing schemes broken down by type of service is shown in Fig. 19. For telepsychiatry, 82% of Member States with such a service (18 out of 22) stated that this service was covered by government or compulsory financing schemes; for teleradiology this was 74% (28 out of 38); for telemedicine – 73% (24 out of 33); for telepathology – 69% (11 out of 16); and for teledermatology – 65% (13 out of 20).

While it is difficult to make subregional comparisons in this regard due to low numbers,

there are still some noticeable differences. In eastern Europe, except for telemedicine, no other teleservices were covered by the government in more than half of the Member States. Southern Europe had the highest coverage of the initiatives with all five Member States covering teledermatology, and four covering both telepathology and telepsychiatry. In the EU, the coverage range varies from eight Member States for teledermatology to 11 Member States for telepsychiatry.

Fig. 19. Telehealth services covered by government or compulsory financing schemes





Telehealth in the different subregions

The proportion of Member States by subregion that offer different types of telehealth services is shown in Fig. 20. Telehealth initiatives are not uniformly distributed across the WHO European Region. While the majority of Member States in subregions such as northern Europe and western Europe have a wide offering of telehealth initiatives, regions such as western Asia and central Asia have a more limited range of services. Teleradiology is the most common telehealth service in use across the whole Region, with more than 80% of Member States in all subregions except for central Asia using teleradiology. In southern Europe, northern Europe and western Europe, telemedicine or remote patient monitoring is also highly in use, with 90% (9 out of 10), 91% (10 out of 11), and 100% (eight out of eight) of Member States offering such as service. Comparatively, only 56% (five out of nine) and 25% (one out of four) of the responding Member States in eastern Europe and central Asia offer telemedicine or remote patient monitoring services, respectively.

The use of teledermatology and telepathology services also varies significantly across subregions. While only one out of six Member States (17%) in the western Asian subregion offered telepathology services, five out of six Member States in western Europe offered the service. However, comparisons across the subregions are limited by the different number of

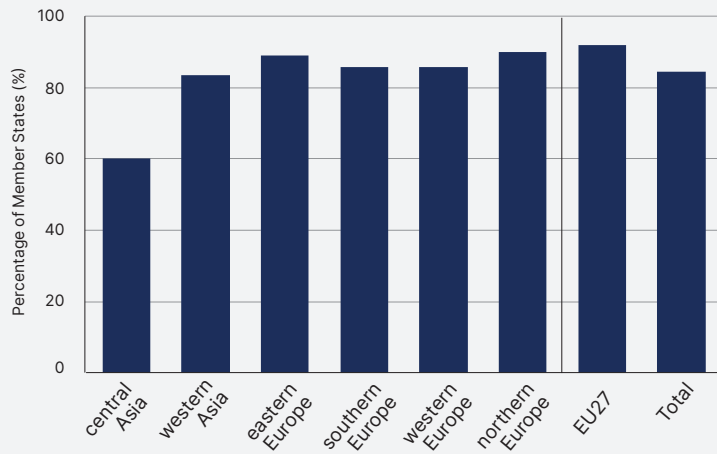
Member States within each subregion – notably the percentages for the western Asia and central Asia subregions are influenced by the small number of Member States.

Differences also exist in terms of service maturity – from 20% of responding Member States (two out of 10) in southern Europe up to 63% in western Europe reporting established telemedicine initiatives. Similarly, for Member States using telepathology, 100% of responding western European Member States have established initiatives, against only one Member State in southern Europe, and 50% of Member States in northern Europe (two out of four).

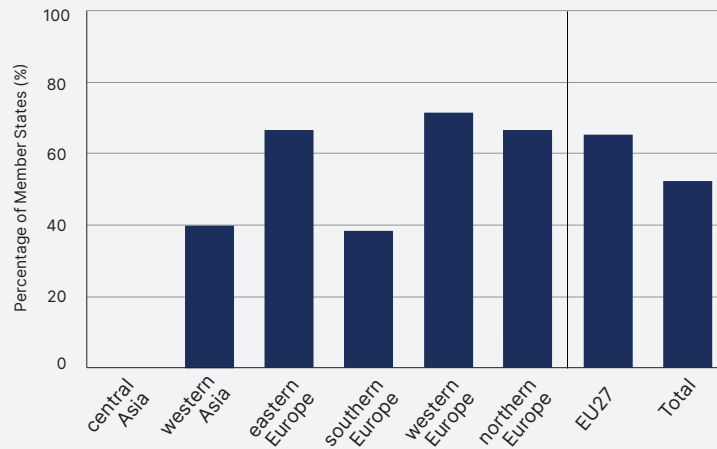
More than 80% of the Member States in all of the subregions that report telepsychiatry initiatives defined them as established with the exception of central Asia and eastern Europe. For teleradiology, more than half of the Member States with telehealth initiatives in all the subregions except western Asia and eastern Europe have established initiatives – 83% of Member States (five out of the six) in western Europe with teleradiology initiatives and 60% of Member States (three out of the five) in central Asia reported that they were established, which dropped to 50% of responding Member States (four out eight) in eastern Europe, and 40% (two out five) in western Asia.

Fig. 20. Percentage of Member States with telehealth services by subregion

Teleradiology



Teledermatology



Telepathology

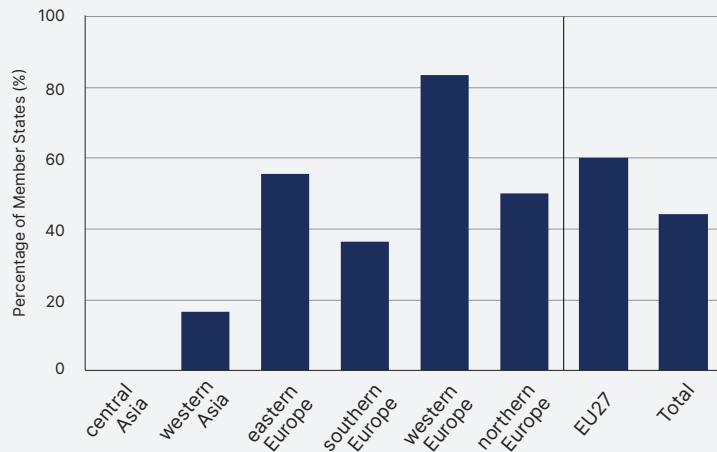
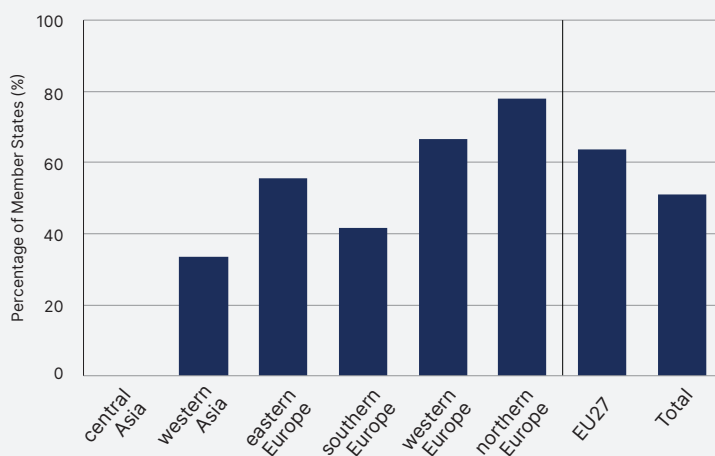
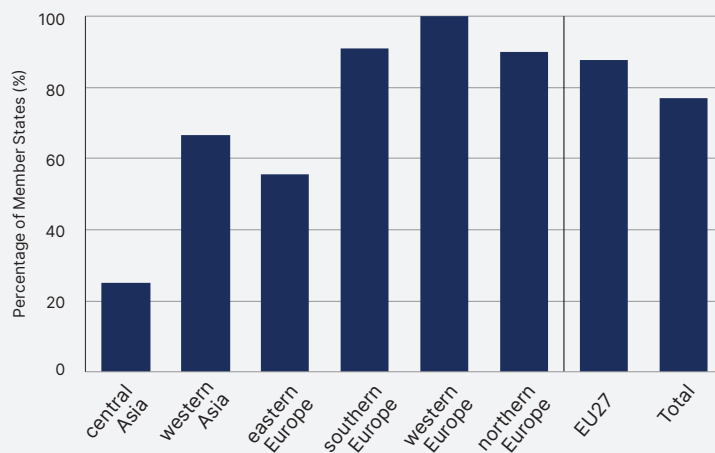


Fig. 20. contd.

Telepsychiatry



Telemedicine/ Remote monitoring





Telehealth during the COVID-19 pandemic

The COVID-19 pandemic brought about a seismic shift in the use of digital technologies in all areas of society as lockdowns and attempts to restrict the spread of the virus prevented people from travelling and meeting face-to-face. This same shift occurred in health-care services where telehealth consultations were offered via video conferencing, telephone or online chat in many Member States. Many health-care providers, as with other sectors of the economy, had no experience of providing care remotely prior to the pandemic and so were required to pick up the expertise very quickly. Despite this, the experience proved largely positive in many Member States as illustrated in a study of Norwegian GPs (62), which showed that 51% of video consultations were considered as effective as face-to-face patient consultations, which rose to 61% in the case of follow-up consultations – the striking aspect of this study was that prior to the pandemic, 81% of the GPs surveyed had no experience of conducting a video consultation.

Member States that offered telehealth services were asked if these services had changed during the COVID-19 pandemic. Respondents could either respond that the service had been introduced during the pandemic or had improved (Fig. 21).

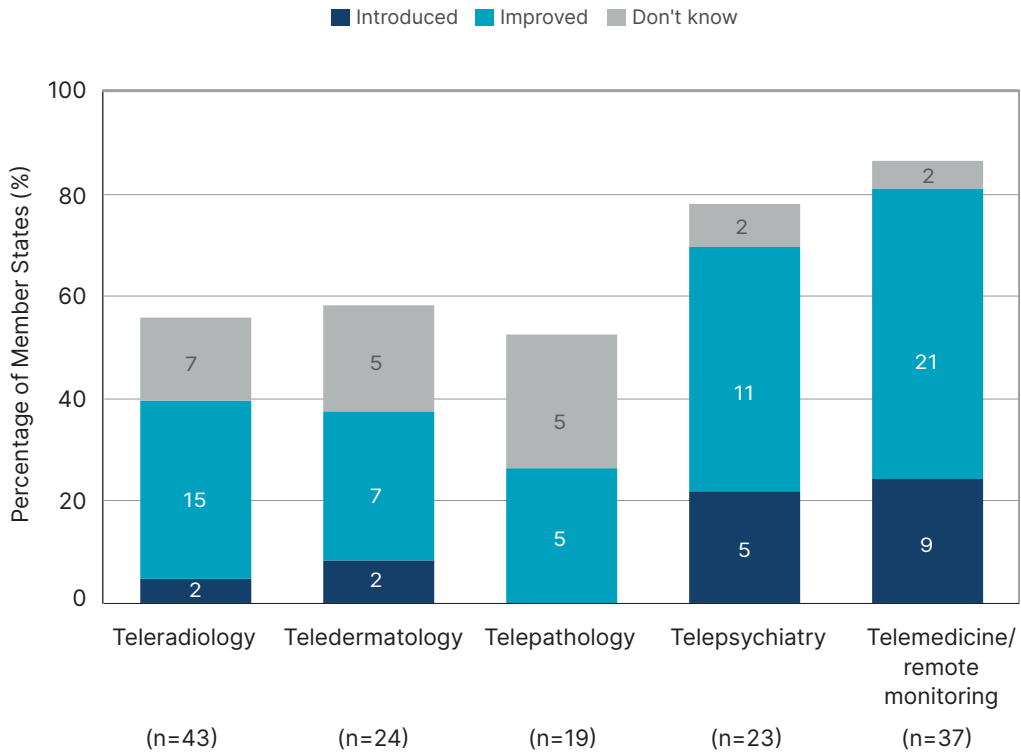
Telemedicine represented the service that was most impacted during the pandemic. Among the

respondents, 26% of Member States (nine out of 35) reported having introduced telemedicine services during the pandemic and 60% (21 out of 35) said that their telemedicine services improved because of the pandemic. Telepsychiatry was also significantly boosted, with 24% of Member States (five out of 21) reporting that telepsychiatry services had been introduced and 52% (11 out of 21) reporting that their telepsychiatry service improved. Improvements in other telehealth services were also reported albeit to a lesser extent – teleradiology was introduced in 6% of Member States (two out of 35) and improved in 43% of Member States (15 out of 35); teledermatology was introduced in 11% of Member States (two out of 19) and improved in 37% of Member States (seven out of 19); and telepathology improved in 36% of Member States (five out of 14).

The improvements in telehealth service provisions are consistent with the allocation of special funding to extend these services during the COVID-19 pandemic as reported in Part 1.

Many Member States expanded other services during the COVID-19 pandemic. For example, Azerbaijan introduced a distance learning programme and Malta established a national telemedicine centre for primary care.

Fig. 21. Telehealth services introduced or improved during the COVID-19 pandemic



Note: "Don't know" responses are included in both numerators and denominators; denominators consist of the number of Member States where services were implemented.



Additional telehealth services

Member States were asked to provide information about additional telehealth services for diagnosis, consultation, distance learning or intervention. In all, 27 Member States reported additional telehealth services covering a wide range of specialties ranging from teleconsultation and telerehabilitation to telesurgery – illustrating the potential application of telehealth in all areas of health care (Table 8). Teleconsultation was the

most cited additional initiative (nine Member States) followed by distance learning (five Member States).

As an example, Finland reported an innovative national-level initiative called Omaolo (63), which directs patients to appropriate care based on reported symptoms. During the COVID-19 pandemic, the service was deployed to allow

people to self-assess their COVID-19 symptoms and direct them to care, if needed. Finland also reported another established telehealth programme, Terveyskylä [Health Village] (64), which provides patients with health information, and advice on self- and professional care. Furthermore, Austria reported a range of telehealth initiatives, including “NoTube”, an

initiative for children and adolescents with an eating disorder and through which parents are coached by experts in weaning young children off artificial nutrition (65). The programme also has other modules such as Weight-Doc, through which adolescents and young adults are provided with web-based therapy for anorexia.

