

May 2024. Technological snapshot

Digital health in Catalonia

Digital health in Catalonia. Technological snapshot

ACCIÓ
Government of Catalonia



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Carried out by

Strategy and Competitive Intelligence Unit of ACCIÓ

Collaboration

Barcelona Health Hub
Biocat



Barcelona, May 2024



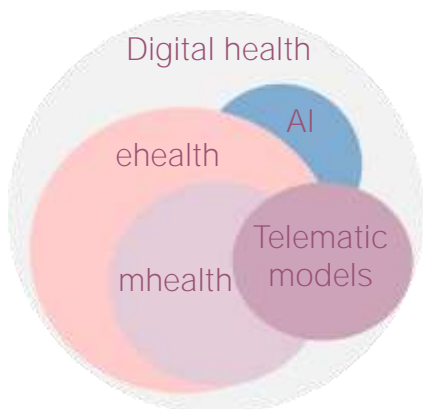
CataloniaConnects

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Digital health is the field of knowledge and practice associated with the development and use of digital technologies to improve health

Fields of digital health



Technological solutions

- Health information technology
- Personalized medicine
- Devices, sensors and wearables
- Telemedicine
- Digital therapies
- Mobile health (mhealth)

Digital health trends

- Artificial intelligence and massive use of data
- Evolution of remote care
- Virtual and augmented reality
- Internet of medical things (IoMT)
- Privacy and cybersecurity
- Bio-printing and 3D and 4D printing

World Market

13.1% year-on-year growth is expected until 2032, when it will reach a value of 939.5 billion dollars

The Asia-Pacific region stands out above the rest, with 44% of the market share, followed by North America (28%) and Europe (19%)

Between 2019 and 2023 the figure of 30.5 billion dollars was recorded in venture capital in digital health startups in the world, more than double the total in the previous five-year period

FDI in technologies linked to the health sector has amounted to 649 projects over the last five years, with the investment totaling 23.7 billion euros and over 65,000 jobs created

331 companies along the value chain



24% more than in 2022

€592.5 M turnover

4,810 jobs

64.6% are less than 10 years old

We should highlight:

Clinical tools (18%)

Technological consultants (18%)

Impact of investment in digital health on the economy

€1,208 M of the GVA (0.5% of the GDP)

AI has the potential to save **6,700 lives** each year and make **€3,000 M** of savings in Catalonia



Agents

17 technological centers and hospital research institutes

11 support agents

13 universities and training centers

7 acceleration programs

11 talks and specialized meetings



Benchmarking Initiatives in Catalonia

SISCAT Information Systems Master Plan

La Meva Salut

Shared clinical history

Health service integrator iS3

Electronic prescriptions

Capture and integration of clinical images

Public procurement of innovation

Center for clinical validation of digital solutions

Health/AI program

Operational Plan for the access to innovation



Attractive for international companies

5th-ranked region in the world for attracting foreign investment projects in technologies linked to the health sector over the last five years

13 technological hubs of companies such as AstraZeneca, Bayer, Novartis, Roche and Sanofi



Entrepreneurial ecosystem

Health technologies in Catalonia:

- is the sector that brings together the largest number of startups, with **356 startups accounting for 16.9% of the total**
- is the sector that has captured the largest volume of investment in 2023, with **124.1 million euros, accounting for 18% of the total**

Catalonia is a benchmark in the EIC Accelerator, which has supported **8 digital health companies** that received **€49.5 M** in 2022 and 2023

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Digital health in Catalonia

1. Definition, importance and applications of digital health

Digital health: plurality of definitions



The **World Health Organization** defines digital health as:

“The field of knowledge and practice associated with the development and use of digital technologies to improve health”



According to the **European Commission**, digital health is:

“The tools and services that use ICT to improve the prevention, diagnosis, treatment, monitoring and management of diseases and health conditions and monitor and manage lifestyle habits with an impact on people’s health”



Sources: European Commission, World Health Organization

Technological solutions

Technology can help health in many different ways



Mobile health (mhealth)

- Nutrition and diet apps
- Access to health information
- Medication adherence apps

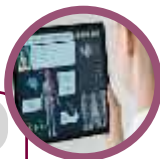


Digital therapies

- Diabetes-accompanying apps that reduce risk events
- Mental health solutions that reduce symptoms of depression

Health information technology

- IT apps
- Electronic health histories
- Electronic prescriptions



Personalized medicine

- Predictive analytics
- Clinical decision support



Devices, sensors and wearables

- Biometric sensors
- Diagnostic products



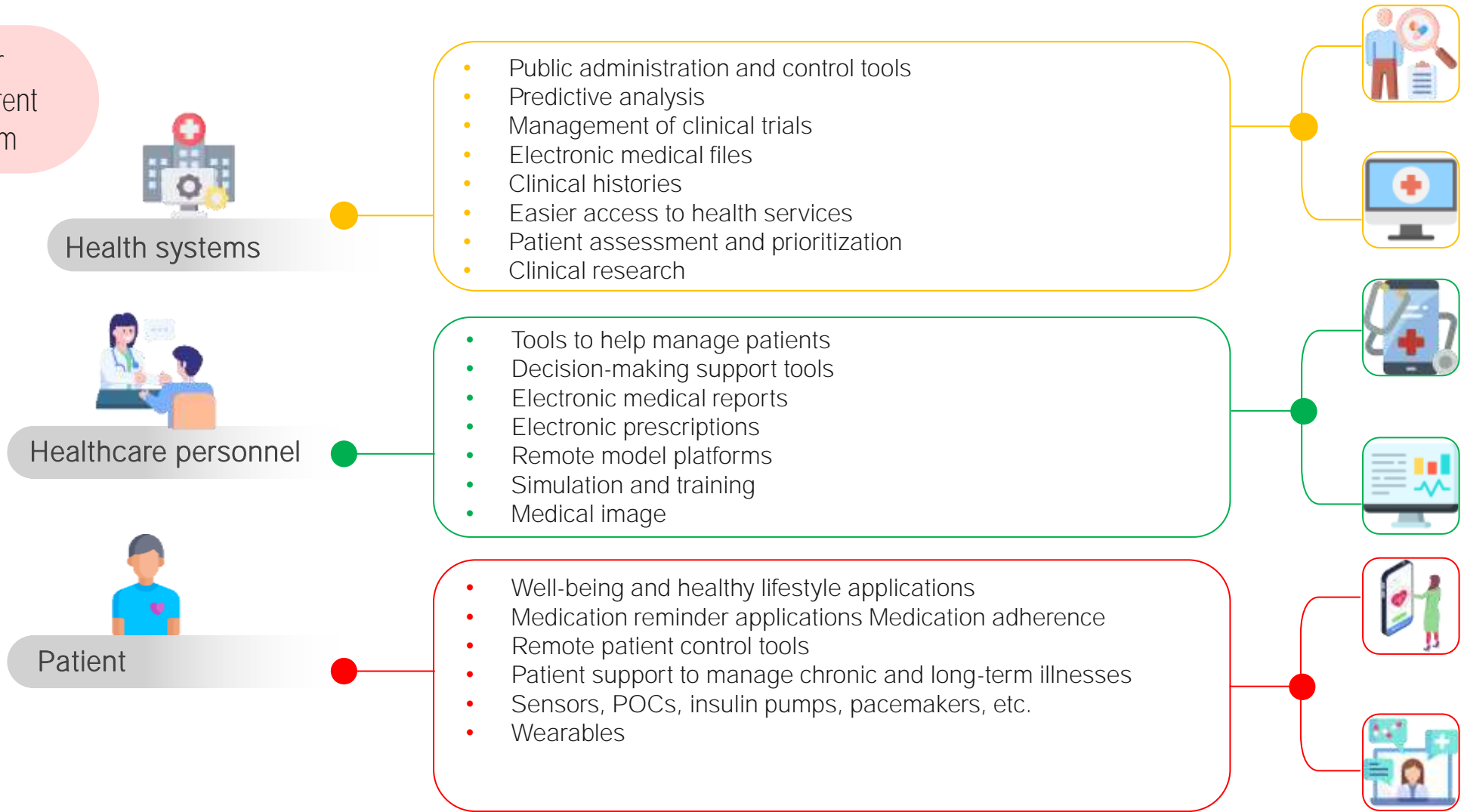
Telemedicine

- Telematic visits
- Patient monitoring
- Remote health programs



Digital health applications

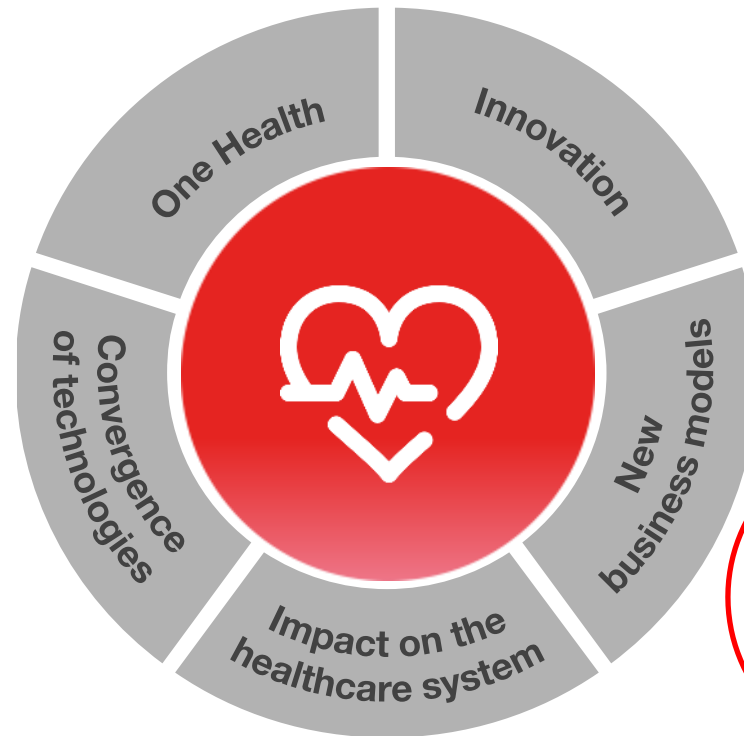
Digital health can offer many benefits to different actors in the ecosystem



Importance of digital health

The use of technologies in health can lead to a practical approach to the One Health concept, based on the idea that human, animal and planetary health are inter-dependent. The nature of digital health can help promote a practice under this concept in a multisectoral, cross-disciplinary and, above all, digitally inter-connected manner.

Digital health consists of a comprehensive and hybrid approach that brings together a wide range of different key technologies, such as the use of big data, robotics, genomics, cybersecurity and wearables, which can lead to high added value and reduced healthcare costs in terms of prediction, forecasting and quality improvement.



Digital applications and technologies in the field of health are undergoing healthy growth in view of the rise in new and serious socio-sanitary and biological threats and those linked to climate change that require a global response. Healthcare supported by ICT can deliver new pioneering methodologies and uses in order to establish a comprehensive approach to health based on previous research work.