Table 8. Additional telehealth services

Initiative	Number of Member States reporting service
Teleconsultation	9
Distance learning	5
Telecardiology	4
Telerehabilitation, cardiac rehabilitation	3
Teletherapy monitoring	3
Telediagnosis	2
Other (telementoring, telemetry, telesurgery, telegeriatrics, teleophthalmology, COVID-19 telemonitoring, telesurveillance)	1 each



New legislation, strategy, policy or guidance to support telehealth use during and after the COVID-19 pandemic

Before the COVID-19 pandemic, telehealth often operated in many Member States in a legal vacuum. However, the pandemic brought in the necessary push to advance the legislative and regulatory landscape, with 59% of Member States (30 out of 51) having issued new legislation, strategy, policy or guidance to support telehealth (Fig. 22).

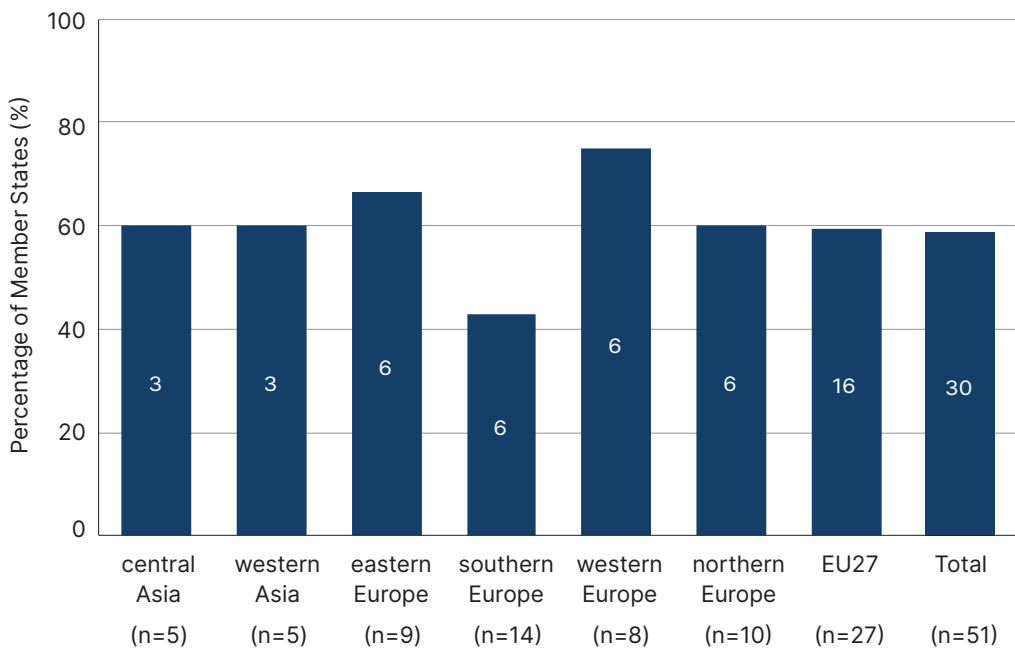
However, according to the survey the scope of the regulatory and policy changes varied significantly across Member States. While some Member States such as Finland, Greece and Iceland introduced narrow and targeted legislation for the purpose of COVID-19 patient

monitoring and treatment, others such as Belarus, Georgia, Kazakhstan, Turkmenistan and the United Kingdom introduced national-level strategies or laws to govern the use of telehealth technologies in general. As illustrated in Case Example 10, which covers regulatory changes in Hungary, many regulatory changes were initially introduced as a temporary response to the COVID-19 pandemic. Member States such as Italy and the Russian Federation introduced temporary guidelines regarding the provision of telehealth service for the delivery of medical care during the pandemic. In Estonia, regulation on teleconsultation was implemented temporarily in March 2020 during the first wave of the pandemic,

but was made permanent as of September 2020. Similarly in France, the use of telemedicine was extended to all health professionals during the pandemic and the previous requirement that patients could only consult a provider via telemedicine if they had seen that provider in-person before was dropped, and eventually permanently removed (66). Furthermore,

several Member States such as Hungary, Latvia, Netherlands (Kingdom of the) and Switzerland also introduced policies or legislation regarding the reimbursement of telehealth initiatives. Hungary introduced payment parity between telemedicine services and equivalent in-person care (Case Example 10) (67).

Fig. 22. Percentage of Member States introducing new legislation, strategy, policy or guidance to support telehealth use during and after the COVID-19 pandemic



Case Example 10.



Telehealth regulation in Hungary

During the pandemic the Hungarian Government introduced a new set of legal provisions to promote telehealth. The Telemedicine Decree 157/2020 (IV. 29.) temporarily extended access to telemedicine to all doctor-patient and doctor-doctor activities during the pandemic emergency. The regulation enabled health-care providers to set up their own telemedicine protocols and provide telemedicine services in a regulated manner. However, it was necessary to define the legal and financial framework for telemedicine care in a long-term sustainable manner.

The decree changed the minimum conditions and funding rules allowing the provision of some telemedicine services and their public funding in primary and specialist care. According to the new decree, telemedicine services are defined as specific health services that can be provided without physical contact. Telemedicine services include, among others, scheduling appointments for diagnosis, therapeutic advice, issuance of medical admissions for further examinations, care services, prescribing medicines and provision of therapy. A new set of financial codes for telemedicine services were introduced enabling payment parity against the State Health Insurance Fund.

The new legal frameworks have resulted in an expansion of telehealth in primary and outpatient care. As a result, there was a significant increase in the number of teleconsultations during the pandemic – reaching 119 000 in January 2021 – and two years later, teleconsultations continue to play an important role in health care in Hungary.

Source: (67,68).



Evaluations of telehealth programmes

Only 37% of Member States (16 out of 43) reported that a telehealth service in their country had been evaluated, with just over half of Member States reporting that there is no evaluation of telehealth programmes. While this is an improvement on 2015 when only 22% of responding Member States (10 out of 46) reported an evaluation of telehealth programmes, there is still a long way to go.

The increased utilization of telehealth during the pandemic created opportunities to examine the impact of these services. But only seven Member States reported that they had carried out internal or external evaluation of the telehealth services

or programmes employed nationally or regionally during the COVID-19 pandemic.

The evaluation of telehealth programmes is therefore clearly still not being performed systemically, which may in turn create allocation issues as there is no evidence base to guide a funding decision – leading to inefficient resource allocation and impactful initiatives not receiving adequate funding. There is, however, a growing body of evidence showing that, when well used, telehealth services can be effective, safe, patient-centred (responsive) and cost-effective (see Case Example 11).

Case Example 11.



Evaluation of telehealth in Norway

The Norwegian practice of telehealth care aims to improve the physical and mental health of patients with a chronic condition, to improve their satisfaction with care and to reduce their use of health-care services.

The Norwegian Directorate of Health in the period 2018–2021 conducted a randomized controlled study on the use of remote care. Remote telehealth care was implemented in six locations in different parts of Norway. Patients with severe chronic diseases often need coordinated health and care services. Both general and primary health care practitioners in the municipality and local hospitals participated in the study. The evaluation shows that patients receiving telehealth/remote care feel more secure and safe, and understand and cope better with their situation, compared to the control group – patients receiving standard clinical care. Telehealth/remote care helped patients to stabilize their health condition. Patients using the service showed lower mortality rates than in the control group and used fewer homecare services than patients receiving standard clinical care. There was a slight increase in the number of consultations with GPs, mainly because of interdisciplinary meetings to establish self-care plans, while there was no change in the number of hospital admissions overall. Interviews with patients and health-care workers showed that many patients underwent fewer hospital admissions and GP visits than prior to their use of telehealth. The research group concluded that telehealth can help provide cost-effective and sustainable health-care services, if it is provided to those who benefit the most and costs are contained.

Source: (69).



Barriers to implementing telehealth initiatives

Member States were asked to rate potential barriers to successfully implementing telehealth services or programmes in their Member States. The ratings were on a five-point scale from “Not a barrier”, through “Slightly important barrier”, “Moderately important barrier”, “Very important barrier” to “Extremely important barrier”. As shown in Fig. 23, combining Member States that rated a barrier as either moderately, very or extremely important, funding was rated as the most important barrier by 77% of Member States (39 out of 51) followed by capacity and human resources (69%; 35 out of 51) and infrastructure (59%; 30 out of 51). Legal, effectiveness, demand and policy barriers were less frequently noted.

Subregional analysis of responses shows that funding to develop and support telehealth initiatives was considered an extremely important barrier by Member States in central Asia, western Asian and northern Europe (see Table 9), with capacity and human resources as the next most important barrier. Infrastructure remains an extremely important barrier in central and western Asia.

In the 2015 survey, the four main barriers were lack of funding (30 Member States) followed by competing health systems priorities (19 Member States), lack of legal regulations or legislation on telehealth programmes (18 Member States) and the lack of equipment or connectivity for a suitable infrastructure (16 Member States).

Fig. 23. Barriers to implementing telehealth initiatives

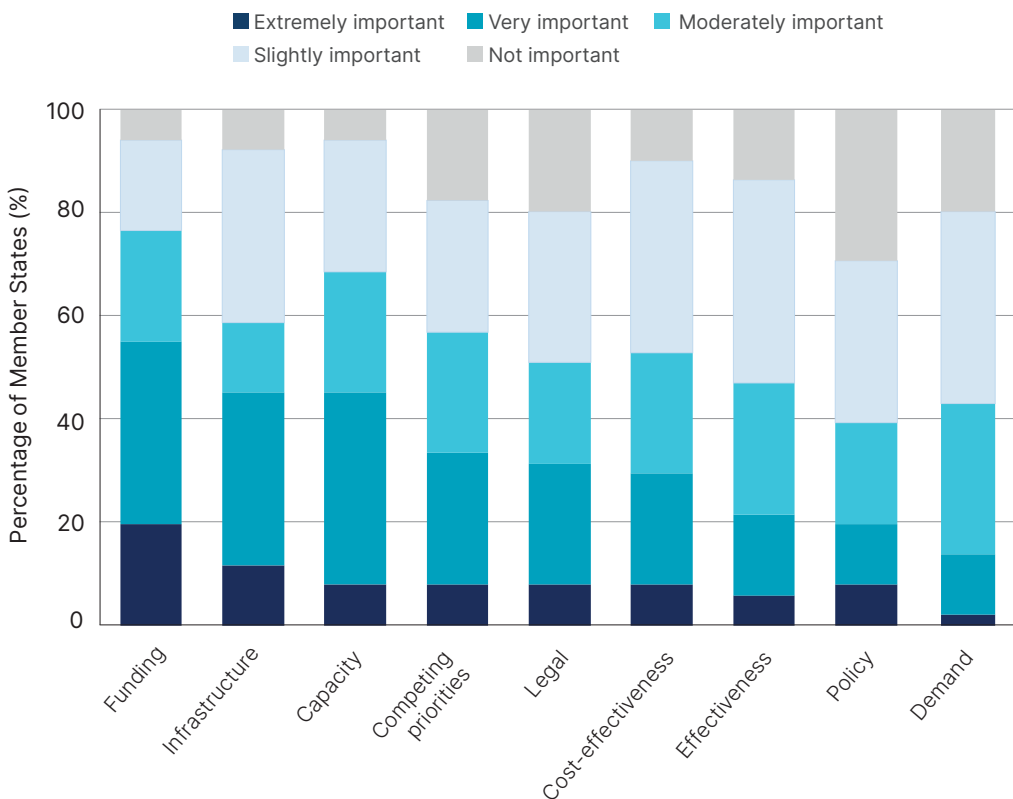
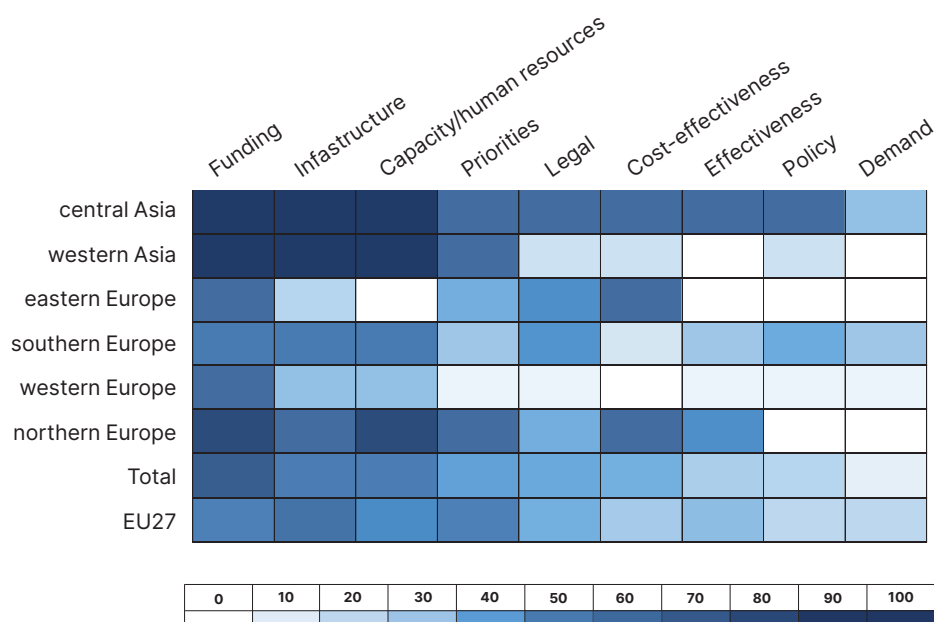


Table 9. Barriers to implementing telehealth initiatives by subregion



Summary

There has been a notable shift in the landscape of telehealth services since 2015, with an increased number of Member States establishing such initiatives. The COVID-19 pandemic significantly expedited this growth, propelling numerous telehealth pilot projects into broader implementation phases. This expansion aligns with previously reported special funding allocations to extend telehealth services during the pandemic.

Teleradiology, prevalent since 2009, remains the most established telehealth service. However, the pandemic has particularly boosted telemedicine, with 26% of Member States (9 out of 35) introducing these services during the crisis and

60% (21 out of 35) reporting improvements in their existing telemedicine services due to the pandemic.