The use of digital technologies in health gives rise to new businesses and business models that can ultimately attract new market sectors. We should highlight the challenge of securing new economically sustainable strategies, health platforms and ecosystems, the role of insurance and new public-private partnerships.

Digital health can shorten and alleviate the response capacity of healthcare systems while promoting optimal care with speed and efficiency. With the aim of preventing work overloads, the use of digital technologies in health also proposes a human-centered approach that seeks improvements in terms of quality.

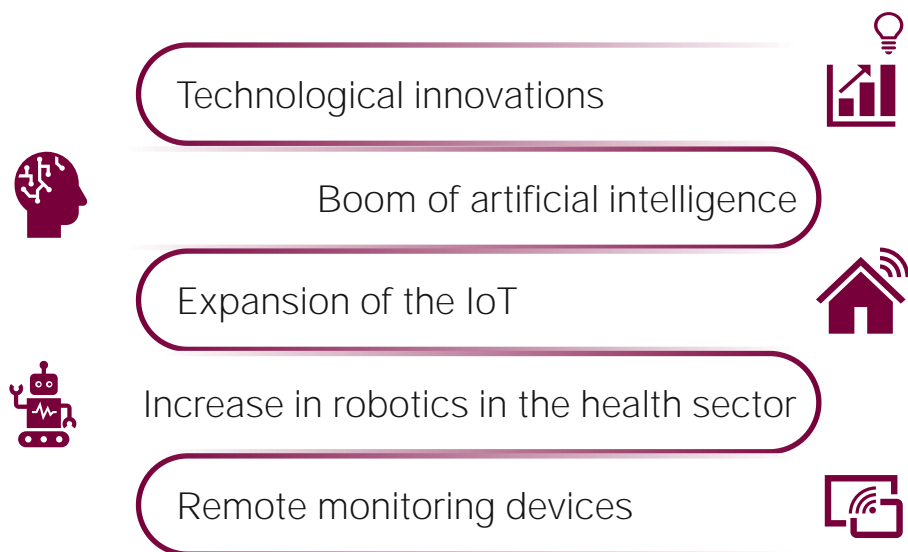
Digital health in Catalonia

2. World digital health market

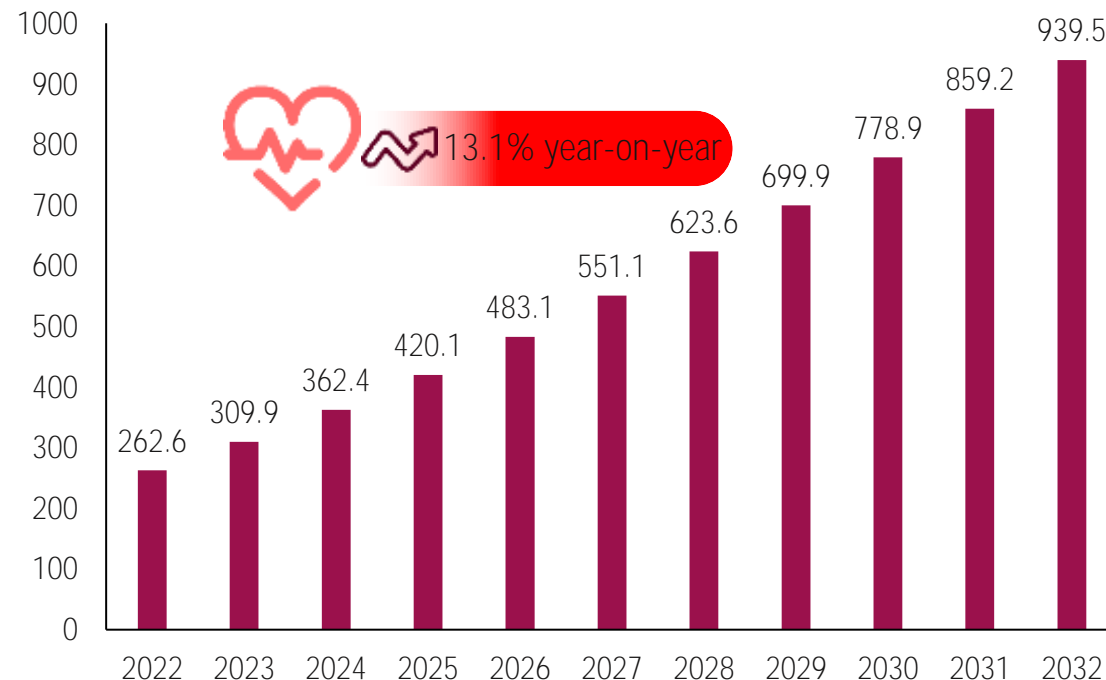
Size of the global digital health market

The global digital health market recorded a total value of 309 billion dollars in 2023 and it's expected to exceed 939.5 billion dollars by 2032, with year-on-year growth totaling 13.1% until 2032.

Growth factors



Global growth of digital health (billions of dollars, 2022-2032)

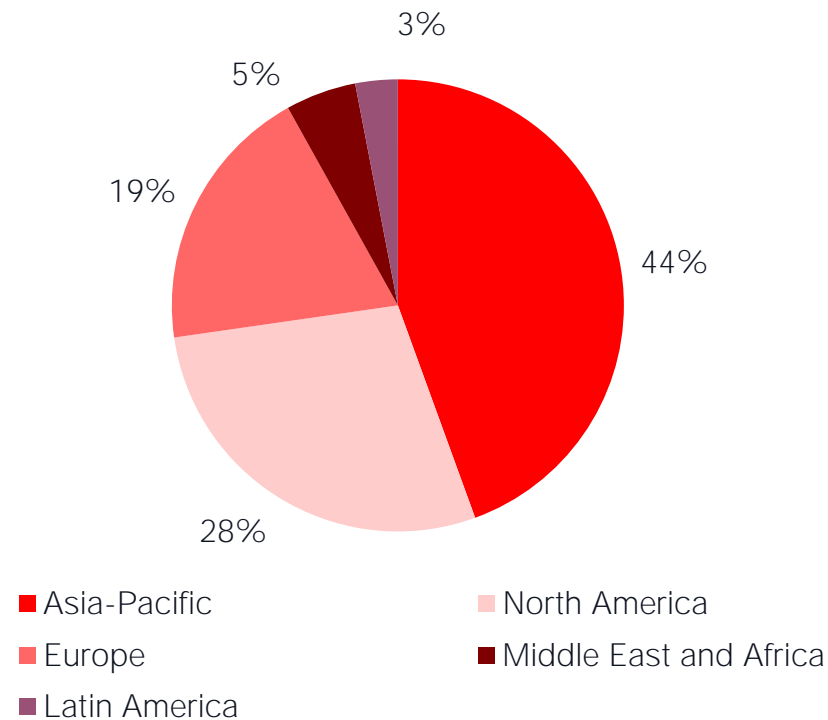


Source: Precedence Research

Global data and prospects for digital health by regions

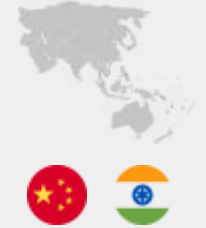
Asia-Pacific stands out above the rest of the world's regions in terms of the turnover of the digital health market (44%), followed by North America (28%) and Europe (19%).

Percentage of turnover of the digital health market, by regions (2023)



China leads the global digital health market and it's expected to undergo the fastest growth, due to factors such as increased investment and the emergence of startups. India is driving the implementation of digital technologies and governmental initiatives, enabling it to lead part of the market in the region.

Asia-Pacific



The United States excels in its advanced health management and development of innovative software, as well as the presence of pioneering companies. The country will remain in second position worldwide in the coming years.

North America



Germany, with the largest market share in Europe, is home to the major innovative companies in this field. The United Kingdom is one of the major players in the European market that will become stronger in the coming years.

Europe



Source: the authors, based on Statista and Precedence Research

Leading global digital health companies (by turnover)



 With presence in Catalonia

Digital health in Catalonia

3. Digital health trends

Digital health trends



Artificial intelligence and massive use of data

The deployment of the potential of AI and new and better algorithms will allow the development of new medicines and drugs and the processing and treatment of big data to improve the healthcare system, prevent epidemics and improve diagnoses and treatments.

The improved remote care systems, connectivity and data storage systems and the interoperability and integration of the different health systems are leading to an evolution of the remote care model, bringing challenges ahead such as bridging the digital divide.

Evolution of remote care



Virtual and augmented reality

Improved virtual reality and augmented reality devices, as well as their greater supply and lower prices, mean that their potential for the training of healthcare professionals, care during surgical interventions, treatment of different diseases and patient support can be harnessed.

The increase in the number of wearable devices and the IoT is leading to better remote patient data collection and monitoring (RPM), as well as patient empowerment. Connection of ambulances en route to medical facilities. Tracking of medication orders and location of admitted patients.

Internet of medical things (IoMT)



Privacy and cybersecurity

Communications between doctors and patients, remote surgical operations and other safer medical interventions. Post-quantum cryptography to protect communications and patient data from potential cyberattacks and decryption attempts. Use of blockchain for the processing and management of patients' data.

Creation of new organs using patients' cells and bioprinting to produce organic tissues similar to those of the human body. Printing of prostheses, anatomical models, implants, surgical guides and personalized medication. 4D printing of active polymers and living tissues (e.g. vascular endoprostheses) that react and adapt to the patient.

Bio-printing and 3D and 4D printing



Sources: Forbes, McKinsey, Masschallenges, IBM, HHS, NIH, OMS and ACCIÓ

Digital health in Catalonia

4. Initiatives related to digital health

In its **2020-2025 global digital health strategy**, the World Health Organization (WHO) sets out four strategic goals for the states included in a multilateral action plan.

Global collaboration and knowledge transfer

Establishment of global knowledge management mechanisms to identify and share good practices, evidences, opportunities, risks and lessons learned with regard to public and digital health.

Alignment of countries and stakeholders to improve digital health and mitigate threats through use of digital technologies.

Implementation of the digital strategy

Integration and reinforcement of the digital technologies in the national health strategies that are already established, through all the appropriate legal and ethical data security frameworks.

Promotion of sustainable financing models for the development of digital health.



Digital health governance

Enhancement of digital health governance structures, including regulatory frameworks and the capacity to implement evidence-based solutions.

A person-centered approach to facilitate actions and investments based on informed decisions, the promotion of competences in education and capacity-building for leaders and policy-makers.

Health systems focused on the human being

Development of the appropriate literacy for digital technology skills and/or applications and data for users and healthcare workers, based on **ongoing training to promote citizens' participation (e.g. forums)**

Introduction of digitized monitoring and evaluation models to reduce the overloading of primary care and reinforce approaches to gender equality and equity.

Initiatives in the European Union

The digitization of health systems is a key factor in the digital transition of the economy and society and one of the six political priorities of the European Commission for the 2019-2024 period.