The pandemic has also catalyzed changes in the legislative and regulatory landscape for telehealth. In all, 59% of Member States (30 out of 51) issued new legislation, strategy, policy or guidance to support telehealth. However, the scope of these regulatory and policy changes varies greatly, with persisting disparities in the organization, regulation and financing of remote care across the Region.

Despite its potential, telehealth's role in extending services and enhancing accessibility and UHC

still requires thorough strategy planning and evaluation. A promising 78% of Member States (40 out of 51) reported having either a national telehealth strategy or incorporating telehealth into a broader national DHS, marking an increase from 62% in 2015.

The pandemic-induced increase in telehealth utilization provides an opportunity to study the impact of these services. Yet, only seven Member States reported evaluating any telehealth service or programme used during the pandemic. While 37% of Member States (16 out of 43) reported evaluating a telehealth service generally, over

half of Member States reported no evaluation of telehealth programmes. This indicates a need for greater focus on this area, despite the rise in telehealth adoption.

Despite progress, barriers remain, the most significant being the lack of funding for the development and support of telehealth programmes. This was identified by 77% of Member States (39 out of 51) as the primary barrier, with other barriers including capacity, human resources and infrastructure – indicating that further concerted efforts are needed for the effective deployment of telehealth technologies.



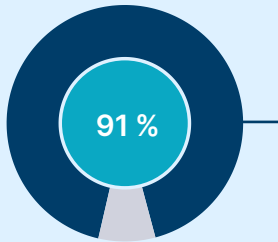
Considerations

- ▶ To ensure that telehealth is integrated effectively into the health-care system, Member States should have clear telehealth policies and strategies in place. These policies should define the role of telehealth in health-care service delivery and outline and promote different modes of collaboration between health and social sectors to address different health-care needs.
- ▶ Systematic monitoring and evaluation are essential to inform policy and practice. Without evaluation, it is not possible to determine whether telehealth services are contributing to achieving national health-related objectives and to demonstrate benefits for patients in access and outcomes.
- ▶ Member States should consider prioritizing telehealth funding and reimbursement in order to strengthen and sustain their national telehealth initiatives. In addition, analyzing telehealth's effectiveness and cost-effectiveness can foster collaboration between public and private entities, ultimately leading to more collaborative networks for telehealth delivery.
- ▶ Clearly defined capacity-building strategies and intersectoral collaboration for telehealth services are also seen as important elements which need more attention.



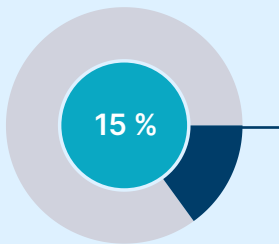
Part 4 : health in your hands – mHealth and mApps

Data highlights: key insights from survey responses



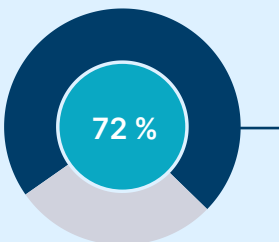
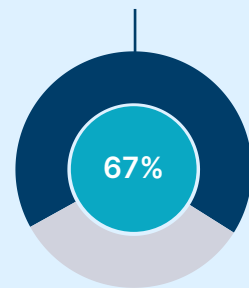
91% of Member States (38 out of 42) reported having at least one government-sponsored mHealth programme.

The COVID-19 pandemic had a significant positive impact on the introduction and improvement of existing mHealth services.



Only 15% of the responding Member States (six out of 39) reported the evaluation of government-sponsored mHealth programmes.

67% of Member States (31 out of 46) have established mHealth services providing access to an EHR.



72% of Member States (34 out of 47) reported not having an entity that is responsible for the regulatory oversight of mApps for quality, safety and reliability.



mHealth is the use of mobile devices, such as mobile phones, patient monitoring devices and wireless devices, for medical and public health practice. mHealth offers several advantages over traditional methods of health-care provision by allowing for convenient, real-time and portable access to information and services. mHealth facilitates patients' engagement in their own health care, allows for better coordination of care and is a key enabler for the provision of remote care services and health promotion.

The COVID-19 pandemic brought significant changes to the mHealth landscape – face-to-face contact between health workers and patients was impacted and accompanied by a significant shift to virtual remote consultations and monitoring in the form of telehealth and telemedicine as discussed in the previous chapter. Much of this was mediated through mHealth. At the same time, government focus turned to the public health challenges of the pandemic including the need to prioritize and rapidly set up nation-wide services for COVID-19 testing and vaccination, introduce contact tracing to contain the spread of the disease and monitor quarantine measures and isolation, amongst other things. Along with

this primary focus that occupied governments for much of 2020 and 2021, came the secondary effects of the pandemic, namely a growth in the prevalence of mental health conditions which was estimated by WHO to have increased by 25% in the first year of the pandemic (70).

mApps delivered by governments during the pandemic focused on providing information on COVID-19, information and appointment booking for testing, information about vaccination programmes, booking of appointments and the display of a certificate of vaccination status. Examples are the Salut application (app) developed by the Andorra Digital Agency, a part of the Andorran Health Care Service (Case Example 12) and Slovenia's *Zdravje vse na enem mestu* (zVEM) [All health matters in one place] app (Case Example 13) (71).

Many other non-COVID-19 related mhealth projects or initiatives were put on hold during the pandemic as health services struggled to deal with COVID-19 amongst patients and staff themselves. This makes interpretation of trends in health projects, including mHealth, since 2015, complicated.

Case Example 12.



Andorra's Salut app

In 2021, in response to the COVID-19 pandemic, the Andorra Digital Agency developed the Salut app. The app provided a summary of patient health records which included:

- ▶ details of COVID-19 vaccination status and a digital certificate, and allowed users to book vaccinations and COVID-19 tests;
- ▶ appointments with professionals or medical services with reminders to attend;
- ▶ laboratory test results;
- ▶ medical reports including hospital and emergency department discharge summaries; and
- ▶ medical prescriptions.

The functionality of the app will be further extended to include radiological images and results and teleconsultations with health-care professionals via video. Since its launch in July 2021, the number of users has ranged from 13 414 people in the first month to around 3000 last September. The target usage is 7000 monthly active users.

Case Example 13.



Slovenia's zVEM mApp

In 2021, the Slovenian Government released the zVEM mApp. This app provided a mobile-based interface to the national zVEM patient portal, developed in 2016. In addition to accessing the features of the patient portal, such as ePrescriptions, electronic referrals and medical documents, the zVEM app also provided a digital COVID-19 certificate. By July 2022, the app had been downloaded by 1 million users and activated and used by more than 250 000 users – approximately 12% of the total population.

Source: (69,70).



Results of the survey

Most common types of mHealth services

The three most supported mHealth services reported by Member States in 2022 were mobile teleconsultations, available in 81% of Member States (35 out of 43); the provision of appointment reminders, available in 80% of Member States (36 out of 45); and access to electronic patient information (held in EHRs), available in 76% of Member States (35 out of 46) (Fig. 24).

In Member States that provided mHealth-based appointment reminders, 23 had government support for these programmes. Mobile teleconsultations were supported by the government in 22 of the responding Member States and access to patient information in 30 of the responding Member States.

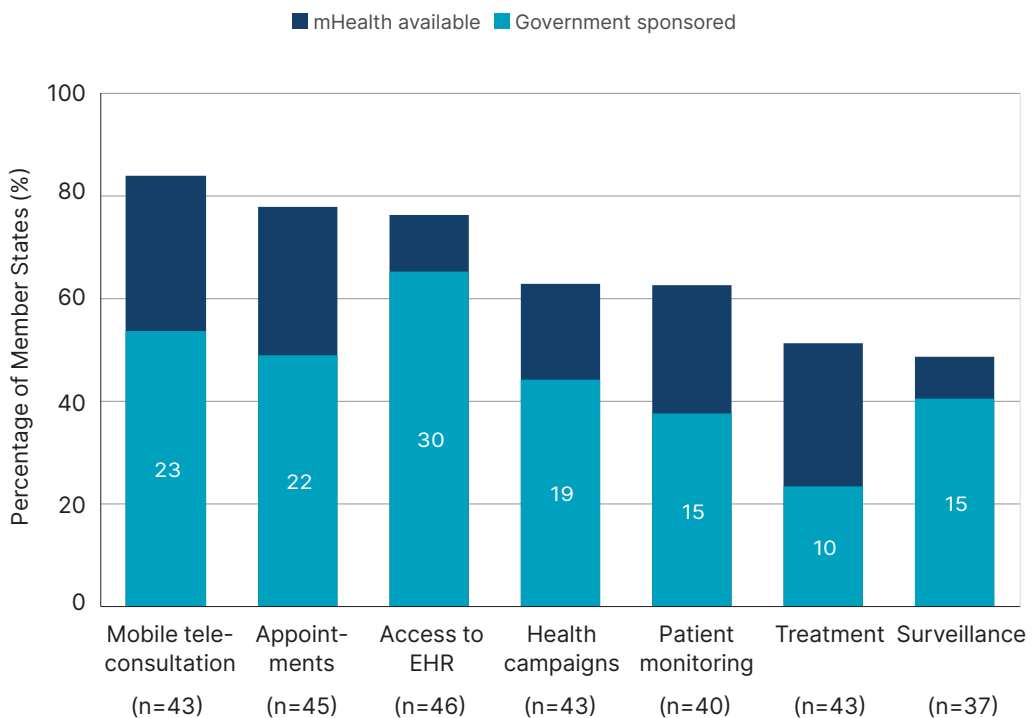
Treatment adherence

Fifty-one per cent of Member States (22 out of 43) reported that treatment adherence services were being offered. These were defined as reminder messages, which could be text, voice or multimedia, provided to patients aimed at achieving medication adherence. These services were government sponsored in 46% of Member States (10 out of 22).

Health promotion

Health promotion, community mobilization and risk communication through mobile devices were offered in 63% of Member States (27 out of 43). These services were sponsored by governments in 70% of Member States (19 out of 27).

Fig. 24. Most common types of mHealth programmes and services for health care



Patient monitoring

Patient monitoring, which involves data capture and transmission for monitoring a variety of conditions in a range of settings using a mobile device is available in 63% of Member States (25 out of 40) and is government sponsored in 60% of these Member States (15 out of 25).

Surveillance

Finally, surveillance, which is defined in this case as the routine or emergency and targeted data collection, management and reporting for public health surveillance using mobile devices, was available in 49% of Member States (18 out of 37) and was government sponsored in 83% of Member States (15 out of 18).

At least one type of government sponsored mHealth service was available in 91% of Member States surveyed (38 out of 42) in 2022, compared with 49% of Member States (22 of 45) reporting a government-sponsored mHealth programme in their country in 2015.

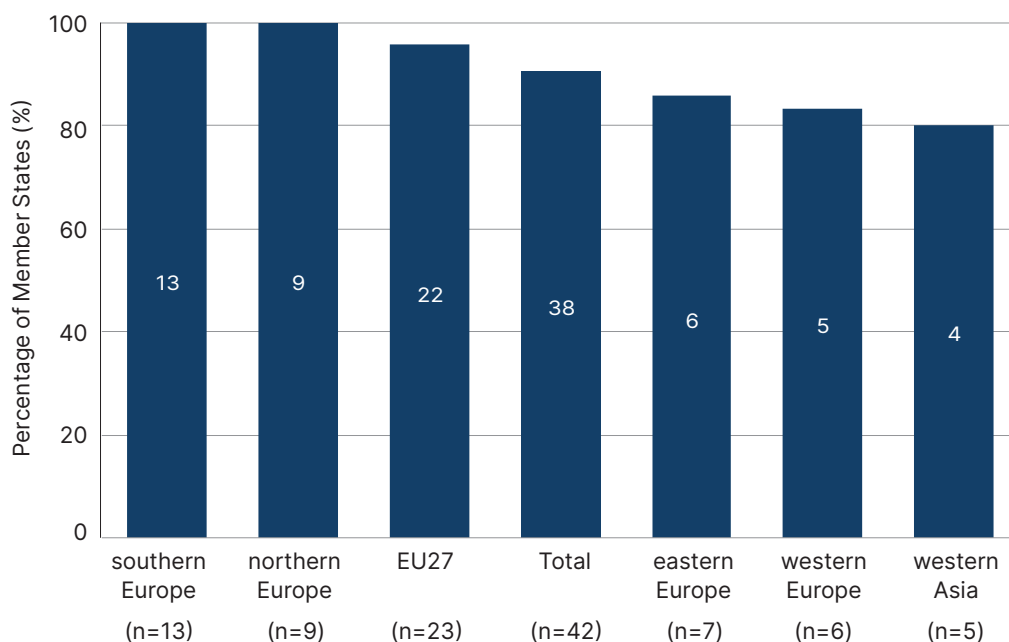
mHealth in the different geographical subregions

In northern and southern Europe, governments of all Member States provided at least one mHealth service; whereas in western and eastern Europe and western Asia governments of between 80–86% of Member States provided at least one mHealth service (Fig. 25).

Maturity of mHealth services

Member States were asked to assess the level of maturity of the mHealth service offered in their country. The possible levels of maturity were informal, pilot or established. An informal project was one where it involved an early adoption for health purposes and was not associated with any formal process or policy. A pilot phase was understood to mean that the services were being offered in a limited fashion to a restricted target audience for testing and evaluation. An established service was one in which the service was ongoing or the programme had been operational for a minimum of two years and the intention was to continue the funding and support for at least another two years.

Fig. 25. Percentage of Member States that reported at least one government sponsored mHealth project by subregion



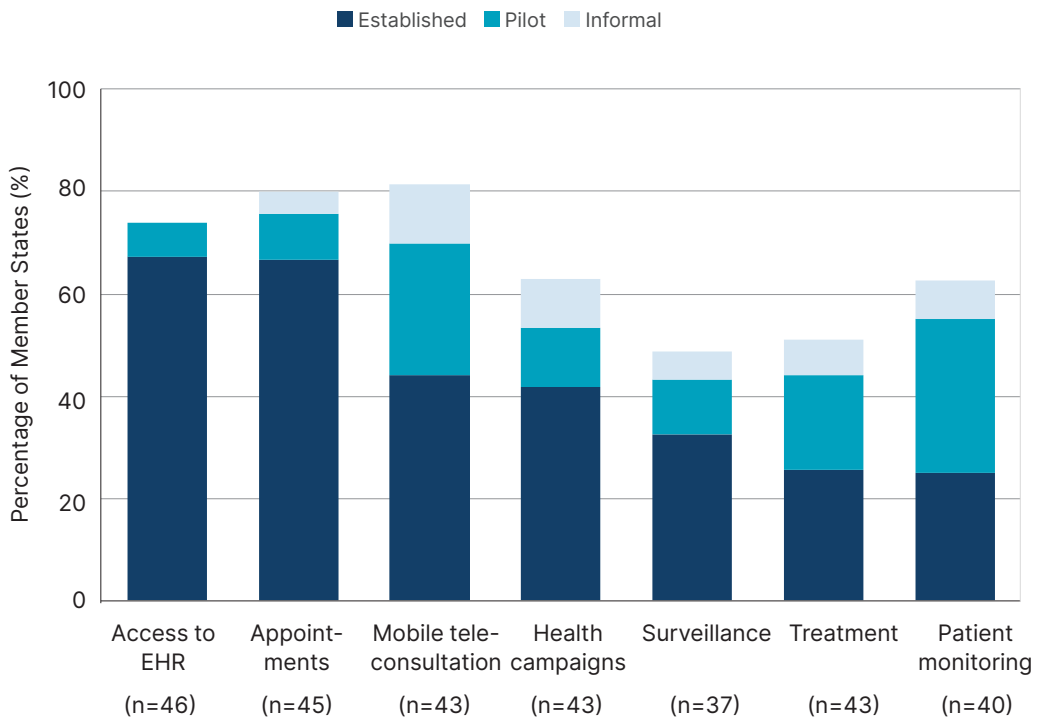
Note: central Asia is not included in the figure as only one Member State replied to this question.

Fig. 26 shows the maturity of mHealth projects by their different types. In all categories other than patient monitoring, the majority of Member States reported services that were established. The two categories of projects with the largest number of Member States with established programmes were mApps offering access to EHR information and mApps providing access to appointments and appointment reminders. In all, 67% of Member States (31 out of 46) had established programmes offering access to EHR information, with a further 7% of Member States (three out of 46) running pilot or informal programmes. Similarly, 67% of Member States (30 out of 45) had established projects to provide appointment details and reminders, with a further 13% of Member States (six out of 45) having pilot or informal programmes. mHealth programmes offering mobile teleconsultation and providing information on health campaigns were the next

most prevalent types of service with established programmes, followed by a third group of mHealth projects providing patient surveillance, patient treatment information and patient monitoring.

As a percentage of the number of projects, the 2022 survey showed a greater proportion of established projects (as a total of all projects) compared to the 2015 survey: in the case of appointment reminders, 74% of Member States (34 out of 46) in 2015 reported having mHealth programmes to remind patients about appointments. Out of 34 appointment reminder services only 18 operate as established programmes with another eight operating as informal and seven as pilot services. Furthermore, 53% of the total number of mHealth projects were labelled as established in 2015 compared to 83% (30 out of 36) in 2022.

Fig. 26. Maturity of mHealth project by type

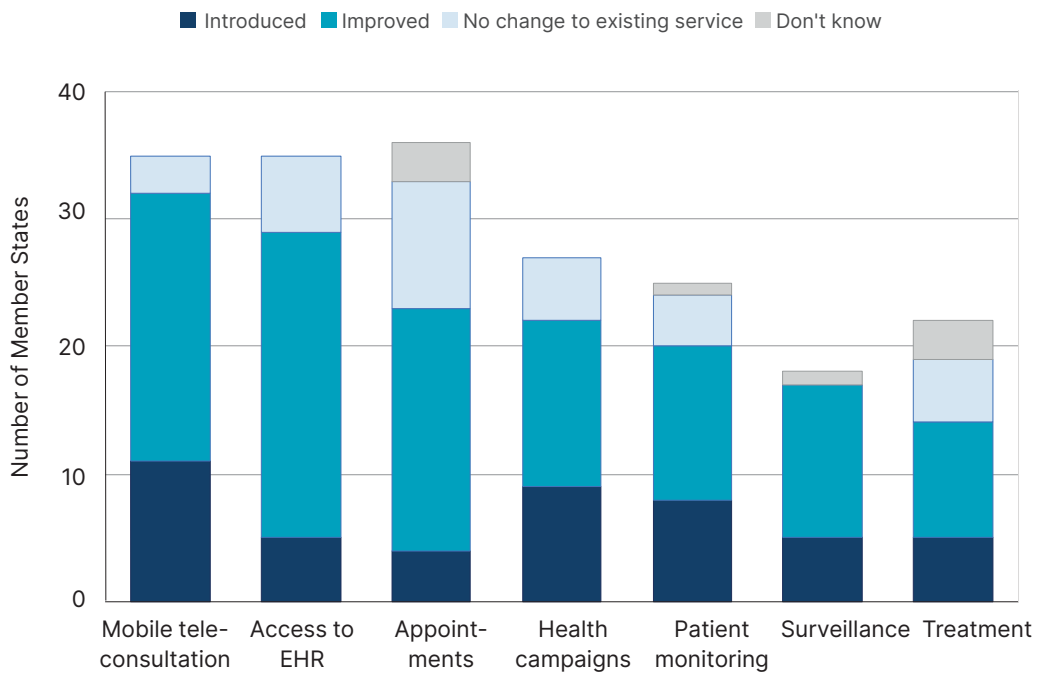


Access to EHR via a mobile app was reported as established for 53% of all projects in 2015 compared to 91% of the total number of projects (31 out of 34) in 2022. However, it must be again noted that there were some differences in the structure of the two surveys (see methodology section).

Member States were also asked whether any of seven identified types of mHealth services

had been introduced or improved during the pandemic (Fig. 27). The overwhelming trend was for services to have improved as a result of the COVID-19 pandemic, with 63% of Member States (29 out of 46) having introduced or improved mHealth services to allow patients to access EHRs; 74% (32 out of 43) to support teleconsultations; and 51% (23 out of 45) to support appointment reminders.

Fig. 27. mHealth projects introduced or improved during the COVID-19 pandemic by type



Notes: "Do not know" responses are included in both numerators and denominators; denominators consist of the number of Member States where the services were implemented.

mApps

Twenty-eight per cent of Member States (13 out of 47) reported that there is an entity in their country responsible for regulatory oversight and evaluation of mApps for quality, clinical utility and reliability and 53% of Member States (25 out of 47) reported that there is an entity that provides incentives and guidance for the innovation, research and evaluation of health apps (reported by subregion in Fig. 28). Almost all Member States in western Asia and western Europe report that this type of support is available, with between 33–50% of Member States reporting support in other subregions.

When asked whether their government had sponsored mApps for health-related services, 45% of Member States (21 out of 47) reported that their government had introduced apps that promote healthy behaviours as part of a public health promotion campaign; 26% (12 out of 47 Member States) apps that made general public health announcements; 30% (14 out of 47)

apps that made emergency announcements; and 15% (seven out of 47) apps that allowed the public to provide feedback on health-care services (Fig. 29).

mApps introduced during the COVID-19 pandemic

The COVID-19 pandemic saw Member States rushing to introduce programmes to manage the spread and outcomes of the infection. This initially involved allowing health authorities and the public to test, track and trace infections and manage any isolation or quarantine requirements – being alerted to infectious close contacts and then allowing for members of the public to take a polymerase chain reaction test at government-sponsored facilities and be notified of the results. As COVID-19 vaccinations became available, the ability to book vaccinations and then display the vaccination status became an important feature.

Fig. 28. Incentives and guidance for innovation and research on mApps by subregion

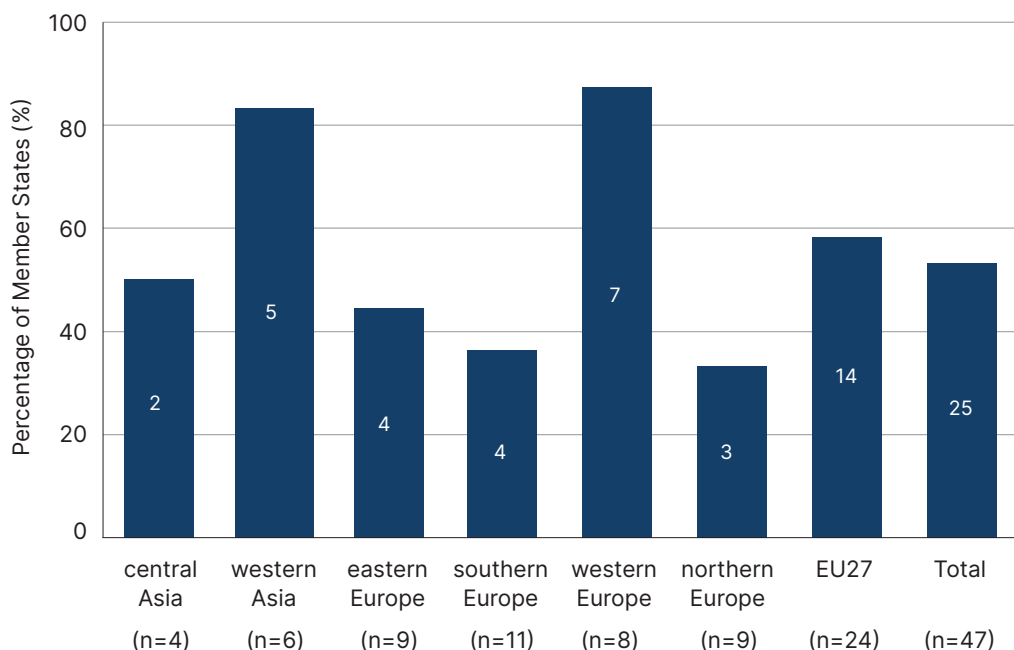
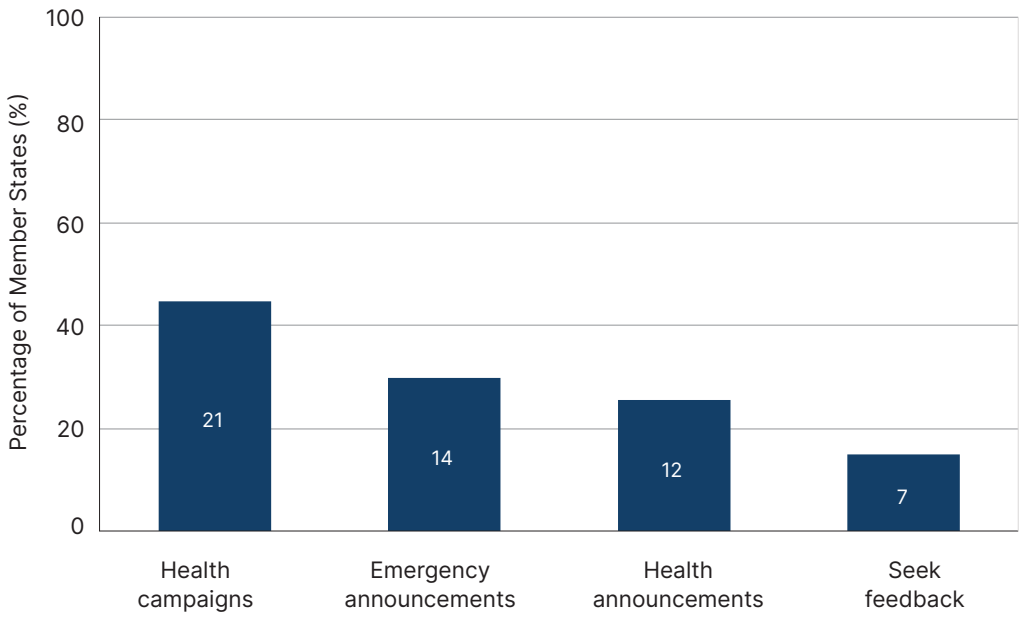


Fig. 29. Government sponsorship of mApps for health-related services

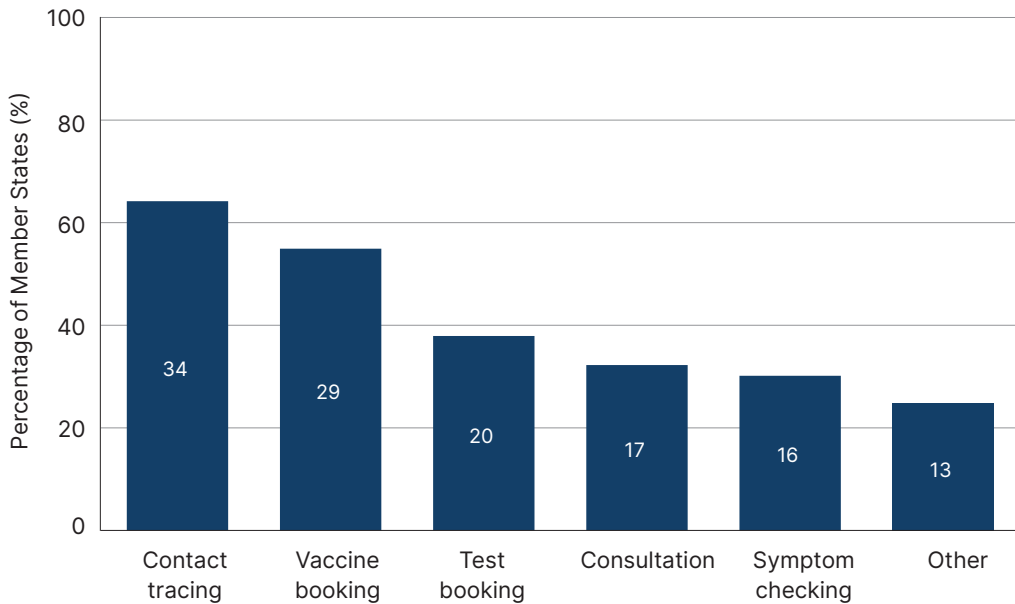


Travel between Member States became contingent on being able to show a valid COVID-19 vaccination status and the EU introduced the EU Digital COVID Certificate. mApps became the ideal means of handling all of these functionalities and many Member States implemented apps that handled some or all of these requirements and the 2022 survey confirmed this.