The Communication of the Commission on enabling the digital transformation of health and care in the digital single market (April 2018) set the theoretical precedent for technologically responding to the challenges of an aging population, chronic illnesses, unequal access to healthcare and the training of health professionals. The following goals are set:



Secure access to and exchanges of health data

Personalized medicine through a European data infrastructure for research

Training for citizens in digital tools and data for person-centered healthcare

European Health Union

The current project of the European Health Union is included in the objective of improving protection, prevention, preparation and the response to threats to human health in the EU. A digital health barometer was published in 2022 in order to control the development and attractiveness of the sector, within the **EU global health strategy** published by the Commission. This will guide the **EU's action in the field of global health until 2030 and establishes clear action priorities, guiding principles and operational action lines.** It will also create a new monitoring framework to assess the effectiveness and impact of the EU's policies and funding. The use of technologies is envisaged in current initiatives such as the following:



European Health Emergency Preparedness and Response Authority (HERA). Medical counter-measures for health crises.



Pharmaceutical strategy. Access to medicines and medical needs which are not covered.



European Plan for the Fight against Cancer. Prevention, detection and patients' quality of life.



Global mental health approach. To put mental health on a par with physical health.

Spanish State Initiatives: PERTE For Cutting-Edge Health



The Spanish Government approved a Strategic Project for Economic Recovery and Transformation (PERTE) to transform the Spanish health sector through science, innovation and public-private partnerships between 2021 and 2023 known "PERTE For Cutting-Edge Health." This project sought to promote the creation of a high-performance healthcare system based on precision medicine, advanced therapies and artificial intelligence.

4 axes or objectives

Implementation of personalized precision medicine



To address new environmental, demographic and socio-economic challenges

Development of advanced therapies and drugs



To reinforce alliances between the academic and business sectors

Digital transformation of healthcare



High-quality and cyber-secure primary and health care

Innovative data system development



Collection and exploitation of data to provide a better health service

€1,469 M
Total investment



2021-2023

€982 M
Public contribution

€487 M
Private contribution

5 cross-disciplinary strategic lines

1. Strengthening of the National Health System centers



2. Digitization and modernization of industrial capacity



3. Collaboration between scientific and business fabrics



4. Reinforcement of territorial cohesion



5. Enhancement of professionals' training



Digital health in Catalonia

5. Opportunities and challenges stemming from digital health

Opportunities



Better access to medical care



Data analysis and personalized medicine



Patient participation



Improving the health of the population



Reduced costs



Challenges

Data privacy and security



Equity and digital divide



Interoperability



Legal and regulatory framework



Acceptance and adoption

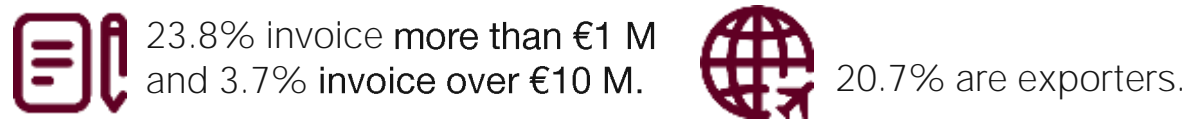
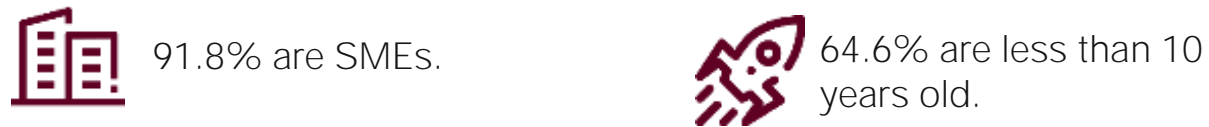


Source: ACCIÓ, based on NIH, World Economic Forum BCG and Precedence Research

Digital health in Catalonia

6. Digital health in Catalonia

Mapping of the digital health ecosystem in Catalonia (I)



The work areas that bring together the most companies are **clinical tools** (18.0%), **technological consulting** (18.0%), **digital therapies** (12.2%) and **medical decision support** (10.1%).



**With respect to the mapping data obtained in 2022.*

Mapping of the digital health ecosystem in Catalonia (II)

R&D into medicines



Clinical trials



Genomics



Diagnoses



Medical decision support



Clinical tools



Patient follow-up



Data management



Digital therapies



Prevention



Treatment



Simulation and training



Health services



Health and well-being support



Marketplaces



Technological consultants

Product engineering and technological services



Cloud services








Consulting services



Logistics and others



Agents of the digital health ecosystem in Catalonia

-  Research and technological centers, hospital research institutes and hospitals
-  Universities and training centers
-  Acceleration programs
-  Associations and networks
-  Institutions and public administration



The grid contains logos for the following categories:

- Research and technological centers, hospital research institutes and hospitals:** barcelonaβeta, FUNDACIÓ CLÍNIC, Parc Taulí, SJD, CIDAI, CREB, UNIVERSITAT POLITÈCNICA DE CATALUNYA, CVC, eurecat, i2cat, IDIBAPS, UJA-CSIC, IMIM, Institut Guttman, ISGlobal, LEITAT, Institut de Recerca Sant Pau, Vall d'Hebron, Institut de Recerca Sant Pau.
- Universities and training centers:** UAB, UNIVERSITAT DE BARCELONA, Universitat de Girona, ULB barcelona, Universitat de Lleida, UOC, Barcelona Digital Talent, UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH, upf., Universitat Pompeu Fabra, UNIVERSITAT RAMON LLULL, UNIVERSITAT DE VIC, UVIC, BTS | Barcelona Technology School.
- Acceleration programs:** cimti, CRAASH BARCELONA, d-HEALTH BARCELONA, The Collider, Ship2B Foundation, StartHealth, wayra.
- Associations and networks:** Beauty Cluster, BARCELONA HEALTH HUB, BIB, BIOINFORMATICS BARCELONA, BIST, CataloniaBio & HealthTech, CERCA, Cluster Digital, Digital Health Connect, INDESCAT, iSYS, Tech Barcelona, tecnio, WE MIND Cluster, xartecsalut.
- Institutions and public administration:** ACCIÓ, Generalitat de Catalunya, biocat, Salut/, Agència de Qualitat i Avaluació Sanitàries de Catalunya, CatSalut, TIC Salut Social, eit Health.

Catalonia has universities that teach bachelor's and master's degrees that offer knowledge applicable to the field of digital health. Integrated care technologies, data analysis and biomechanics will deliver innovative products and services offering personalized, preventive, predictive and participatory care.

Bachelor's

- Bioengineering
- Biomedical Engineering
- Bioinformatics
- Computer Engineering
- Biotechnology
- Health Engineering
- Human biology
- Artificial Intelligence
- Applied Data Science
- Software Application techniques
- Data Science and Engineering

Master's

- Omics Data Analysis
- Biomedical Data Science
- Automation and Robotics
- Medical Image Computing
- Bioengineering
- Cybersecurity
- Bioinformatics
- Biomedical Engineering
- Bioinformatics and Biostatistics
- Computational Biomedical Engineering
- Bioinformatics for Health Sciences
- Big Data Engineering
- Advanced Biotechnology
- Computer Engineering
- Fundamentals of Data Science

Catalan universities that provide training in digital health



The UB and Siemens Healthineers have created the UB Siemens Healthineers Chair in Digital Healthcare, with the aim of promoting education, information and documentation activities in the field of health digitization.

Source: the authors

Digital health initiatives in Catalonia

SISCAT Information Systems Master Plan

This identifies, approves and executes the opportunities to improve care by means of the application of ICT

Shared clinical history

A tool that groups together documents containing data and information on a **person's** status throughout their care process

Electronic prescriptions

A tool that allows the integrated management of pharmaceutical services

Public procurement of innovation

A public procurement instrument that promotes innovation as a key instrument

Health/AI program

A person-centered program for the promotion and development of AI in the Health System

La Meva Salut

A personal digital health space that makes it easier for users to view their medical histories

Health service integrator iS3

An interoperability technological platform for the management of care processes

Capture and integration of clinical images

A service aimed at healthcare professionals that allows them to add clinical photographs to their **patients'** clinical histories

Center for clinical validation of digital solutions

It supports the co-design, testing and validation of innovative healthcare technologies in hospital settings

Operational Plan for the innovation access in the Catalan Health System

Mechanisms to ensure that innovation reach the Catalan Health System more quickly



Talks and specialized meetings

- 4YFN
- Barcelona Deep Tech Summit
- Barcelona Health Hub Summit
- Healthcare Barcelona Investment Forum (COMB)
- Seed Deep Tech Barcelona Investment Forum
- Giant Health
- Health Revolution Congress
- mHealth BCN Conference
- Mobile World Congress
- Public presentation of the BioRegion Report
- Tech Spirit Barcelona



Technological hubs in Catalonia focused on digital health



140 technological hubs
of foreign companies

+11% with respect to the previous year

5,200 new jobs **€500 M** turnover

Main hubs in Catalonia focused on digital health:



United States

(with 28% of all hubs)
the main source country
for investment in these
centers, followed by
Germany (17%).

59% of hubs

come from companies in
European countries.

The health sector (9%)

has a significant
representation among the
companies in the hub
ecosystem.

Source: Mobile World Capital Barcelona, ACCIÓ, Barcelona City Council: "Tech hubs overview"

Foreign investment in technologies linked to the health sector in Catalonia



- Catalonia** has been the **fifth-ranked region in the world** in attracting foreign investment projects in technologies linked to the health sector in the last five years
- Catalonia, the preferred destination in Spain**: it ranks top in projects (56% of the total), in terms of invested capital (60%) and jobs created (56%).

Ranking by projects

- 1 Ireland
- 2 Massachusetts
- 3 California
- 4 Ile-de-France
- 5 Catalonia**

Ranking by capex

- 1 Massachusetts
- 2 California
- 3 Kanto
- 4 Ireland
- 5 Catalonia**

Investing companies in Catalonia



Teladoc HEALTH ACCIÓ Governador de Catalunya
Teladoc Health chooses Barcelona to locate its first digital hub in Europe

AstraZeneca ACCIÓ Governador de Catalunya
AstraZeneca will create 1,000 new jobs in Barcelona

18 projects

1,003 million euros

1,943 jobs created

Note: the data refer to the 2019-2023 five-year period.

Impact of investment in digital health on the economy

Short-term impact:


€1,208 M in GVA (0.5% of the GDP)


17,343 jobs (0.5% employment)

Mid-term impact:

Digitization is one of the most important ways that the healthcare system has to increase its productivity and thus improve the GDP per capita.