Member States were asked if they had introduced mApps for COVID-19 health-related services. As indicated in Fig. 30 below, 64% of Member States (34 out of 53) had introduced apps to carry out contact-tracing or proximity tracing functionality

(so-called Track/Trace apps); 55% (29 out of 53) to provide a means of obtaining vaccinations for COVID-19; 38% (20 out of 53) to facilitate COVID-19 testing; 32% (17 out of 53) to book appointments with a primary care provider; 30% (16 out of 53) to check COVID-19 symptoms; and 25% (13 out of 53) reported that they had provided apps that performed other functions. In this other category, Member States reported having provided a means of displaying the European Digital Covid Certificate and managing travel passes where this was restricted based on vaccination status.

Fig. 30. Types of mApps introduced for COVID-19 health-related services



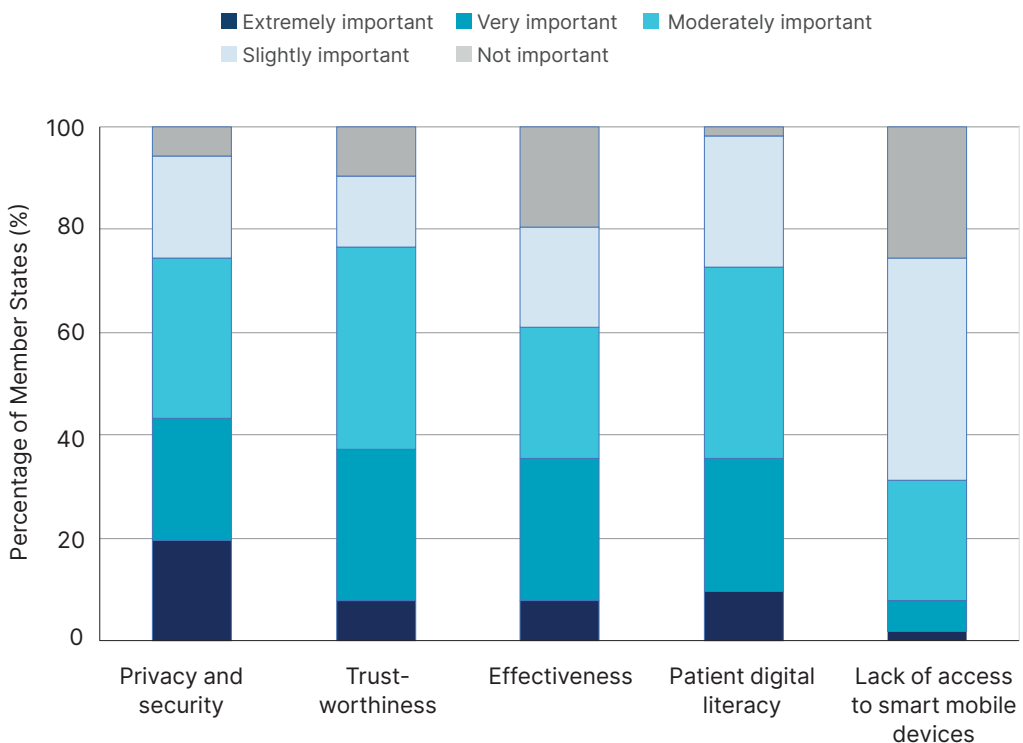


Barriers to health mApp integration into clinical practice

Member States were asked to rate potential barriers to integrating health apps into clinical practice. The ratings were on a five-point scale from “Not a barrier”, through “Slightly important barrier”, “Moderately important barrier”, “Very important barrier” to “Extremely important barrier”. Summing Member States that rated a barrier as either moderately important, very important or extremely important, 75% of Member States (38 out of 51) rated privacy and security as a significant barrier (Fig. 31). Privacy and security relate to the need for appropriate oversight to

ensure that patient data is not misused or abused. During the COVID-19 pandemic, the mechanisms by which the population was surveilled for infections and tracking possible contacts raised significant privacy concerns. Furthermore, 77% of Member States (39 out of 51) rated the lack of a trustworthy source to access effective apps as being a significant barrier; 73% (37 out of 51) a lack of patient digital literacy; and 61% (31 out of 51) rated the lack of evidence on the effectiveness of the apps in clinical practice as a barrier.

Fig. 31. Most important barriers to mApp integration into clinical practice



Subregional analysis shows that privacy and security as well as trustworthiness were considered an extremely important barrier particularly by Member States in northern Europe, where the lack of evidence on the effectiveness of the apps in clinical practice was also seen as a very important barrier (Table 10). A lack of patient digital literacy was a particularly important barrier in central and western Asia (Table 10). Only 31% of Member States (16 out of 51) rated the lack of access to smart mobile devices as a barrier.

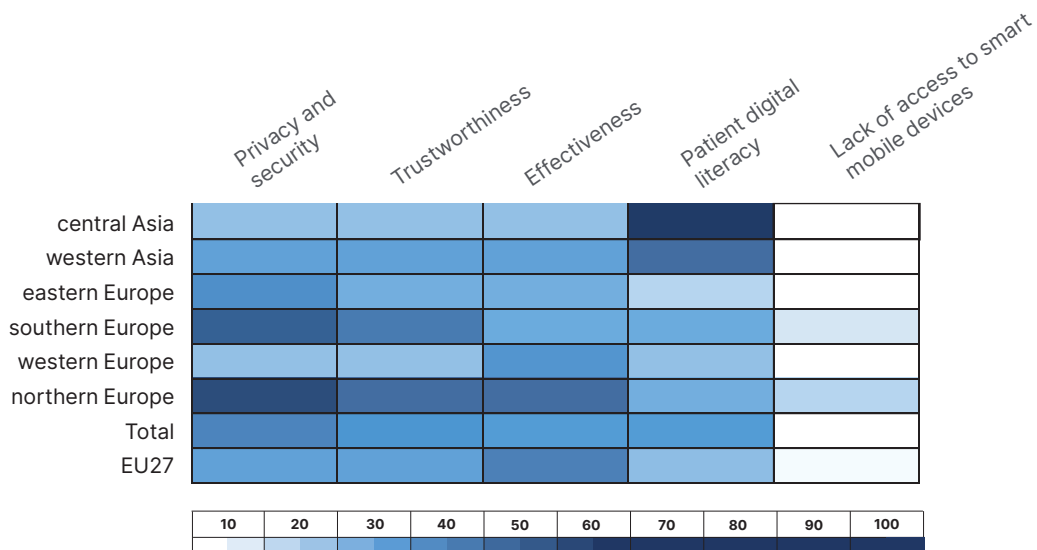
Evaluation of mHealth and mApps

Evaluation of mHealth

Only 15% of Member States (six out of 39) reported that they had evaluated any mHealth service or programme, although 25% of Member States (13 out of 52) responded that they did not know if any service had been evaluated. This makes interpreting these results somewhat

difficult. Of those Member States that responded yes, only three provided further details regarding the evaluation criteria. Belgium referred to its “Validation Pyramid” scheme (73), which deals with mApps that are CE certified medical devices. CE certification is considered level 1 of the validation pyramid, with Level 2 involving the app being “safely connected”, allowing a patient to share health data with a health-care professional, and Level 3 involving having validated the apps full socioeconomic value and obtained financing by the Belgian National Institute of Health and Disability Insurance. Spain referenced the AppSaludable quality seal that is run by the Andalucian regional government and provides a standardized assessment of mApps (74). Tajikistan reported that an mApp related to the National Program to combat HIV/AIDS (2021–2025) was evaluated by the State Institution Centre for Prevention and Control of AIDS.

Table 10. Barriers to mApp integration into clinical practice by subregion

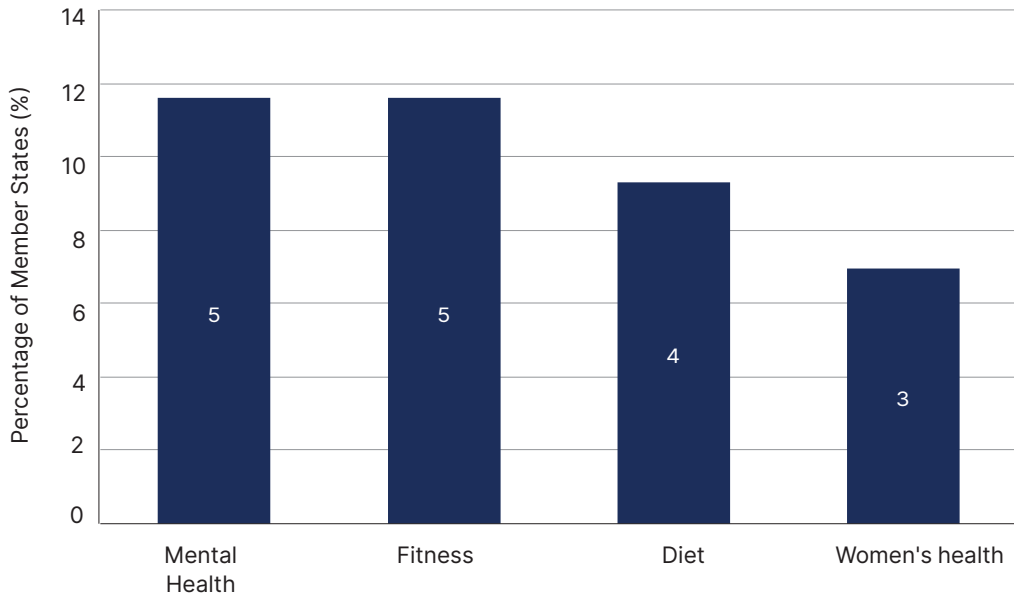


Evaluation of mApps

A small number of Member States reported that they evaluated and approved mApps that helped manage the following conditions: mindfulness and mental health (12% of Member States; five

out of 43); diet and nutrition (9% of Member States; 4 out of 43); exercise and fitness (12% of Member States (5 out of 43); and women's health (7% of Member States (3 out of 43) (Fig. 32).

Fig. 32. Types of mApps evaluated and approved (n=43)



Summary

In the realm of medical and public health practice, the vital role of mHealth has emerged. Its significance, firmly established in recent years, was dramatically highlighted during the challenging era of the COVID-19 pandemic.

Governments across the Region played a central role in mHealth's ascent, with 38 Member States unveiling government-backed mHealth programmes. This governmental commitment has borne fruit in the form of an increasingly mature mHealth ecosystem. Indeed, 67% of Member States (31 out of 46) reported mHealth services that provide access to an NEHR at a mature level.

The COVID-19 pandemic, however, truly underlined mHealth's potential. As nations raced against time to test, track and trace infections and manage isolation or quarantine requirements, mHealth stepped up. From Bluetooth-enabled contact detection to the humble yet effective QR code, smartphones became essential tools in the hands of citizens. As vaccines rolled out, apps to book vaccinations and display official vaccination status became the new passports for public venues and travel.

But as with any rising star, mHealth still faces some challenges. Despite active governmental

involvement, gaps persist in the overall policy and strategic approach to mHealth. A surprising 72% of Member States (34 out of 47) lack a dedicated entity responsible for regulatory oversight of mApps in terms of quality, safety and reliability. Furthermore, only 15% of Member States (six out of 39) have reported the evaluation of government-sponsored mHealth programmes.

This lack of regulatory oversight and evaluation could explain some of the hurdles mHealth must overcome: privacy and security concerns were consistently flagged as a significant barrier, particularly relevant during the pandemic when

surveillance measures raised public concern. A lack of a trustworthy source for effective apps and the dearth of evidence on the apps' effectiveness in clinical practice were also cited as challenges.

As the technological potential unfolds, we witness mobile devices and wearables (e.g. smart watches) becoming increasingly sophisticated in their medical and public health capabilities. The spotlight now turns to the governments to match this pace, and equip themselves with suitable policies and oversight mechanisms.



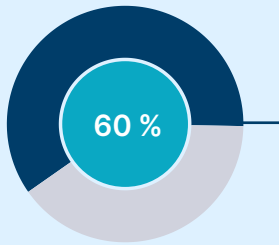
Considerations

- ▶ Member States should consider establishing entities for mApp regulation and oversight to provide guidelines on ownership, security and privacy while ensuring the mHealth solutions' quality, safety and reliability. This is especially important with the growth of digital therapeutics and digital care app.
- ▶ The evaluation of mHealth programmes and apps should become the norm rather than the exception. National health authorities and the health researchers community should collaborate to establish a common methodology to evaluate mHealth programmes, particularly for government-sponsored initiatives. The evaluations should consider aspects such as usability, functionality and meaningfulness of mHealth solutions to their intended users. The evidence generated from these evaluations should inform investment and implementation decisions for these solutions.
- ▶ Policy and strategies are needed to support the regulatory environment. National mHealth policies, strategies and regulations should be in line with international policies and regulations to facilitate continuity in the uptake of mHealth and to aid the development of cross-border programmes.
- ▶ The importance of mHealth should continue to be emphasized as it can play a central role in the coordination of care, and facilitates telehealth, access and control of NEHRs, as well as serving as a platform for the interface between a patient and advanced AI-driven analytic support. Therefore, Member states should have national entities to promote training of health professionals, as well as of patients and citizens, in order to foster the beneficial use of mHealth solutions.



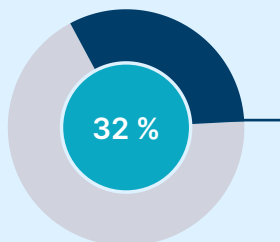
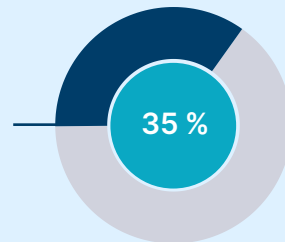
Part 5: the power of knowledge – big data and advanced analytics for health

Data highlights: key insights from survey responses



60% of Member States (30 out of 50) report having developed an overarching national data strategy regulating the use of big data and advanced analytics in the health sector.

35% of Member States (17 out of 48) stated that they had a national policy on the use of big data and advanced analytics in the health sector.



32% of Member States (13 out of 41) have a national policy or strategy regulating the use of big data by private companies.