Potential impact of AI applied to the health system

 Saving of 6,700 lives each year

 **€3,000 M savings each year**
(1.4% of the GDP in 2021)

 Freeing up of 30 M hours per year for healthcare professionals
= 8,300 more full-time health professionals
= 2% of the hours worked by professionals in Catalonia

Potential economic and savings impact of teleconsultations in primary care

Savings situation 2021: **€372 M**

 Public sector: **€91 M**

 Society: **€281 M**

(0.15% of **Catalonia's** GDP)

Nursing consolidation savings 2021: **€452 M**

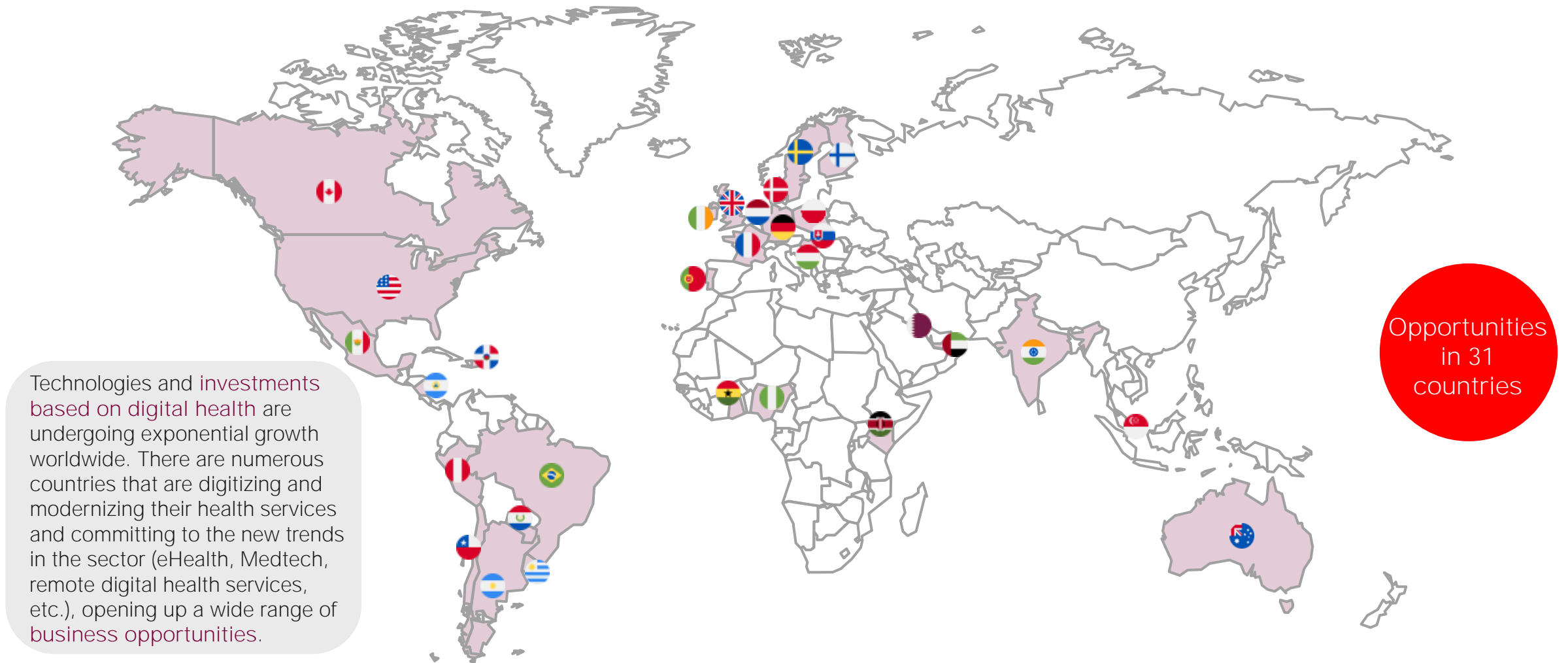
 Public sector: **€110 M**

 Society: **€342 M**

(0.19% of **Catalonia's** GDP)

International business opportunities in digital health

Main markets with business opportunities for Catalan companies identified by ACCIÓ:



Technologies and investments based on digital health are undergoing exponential growth worldwide. There are numerous countries that are digitizing and modernizing their health services and committing to the new trends in the sector (eHealth, Medtech, remote digital health services, etc.), opening up a wide range of business opportunities.

Source: Global map of international business opportunities (2024), ACCIÓ

SWOT of digital health in Catalonia

Strengths



Strong business fabric



Pioneering health system and ecosystem



Global benchmark research and hospital system



Highly dynamic, varied and expanding network of startups

Opportunities



Leadership in initiatives and projects



Capitalizing on the progress of other technologies, such as AI, RX, robotics, etc.



Improvements in the health system. Public procurement of innovation.



Creation and development of solutions for different challenges and therapeutic areas.