Background

In recent years there has been tremendous growth in the range of health-related data being collected and analysed, including clinical, genetic, behavioural and environmental data. This remarkable expansion of digital health data has largely been driven by the great reductions in data storage cost and the development of new powerful advanced analytics. In particular, cloud computing has played a significant role in increasing the capacity to store and analyse data. Analysis of big data is already proving critical in building accurate models of disease progression and providing personalized medicine in clinical practice.

Health-care systems generate a massive amount of data about an individual's health status and interactions with the health-care system itself. At the same time, there is increasing information relating to an individual's genome and phenome and other data that is collected by a wide range of software and devices, including EHRs, high resolution medical imaging, ubiquitous sensing devices (biosensors in wearable devices) and smartphone app that monitor patient health. This data can be used to personalize care for individuals and can also be aggregated at the population level and then linked to other data that has a bearing on health, such as education, employment, and environmental data.

Drawing information from the massive amounts and variety of health data – and other related

data that is generated about individuals and populations – (referred to as health big data) requires specific analytical techniques. Through the application of AI algorithms and machine learning, big data analytics has potential to revolutionize health care, supporting clinicians, providers and policy-makers in planning or implementing interventions, faster disease detection, therapeutic decision support, outcome prediction and increased personalized medicine – resulting in lower-cost, higher-quality care with better outcomes.

In a recent systematic review of the literature, researchers showed that big data analytics had a moderate to high accuracy for the diagnosis of diabetes mellitus (and its complications), melanomas, mental diseases and other chronic diseases (75). A second review (76) showed that AI was being used for disease modelling, diagnosis and prediction of disease in three domains of the WHO Thirteenth General Programme of Work (77), namely UHC, health emergencies protection, and better health and well-being.

Despite increasing awareness of the benefits of big data and the related methodological and technological advances that are being made, many Member States appear to be slow in adopting approaches based on such data and AI.



Big data, analytics and COVID-19

During the COVID-19 pandemic, the health systems of Member States were put under extreme stress. The use of big data sources and advanced analytics became a vital tool in effectively containing the spread of the disease, in the research for common pathological mechanism and in the testing of new vaccines and therapies, as well as for evidence-based policies. Machine learning techniques were applied to predictive analyses to determine patients most at risk of mortality and the most effective apportioning of scarce resources such as intensive care unit beds

and ventilators. Predictive models for estimating case numbers at the population level were critical in allowing the preparation of resources and determining what other activities could be accommodated at the same time. These models were also used by public health officials to determine policy around preventative measures such as limiting social gatherings and wearing masks. An illustration of such applications is reported in Case Example 14.

Case Example 14.



COVID-19 influence on AI and data use in the NHS in the United Kingdom

As the COVID-19 pandemic progressed, data on the disease was in great demand. The NHS AI Lab established the National Covid Chest Imaging Database (NCCID), a centralized database in the United Kingdom which made available more than 81 000 pseudonymised computerized tomography (CT) and magnetic resonance imaging scans and x-rays of patients suspected of having COVID-19 to researchers, clinicians and AI developers in order to develop and test new algorithms to help clinicians find treatments for the disease.

Data sets from the NCCID were used to create a blueprint validation process for COVID-19 AI algorithms, setting a standard for testing and evaluating AI-based technologies.

Five AI models were then put through statistical tests using a validation data set (data not previously used for training the model) to calculate each model's performance and understand any biases in the results. The process assessed the robustness of the algorithm by looking at how it performed in response to changes in the data, like the inclusion of patients with additional medical conditions, or using images taken using different scanning equipment.

Cambridge University Hospitals Trust has been using NCCID data to try to understand why spontaneous pneumothorax is more common in COVID-19 patients than those without. By running AI to detect pneumothorax over the images, they have identified cases of pneumothorax in COVID-19 patients and are still analysing CT scans to see if there is any common pathological mechanism.

The NCCID demonstrated how AI can assist researchers, as well as the benefits of collecting chest imaging data. It is still in use today and the Royal Surrey NHS Foundation Trust's Secure Medical-image Anonymisation Receiver for Trials (SMART) box, which automates the process of collecting medical images and de-identifying/anonymizing them at the trust, uploads these to the NCCID.

The NHS AI Lab will continue to increase hospital contributions to the NCCID to create as large a database as possible, which will provide better quality research and trials to help continue to treat COVID-19 as well as any future diseases.

Source: (78).



National data strategies and policies on big data for health

Member States were asked to provide information on the existence of an overarching national data strategy and of national policies addressing big data and advanced analytics. The survey also asked about regulation of the use of big data.

Sixty per cent of Member States (30 out of 50) reported having a national data strategy (NDS) and 35% (17 out of 48) stated that they had a national policy on the use of big data and advanced analytics in the health sector health data strategy – compared to only 13% of Member States (six out of 46) reporting that they had a policy of this sort in 2015.

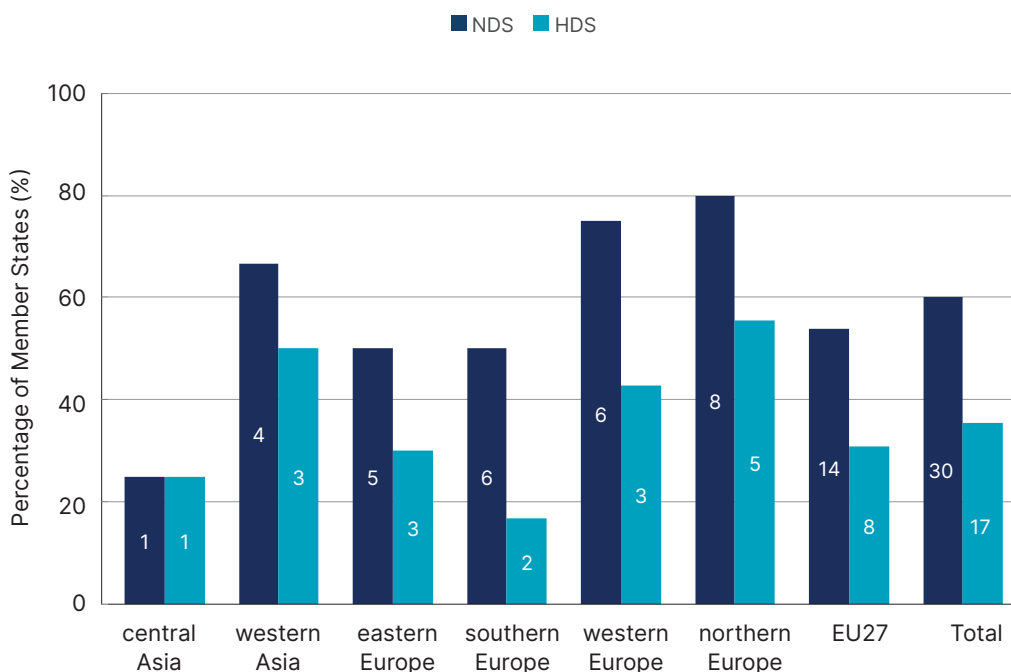
Thirty-eight per cent of Member States (19 out of 50) report not having developed either an

NDS or health data strategy, with subregional analysis showing that these Member States are concentrated in three subregions: southern Europe (50%; six out of 12), eastern Europe (50%; five out of ten) and central Asia (75%; three out of four) (Fig. 33).

Several Member States have also developed white papers and roadmaps around the use of big data and AI, often targeting a sector, a policy domain or a technology (see Case Example 15).

Thirty-two percent of Member States (13 out of 41) also had a national policy that regulated the use of big data by private companies. This is up from 2015 where only 9% of Member States (four out of 46) reported having such a policy.

Fig. 33. Share of Member States that report an NDS or health data strategy



Note: HDS: health data strategy.

35% of Member States have a national policy or strategy regulating the use of big data and advanced analytics in the health sector and 32% have a national policy or strategy regulating the use of big data by private companies.

Case Example 15.



Case Example 15. Digital, AI and robotic technologies in education – AI Roadmap in the United Kingdom

A key recommendation from the Topol Review suggested that “the NHS should create or increase the number of clinician, scientist, technologist and knowledge specialist posts with dedicated, accredited time, with the opportunity of working in partnership with academia and/or the health tech industry to design, implement and use digital, AI and robotic technologies”.

Working with Unity Insights, Health Education England published the AI Roadmap and interactive dashboard in January 2021, which identified 240 United Kingdom-based AI and data-driven technologies in the NHS, together with the workforce impact and educational needs. The distribution of the technology types identified in order of their relative representation in the database were:

- ▶ diagnostic (34% of technologies);
- ▶ automation/Service efficiency (29% of technologies);
- ▶ P4 (predictive, personalized, preventive and participative) Medicine (17% of technologies); and
- ▶ remote monitoring (14% of technologies).

Source: (79–81).



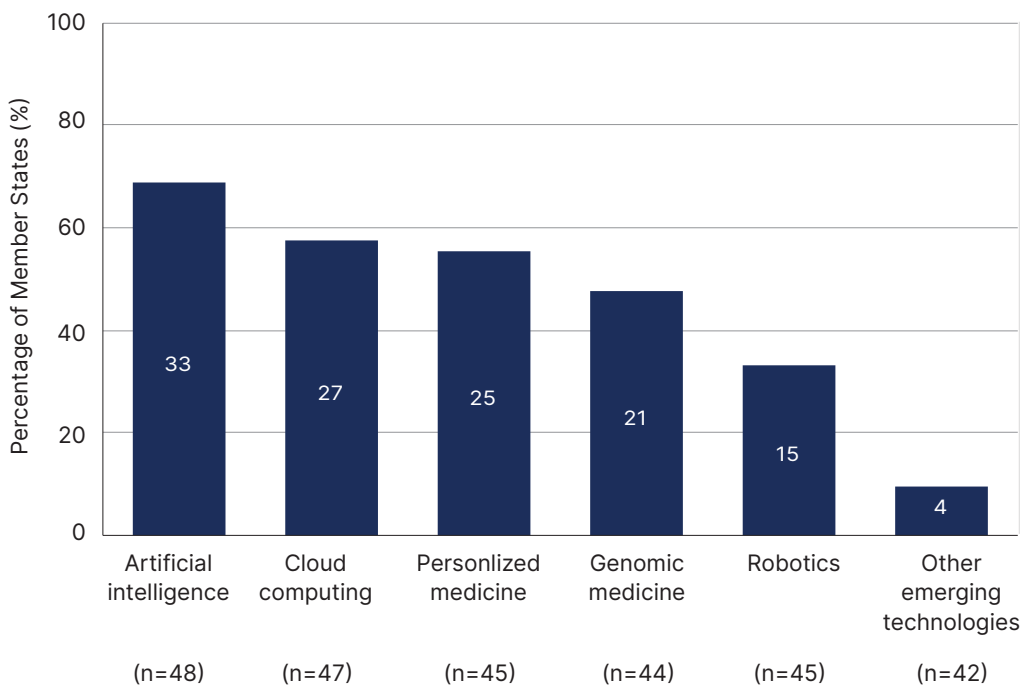
Services, tools and apps to facilitate use

The use of big data and advanced analytics is only made possible by the availability of infrastructure, services, tools and apps, especially cloud computing. Although not specified in the survey, cloud computing may include a range of modalities such as infrastructure as a service, software as a service and platforms as a service. The market in cloud computing and the associated services for big data and advanced analytics has been traditionally dominated by a number of multinational technology companies. This has presented issues in terms of ensuring data protection and conformance when the infrastructure is not within one country's control. As new, more powerful machine learning techniques such as natural language processing using transformer and large language models start to drive the next wave of innovation in health

technologies, the dependence on the companies that provide these as a service may become for some Member States even more critical.

Member States were asked whether there was in place or under development, infrastructure, services, tools and apps that facilitated the use of varying advanced technologies. Sixty-nine per cent of Member States (33 out of 48) said that support was in place for AI; 57% (27 out of 47) for cloud computing; 56% (25 out of 45) for personalized medicine; 48% (21 out of 44) for genomics; 33% (15 out of 45) for robotics; and 10% (4 out of 42) for other emerging technologies such as 5G and Internet of Things, advanced medical imaging and decision support (Fig. 34).

Fig. 34. Share of Member States that report infrastructure, services, tools and apps to facilitate the use of varying advanced technologies





Barriers to adopting big data and advanced analytics for health

Member States were asked about a variety of barriers to the adoption of big data and advanced analytics in their Member States. Barriers rated as very or extremely important by over 50% of Member States in all subregions (Fig. 35), included:

- ▶ different data formats
- ▶ promotion of standards
- ▶ information sharing
- ▶ building capacity
- ▶ lack of integration across the health-care system.

Other barriers that were more frequently rated as moderately to not important included:

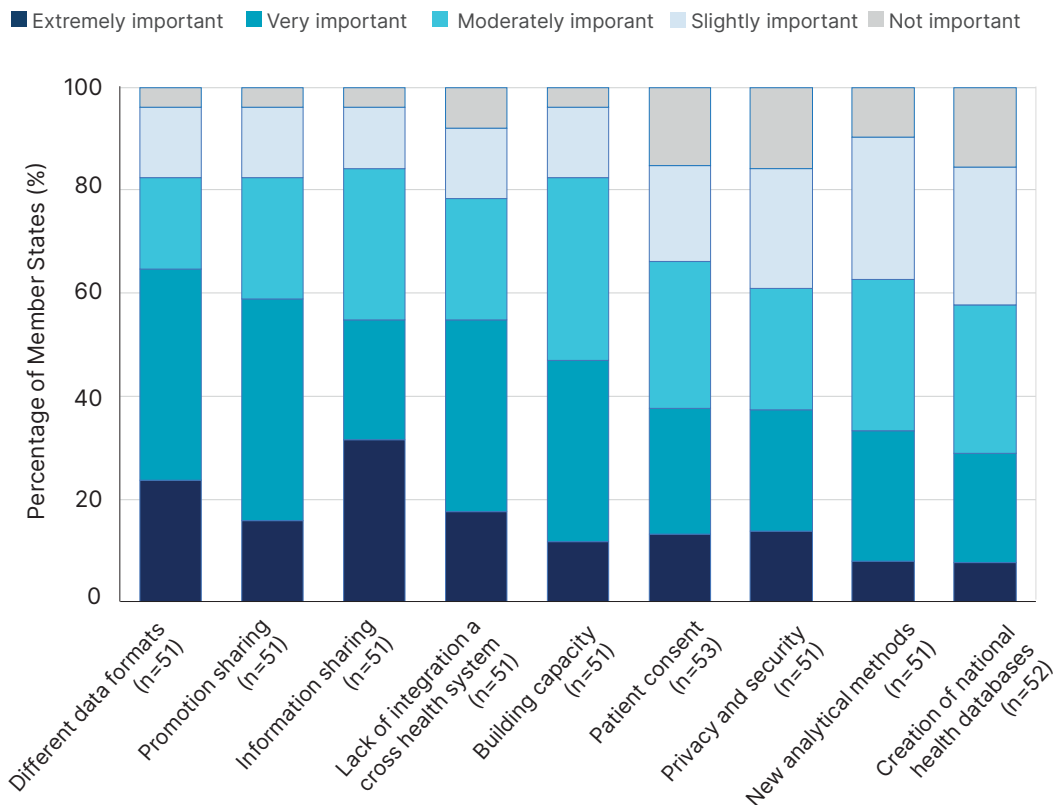
- ▶ creation of an NEHR

- ▶ privacy and security
- ▶ patient consent
- ▶ new analytical methods.