Weaknesses



Network of small-scale technology providers



Human factor: need for different profiles



Validation models



Interoperability

Threats



Emergence of major technologies in the world of health



Lack of data quality



Significant technological cost



Resistance to change

Digital health in Catalonia

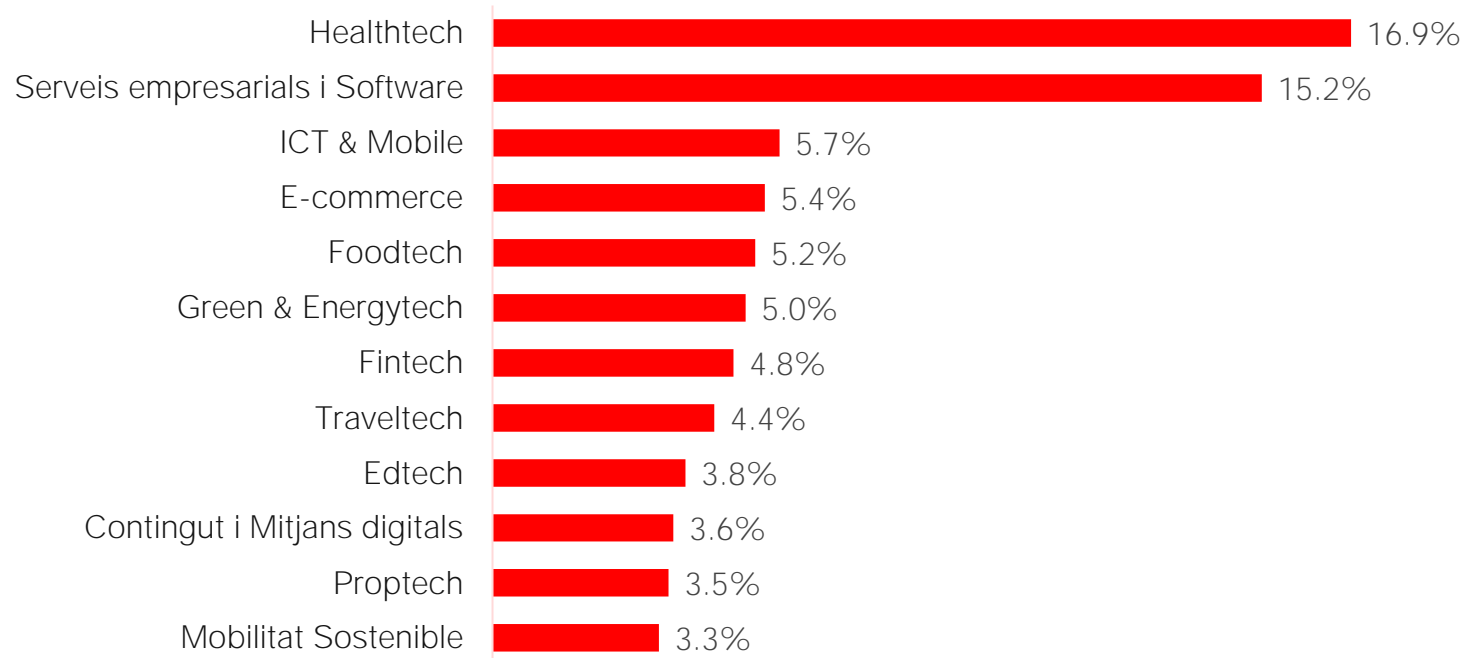
7. Digital health entrepreneurial ecosystem in Catalonia

Startups in Catalonia



The **health technology** sector brings together the largest number of startups in Catalonia, with **356** accounting for **16.9%** of the total

Sectoral distribution of the startups (%)



Note: this chart has been drawn up using the data of the 2,102 startups in the directory that possessed this information. The analysis has been conducted with the main sector of each company

* Sector introduced in 2023

Sector	Number of startups
Healthtech	356
Business services and software	319
TIC & Mobile	119
E-commerce	113
Foodtech	109
Green and Energytech	105
Fintech	100
Traveltech	92
Edtech	80
Content and digital media	75
Proptech	73
Sustainable mobility	69
Sports	60
Fashion and design	59
Hardware	56
Adtech	55
Video games	53
Logistic Tech	50
Community and social media	50
Beauty & Personal Care	38
Agritech	34
Legaltech	32
Musictech	5
Total	2,102

Source: Barcelona & Catalonia Startup Hub, 2023, ACCIÓ

Capital rounds in digital health in Catalonia



**Investment: €18 M
2023**

A healthcare company that provides home care and assistance services for the elderly and people with special needs.



**Investment: €17 M
2023**

Healthtech focused on direct diagnoses of sepsis.



**Investment: €5.7 M
2022**

A health technology platform that provides on-demand mental health and wellness support for employees.



**Investment: €5.5 M
2023**

A health technology platform that provides on-demand mental health and wellness support for employees.



**Investment: €5 M
2022**

A company that provides home care services.



**Investment: €1.8 M
2023**

Specialized in medical devices to monitor physical and biochemical parameters of the skin through sweat



**Investment: €1.75 M
2023**

A startup that develops technology to increase the ratio of pregnancies in *in vitro* reproduction.



**Investment: €1.5 M
2024**

A spin-off from the UB specializing in digital cognitive health.



**Investment: €1.35 M
2023**

A startup that enables healthcare professionals to attend to their patients by chat, call or video call.



**Investment: €1 M
2023**

A startup that promotes tools to monitor patients with implanted stents.

Note: 2022, 2023 and 2024 (until March) are taken as references



Digital health in Catalonia

8. Success stories



Mediktor has developed an AI algorithm that recognizes symptoms by using language recognition.



Angelini Pharma is taking part in an innovative virtual reality project focused on epilepsy awareness among doctors.



DKV Innolab names the winner of DKV Challenges, an application that strives to prevent dementia.



Indescat promotes several projects in the field of sport focused on monitoring the health of athletes.



Broomx has demonstrated the beneficial effects of cognition through immersive virtual reality (IVR) in cancer patients.



We Mind Cluster is working on several projects to develop technological solutions in the fields of aging, mental health and neuroscience.



Oracle Health is opening its Europe Oracle Health Support Hub in Barcelona.




Ypsomed is opening its first R&D center outside Switzerland in Barcelona.

Thank you!

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More information about the sector and related news:
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technologies/technologies/digital-health-in-catalonia](https://catalonia.com/key-industries-technologies/technologies/digital-health-in-catalonia)