This was a change from 2015 where the top three most important barriers (rated as very or extremely important) were a lack of data privacy and security laws; limited integration between different health services and other systems collecting data; and a lack of support for new analytical methods.

In commenting about other barriers, some Member States also mentioned the barriers of “political incentives for integration of data sources”, the “lack of public trust in the use of data”, and “the political and the financial support for these initiatives”.

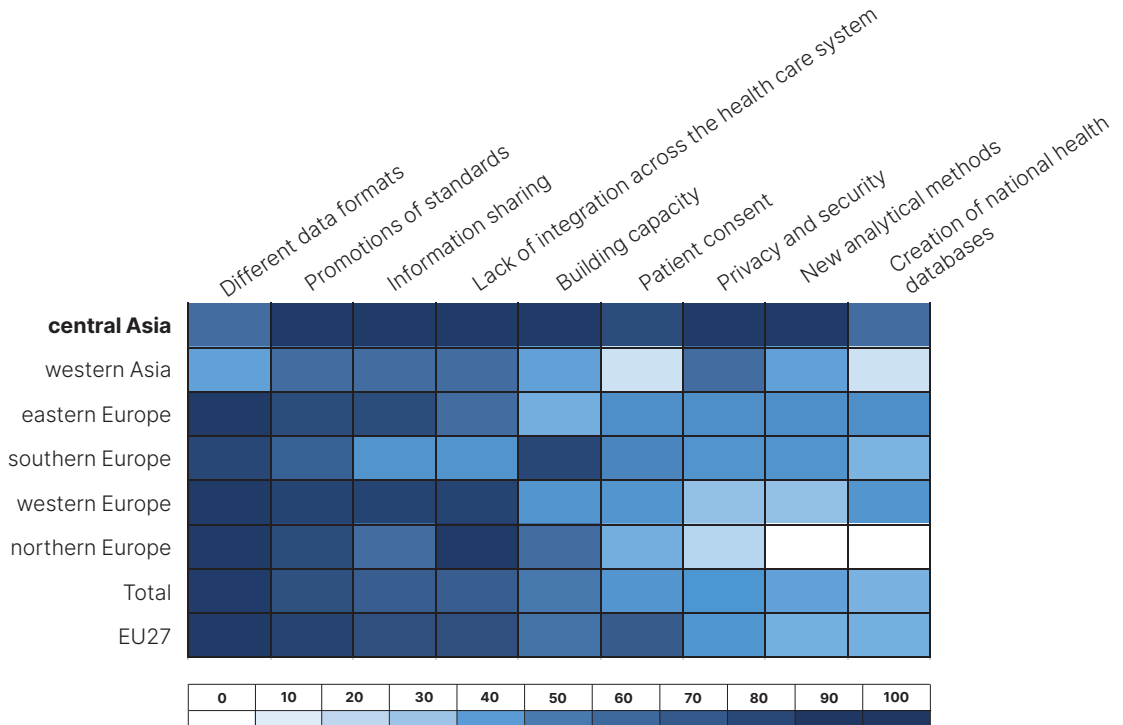
Fig. 35. Rating of barriers to the integration of big data and advanced analytics into clinical practice



Subregional analysis (Table 11) suggests that different data formats and the promotion of standards are perceived as extremely to very important barriers by Member States in all subregions. Responses from Member States in southern Europe and central Asia also point

to capacity building as a barrier. Contrary to other subregions, privacy and security remain an extremely to very important barrier in central and western Asia while patient consent is viewed as an extremely important barrier by the EU27 Member States.

Table 11. Rating of barriers to the integration of big data and advanced analytics into clinical practice by subregion



Summary

This section, “The Power of Knowledge”, reflects the data-driven revolution taking place in the world of health care, driven by the transformative force of data analytics. By delving deep into the vast oceans of health-related data, we are refining service delivery and ushering in an era of personalized care. At the population level,

the power of big data analytics has proven instrumental in advancing preventative health care and managing crises like the COVID-19 pandemic.

The driving force behind this accelerating wave of AI and big data analytics is the proliferation

of digital data. NEHRs, EHRs, genomic data and portable wearable sensors – all are contributing streams to the ever-growing data river. The ability to cross-link this data with other health-related digital data is driving forward our understanding and capabilities. At the same time, strides in machine learning techniques, particularly deep learning and large language models, are unlocking the promise of predictive analytics in all facets of health care.

An encouraging majority of Member States have harnessed this potential, with over half of them reporting an NDS. Since 2015, there has been a significant increase in Member States implementing a national policy on the use of big data and advanced analytics in health care: a leap from 13% of Member States (six out of 46) in 2015 to 35% (17 out of 48) in 2022. Likewise, regulation of big data usage by private companies saw an increase, from 9% of Member States (four out of 46) in 2015 to 32% (13 out of 41) in 2022.

Backing this data revolution are infrastructure, services, tools and apps, with AI leading the charge. A robust 69% of Member States (33 out of 48) reported that they provided support for AI. Furthermore, cloud computing found support in 57% of Member States (27 out of 47), while personalized medicine was backed by 56% of Member States (25 out of 45). Genomic medicine and robotics, though slightly behind, still enjoyed significant support.

However, like any new development, mainstreaming the use of data analytics movement also faces its own challenges. The primary barriers to its complete implementation are data formats, standards, sharing of information, lack of data integration across the health-care system and capacity building for data analysis. Yet, these are challenges that can and indeed must be surmount to harness the full power of data in health care.



Considerations

- ▶ Member States are encouraged to develop an NDS and policy for the use of big data and advanced analytics in the health-care sector and by private companies.
- ▶ Member States should take the lead in standardizing different data formats and resolving interoperability issues by putting in place commonly accepted data and interoperability standards, along with associated compliance and accreditation mechanisms and by promoting the continuous development of data and interoperability standards to support broader and deeper types of health information flows.
- ▶ Member States should continue to increase their support for advanced analytics infrastructure, services and tools to facilitate and promote progress in health care.
- ▶ Evaluation and regulation of algorithms and products using these algorithms should be carried out to ensure their use and to prevent adverse outcomes.



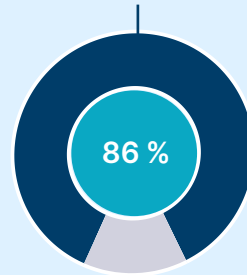
Part 6 : sharing is caring – access to and sharing of data

Data highlights: key insights from survey responses

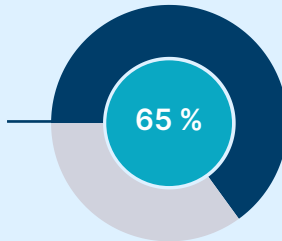
All Member States have passed privacy legislation and 91% (48 out of 53) report having legislation to protect the privacy of an individual's health-related data in electronic format in an EHR.



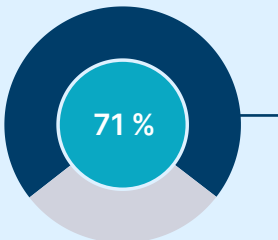
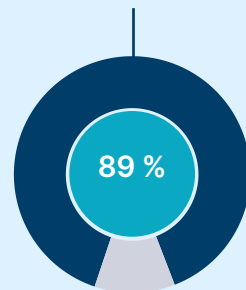
86% of Member States (44 out of 51) have legislation that allows individuals electronic access to their own health data in their EHRs.



65 % of Member States (31 out of 48) report that individuals have the right to specify which health-related information in their EHR can be shared with health professionals of their choice.



89% of Member States (46 out of 52) report having implemented secure identification of patients and health-care providers



71% of Member States (34 out of 48) reported they had laws or policies in their country that permitted the public authorities to extract data from EHR systems for the creation of regional/ local or national registries and databases.



The COVID-19 pandemic has exposed the essential role of data access and sharing for preparedness and response within and across Member States. At the same time, it has uncovered the varying readiness of Member States and redirected policy attention to public acceptance of digital technologies and the need for appropriate reconciliation of the risks and benefits in data use.

Personal health data are sensitive in nature. Their loss or misuse can bring personal, social and financial harms to individuals. Trust is therefore a key factor in the successful implementation of digital health. In turn, this depends on robust privacy legislation and data governance frameworks for the collection, storage, sharing and use of health-related data whether for direct care, public health purposes or research and innovation.

Health data governance reforms have been an important aspect of many Member States' response to the COVID-19 pandemic. In a 2021 Organisation for Economic Co-operation and Development survey (82), 15 of 24 responding countries indicated that there had been legal, regulatory or policy reforms in 2020 and 2021 to improve health data availability, accessibility or sharing. Recent EU legislative initiatives have also been key in strengthening cross-border health data sharing at EU level. In particular, the European Health Data Space (83) has the potential to act as a powerful incentive for Member States to adopt best practices for data sharing and coherent data governance. The European Health Data Space

is a health-specific data ecosystem comprised of rules, common standards and practices, infrastructures and a governance framework that aims at supporting: i) the primary use of eHealth data for better health care at national and cross-border level; and ii) the secondary use of health data for research, innovation, policy-making and regulatory activities.

To support data being shared between health-care providers, mandatory requirements for interoperability, security, safety and privacy will be introduced, as well as mandatory self-certification of EHRs covering interoperability and security. All EU Member States will be required to participate in a new cross-border digital communication channel (MyHealth@EU) for the exchange of health data for health-care delivery (84).

Another key project in this regard is the Joint Action Towards the European Health Data Space (85), which is developing European principles for the secondary use of health data, building upon successful development of health data hubs in a few Member States, such as Finland and France.

If successful, the European Health Data Space combined with the Regional digital health action plan for the WHO European Region 2023–2030 (8), could have an influence on the evolution of collaboration in the whole Region on the protection and sharing of health data for both primary and secondary use.



Protection of data

The survey asked Member States whether they had legislation to protect the privacy of personally identifiable data. Personally identifiable data was defined as information which can specifically identify an individual. This can include, but is not limited to, names, dates of birth, addresses, telephone numbers, occupations, photographs and fingerprints – regardless of the format or medium in which it is held.

All Member States reported they had passed privacy legislation and all but six Member States (Belarus and the central Asian Member States) are also party to the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data (Convention 108) (86). In addition, all EU Member States reported having implemented the General Data Protection Regulation (GDPR) [Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016] (87), which became directly applicable law on 25 May 2018. The GDPR places personal health data in a special category with the highest standards of protection. Key provisions apply a greater focus on the rights of data subjects and impose greater jurisdiction and enforcement. The GDPR aims to ensure a consistent and equivalent high level of protection and remove obstacles to the free flows of data within the Union (Recital 10).

Survey results, however, indicate that a fully harmonized approach to the rules on processing

of health-related data has not yet been achieved. Notably, legal uncertainty is reported as a significant barrier to the implementation of EHRs (by 22% of Member States; 11 out of 51) and telehealth (31% of Member States; 16 out of 51). Privacy and security are considered the most significant barrier to the integration of health apps into clinical practice by 43% of Member States (extremely important by 10 Member States and very important by 12 out of 51). Similarly, trustworthiness is considered a significant barrier by 37% of Member States (extremely important by 4 Member States and very important by 15 out of 51 Member States) (see Part 4 and Fig. 31).

Legal safeguards in place to protect personal data held in EHRs

The survey also included questions on the legal safeguards in place to protect personal data held in electronic formats in an EHR. All but five Member States reported having passed national EHR legislation. However, a number of Member States also reported that they have common laws to cover actions within electronic health even if they are not designed specifically for EHRs or digital information. When results are analysed by subregion, western Asia, western Europe and northern Europe stand out as the most advanced in the development of legal and governance frameworks with central Asia, and eastern and southern Europe slightly trailing behind.

91% of Member States report having legislation to protect personal data held in EHRs.

Patient access to and control of data

The survey results indicate that there is an increasing amount of attention on ensuring that individuals can exert greater agency and control over their personal health data, with 86% of Member States (44 out of 51) having legislated that the patient should have access to their own health data. There were no significant variations across subregions (see Fig. 36).

Access to EHR data via an online portal is a common mode of access in a number of Member States. As an example, in Sweden, patients can log in to the country's patient portal system using either an electronic identifier or their Swedish personal identity number. They are able to see notes from all health-care professionals, a list of prescribed medications, test results, warnings, diagnoses, maternity care records, referrals and vaccinations as well as a log of everyone who has accessed the record. They can also add comments to notes if, for example, information is incorrect.

Eighty-three per cent of Member States provide citizens with the opportunity to have their health data corrected, but only 43% (21 out of 49) go as far as allowing citizens to delete EHR contents. Sixty-five per cent of Member States (31 out of 48) report that individuals have the legal right to specify which health-related information in their EHRs can be shared with health professionals of their choice. The greatest difference across subregions can be found for the latter two provisions with only 20% of Member States in northern Europe allowing deletion against 80% in western Asia, and a range of between 40% in eastern Europe and 100% of Member States in western Asia allowing individuals to specify which health-related information in their EHRs can be shared (Fig. 36).

Similarly to the data reported in the WHO Regional Survey 2022, in the EU (27), a 2019 survey also

indicated that 26 Member States now by law give their citizens access to EHR data, and 20 have included mandatory public access in their legislation regardless of the availability of the technology (88). Eighteen Member States also reported legislation that allows EHR data to be shared across national borders.

Compared to the 2009 and 2015 surveys, where 56% of Member States and 47% of Member States reported respectively that they have legislation that permits individuals the right to access their EHRs, in the last eight years there has been substantial progress in the area of legislation governing patient rights (Table 12).

Patient data is an important element in the delivery of care and for patient safety. Therefore, unsurprisingly, since 2009, few Member States have reported that the deletion of data from EHRs is allowed.

While the issue of an individual's right to access their own personal health information is one aspect to consider, another concerns the extent to which individuals may be allowed to exercise control of that information. Both issues bring up discussions on legal ownership of the information as well as liability issues. In several Member States, these rights are given to health professionals or the health-care system as the legal owners of the EHR, but this is not the case in all Member States in the Region. Allowing patients to adjust or even conceal information in their health records and specify who has access to that information can affect the completeness and quality of the data that health professionals can use, which can in turn affect the quality of care and patients' safety.

Fig. 36. Patient access to and control of data

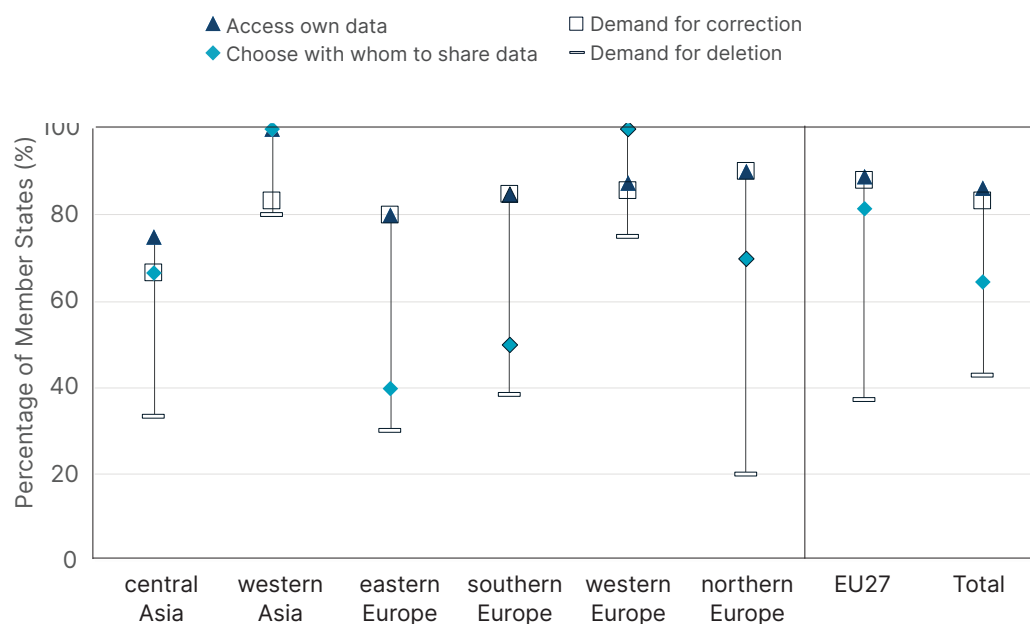


Table 12. Trends on the protection of individuals' data

	2009	2015	2022
Protection of personally identifiable data	94%	100%	100%
Protection of personal data held in electronic formats in an EHR	52%	80%	91%
Legislation granting individuals the right to access their EHR	56%	47%	86%
Legislation allowing individuals to request inaccuracies of their health-related data be corrected within an EHR	33%	52%	83%
Legislation allowing individuals the right to request deletion of data from their EHR	33%	34%	43%
Legislation allowing individuals the right to specify with which health provider(s) to share their EHR	N/A	50%	65%

Note: N/A: not available.

Source: (9–11).



Secure identification of patients and health-care providers

Electronic identification is one of the tools to ensure secure access to online services and to carry out electronic transactions in a safe way. Digital signatures are the most common authentication practice in Europe for patients and health-care professionals, followed by two-factor authentication. Eighty-nine per cent of Member States (46 out of 52) report having implemented secure identification of patients and health-care providers.

The European Commission has set out a number of targets and milestones for electronic identification in its Communication 2030 Digital Compass: The European Way for the Digital Decade (30). For example, by 2030, all key public services should be available online; all citizens will have access to electronic medical records; and 80% of citizens should use an electronic identification solution (see Case Example 16).

Case Example 16.



EU digital identity regulation

The 2014 Electronic Identification, Authentication and Trust Services (eIDAS) Regulation provides the basis for cross-border electronic identification, authentication and website certification within the EU. EU Member States may notify and recognize, on a voluntary basis, national electronic identification schemes in their Member States. The recognition of notified electronic identification became mandatory in 2018. The regulation aims to facilitate identification and authentication of health-care professionals across borders. The new proposal for a Regulation on digital identity will address shortcomings in eIDAS by improving the effectiveness of the framework.

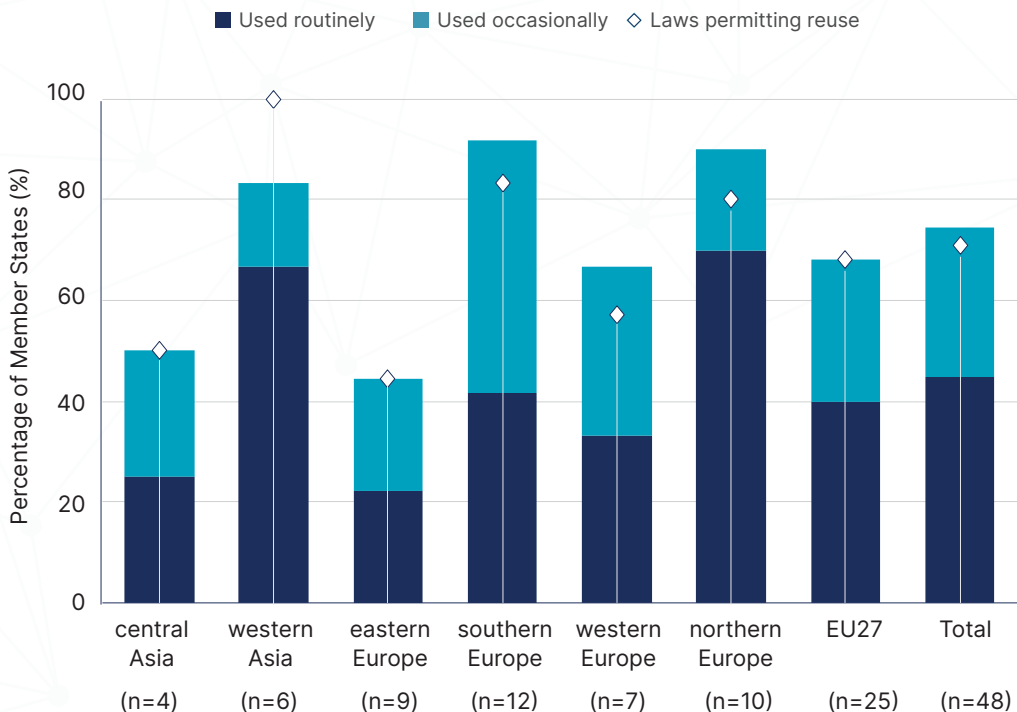


Specific laws or policies that permit public authorities to reuse data from EHR systems

With the widespread adoption of EHRs, the associated data has rapidly become a new source of insights into users' interactions with health systems, health-care processes, quality of care and outcomes. In the most advanced settings, EHRs can provide various types of data that can be linked, integrated or merged directly into regional or national registries. Data types most commonly extracted from EHRs and imported into national or regional/local registries are patient identifiers, demographics, diagnoses, medications, procedures, laboratory results, vital signs and utilization events. Seventy one per cent of Member States (34 out of 48) reported they had laws or policies in their country that permitted the public authorities to extract data from EHR systems for the creation of regional/

local or national registries and databases, while 45% (21 out of 47) and 30% (14 out of 47) reported that data was being extracted routinely and occasionally, respectively, and imported and merged into regional/local or national registries and databases. There are important differences in this regard across the Region, with central Asia and eastern Europe trailing behind western Asia, southern and northern Europe in both the development of laws and frameworks governing the reuse of EHR data as well as the actual reuse of that data. This gap can have major implications for the performance of health-care systems, innovation and competitiveness in these subregions (Fig. 37).

Fig. 37. Impact of laws on the reuse of data held in EHRs (by subregion)





Summary

“The patient at the centre” underlines a truth universally acknowledged in the realm of health care: successful digital transformation hinges on a patient-centred approach. Trust is paramount – trust in technology, trust in data protection and, most critically, trust in the respect and safeguarding of privacy rights pertaining to personal health data. The survey findings depict a landscape where attention to privacy protection is on the rise, and where individuals are gaining greater agency and control over their personal health data.

Every single Member State respondent affirmed the existence of legislation safeguarding the privacy of personally identifiable data, reflecting a strong commitment to privacy protection. Additionally, 46 Member States confirmed the implementation of secure identification for patients and health-care providers, and in 44 Member States, legislation assures patients access to their own health data.

The past eight years have been a beacon of progress. Compared to the 2015 survey, there has been a significant advancement in the realm

of legislation bolstering patient rights to access and modify their health-related data.

However, even as we celebrate this progress, certain challenges persist. Despite national EHR legislation being passed in all but five Member States, the survey results revealed that legal uncertainty remains a significant roadblock to the implementation of EHRs (in 11 Member States) and telehealth (in 16 Member States). The most formidable hurdle to the integration of health apps into clinical practice is deemed to be privacy, security and trustworthiness.

On a positive note, 34 Member States confirmed that laws or policies were in place allowing public authorities to extract data from EHR systems to populate regional/local or national registries and databases. Yet only 21 reported routinely extracting, importing, and merging this data into such registries and databases, with an additional 14 doing so occasionally.

Despite these hurdles, Member States continue to forge ahead towards a more secure, private and patient-centred digital health future.



Considerations

- ▶ Member States should continue to ensure a people-centred approach to digital health so as to build trust and facilitate adoption.
- ▶ Member States are recommended to develop and adopt policies or legislation that address, at the very least, the access and ownership of patient data stored in an EHR, specify who is authorized to access the data, provide patients with the ability to restrict access if they choose, outline how amendments and deletions of data can be made, and ensure that patients are informed about the associated risks.
- ▶ Member States should strengthen their national HISs and data governance frameworks to enhance the reuse of EHR data for health-related public interest.
- ▶ Member States are recommended to develop and adopt policies or legislation and address data quality and standards to facilitate collaboration in the whole Region and the sharing of health data for both primary and secondary use.
- ▶ Member States are recommended to periodically revisit and revise national legal frameworks pertinent to digital health to accommodate technological change and changes in the health information landscape.

Chapter 4

The road ahead

We now find ourselves at an exciting crossroads, the intersection of health and technology, where digital advancements and health care interweave. The time for transformation is upon us, and this chapter emphasizes the crucial actions Member States must undertake in their journey towards digital health commitment and transformation.

Our journey commences with effective governance of digital health, championing the creation and expansion of national agencies and bodies dedicated to this pursuit. It is a call to action for Member States to construct intersectoral national policies and strategies, encouraging shared commitment, universal relevance, and an uncompromising focus on achieving health objectives. Recognizing the integral role of digital health technologies in public health emergency preparedness is pivotal, as is emphasizing the strategic priorities of information sharing and interoperability.

Despite considerable progress, our path is yet to be fully charted. The gaps in digital health understanding echo the need for guidelines for evaluating digital health interventions, revealing the vital role that the WHO Regional Office for Europe and Member States can play in creating a robust evidence base. The WHO and International Telecommunication Union National eHealth Strategy Toolkit (13) is a beacon guiding Member States towards a comprehensive framework for monitoring and evaluation of digital health programmes.

As our path advances, digital and health literacy emerge as indispensable for health-

care professionals and the general public alike. They are essential compass points that must be incorporated into national health objectives. Moreover, bridging the digital divide is a vital step to ensuring no one is left behind in our collective journey. Member States are called to action to develop capacity-building and digital inclusion strategies, promoting universal access to digital technologies.

The COVID-19 pandemic has spotlighted the high costs of underinvestment in data and digital health, serving as a stark reminder that sustainable financing strategies are crucial. It urges Member States to strengthen collaborations between public and private sectors, helping us overcome funding barriers and accelerating the acceptance and implementation of digital health strategies.

Legislation governing EHR systems is an important waypoint on our path, encouraging Member States to consider integrating local and regional EHR systems with national ones, and to invest sustainably in their development and maintenance.

Our journey's roadmap necessitates the full implementation of health data standards and addressing interoperability issues. A quality management system for interoperability testing, suitable testing tools and certification procedures are essential components of this roadmap.

The journey towards patient-centred care involves engaging patients and intersectoral partners in the expansion and development

of EHR systems. It calls for clear policies and strategies to integrate telehealth effectively into the health-care system, along with systematic monitoring and evaluation.

mApps stand as significant landmarks on our digital health journey. Their growing presence in digital therapeutics and digital care highlights the need for robust regulation and oversight. Standardizing the evaluation of these apps will further enable us to make informed investment and implementation decisions.

Our journey culminates in the development of an NDS for the use of big data and advanced analytics. It emphasizes the need for standardization of data formats and continuous development of data standards to resolve interoperability issues.

Ultimately, our journey to digital health transformation is a journey towards trust and adoption. It requires us to ensure a people-centred approach to digital health, formulate policies addressing patient data access, ownership, and risk awareness and strengthen national HISs.

The steps outlined in this chapter mark the turning point in our journey, a rallying call for Member States to start or continue their journey towards digital health commitment and transformation. This is our moment to seize the opportunities presented by digital health and to propel forward into a future of enhanced, inclusive and resilient health care.



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