REPORT **biocat**

The life sciences and healthcare sector in Catalonia

2023 BioRegion Report

2023 #BioRegionReport report.biocat.cat

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Executive Summary

1,400

companies and 91 research entities make up Catalonia's life sciences and healthcare sector

The industry's contribution of 4.1%, coupled with the impact of health activities at 3.8%, has yielded a combined economic impact of 7.9% on Catalonia's GDP

Industry and health services provide nearly 264,000 jobs (predominantly highly qualified talent), accounting for 6.5% of Catalonia's employed population.

The sector has seen higher growth than in previous years, with an annual average (CAGR) of 3.81%.

A total of 94% of the sector is concentrated in the province of Barcelona. SMEs make up 89% of the business network.

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+€1,025 M

of Foreign Direct Investment in the sector in 2023, up 110% on last year

This boost was driven by the opening of the new R&D hub of the multinational AstraZeneca and Alexion, its rare diseases division. It is the largest foreign R&D investment project in Catalonia to date. Investments by foreign companies from the sector in the BioRegion between 2019 and August 2023 accounted for a total of €1,684 M in direct investment and have created over 4,600 jobs.

Between 2019 and 2023, 25 new hubs of excellence, digital development, tech centres and subsidiaries of large multinationals were established in the BioRegion of Catalonia. They have created and/or announced the creation of +5,000 new jobs.

On this point, +50% of Spain's pharmaceutical industry is based in Catalonia and it is the 2nd region in Spain in exports of life sciences and healthcare products.

See pages 8-11 ↘

+€220 M

in investment raised by startups and scaleups. 52% comes from venture capital (through 37 operations)

Despite the global geopolitical, financial and economic context, the investment has declined but remains above €200 M, a trend perceived prior to (the exceptional) 2022. Venture capital (52%) and subsidies (which have doubled) are the main sources of financing.

58% of venture capital raised had international participation, having a share in 13 operations. Despite declining international participation, +15 new VCs came to the BioRegion in 2023. By contrast, national participation has set new records: 36 VC firms have invested in 25 operations.

Digital health is the only subsector experiencing growing, with a 61% increase compared to the previous year and is coming close approaching its historical maximum with €64 M. Even if decreasing, biotech has exceeded +€110.

The highest operations in 2023 have been for InBrain Neuroelectronics (€20 M), Quida (€18 M) and Som Biotech (€17 M).

See pages 15-18 ↘

#3

in number of publications (per M hab) on advanced therapies in Europe

Catalonia leads the way in terms of capacities in the development of Advanced Therapy Medical Products (ATMP) in Spain. Hospital Clínic, Hospital Vall d'Hebron, Hospital de Can Ruti, Hospital de Sant Pau, Hospital Sant Joan de Déu, Banc de Sang i Teixits, Leitat, the UB and the UAB are stand-out institutions in advanced therapy research in Catalonia.

Catalonia holds 3rd position (per M hab) in terms of the number of scientific publications on ATMP in Europe, only behind Switzerland and the Netherlands, between 2013 and 2022.

In addition, Catalonia is the territory to have recorded a higher percentage of growth (156%) in this period.

For applications for patents in advanced therapies, Catalonia holds 6th position (per M hab) in Europe.

See page 24 ↘

#5 in Europe, #8 worldwide

in participation in active clinical trials

The pharmaceutical industry is firmly committed to Catalan hospitals and institutes for the development of its clinical research and most innovative treatments, as it is here that it can find KOL and highly qualified professionals in many different clinical areas, high-level scientific facilities, a strong healthcare system, favourable regulations, and growing patient recruitment.

In 2023, 88.5% of all clinical trials in Spain were conducted in Catalonia (with 5,308 active trials), which places it 5th in Europe and 8th in the world.

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Summary

Preface

1 Overview and key indicators

2 Investment and funding in startups and scaleups

3 Science and technology assets

4 Methodology

Digital Transformation and Advanced Therapies: drivers of change towards a sustainable future for the sector

The hectic pace of digital transformation driven by the pandemic has still been a major topic of discussion in 2023. International analysis suggests the year has been a turning point, with companies shifting from the reactive adoption of solutions to the intentional integration of advanced technologies along the value chain. Without a doubt, most conspicuous drivers are the strong and widespread emergence of artificial intelligence, machine learning and process automation, not forgetting health data. The quality, completeness and sharing of data, breaking down the silos containing them, is a global challenge. In Europe, as in Catalonia, the impact that the path towards a European health data strategy will on research and innovation, the provision of healthcare services, the patient journey through the system is, as yet, incalculable. But there is concern that the legislative framework falls short and cannot meet the expectations of a sector that foresees huge benefits from health data for healthcare systems, health professionals and patients. What is at stake is simply too important for them all and for the research and innovation capacity of the European Union.

This brings us to the second point that we wish to discuss here. The availability of data facilitates preclinical and clinical studies of highly anticipated treatments, gene, cell and tissue therapies. Three issues must be resolved to make effective the hopeful promise of advanced therapies in Europe in the not-too-distant future: (i) regulatory approval, based on real-world data (RWD); (ii) manufacturing and transportation, which challenges current production models and capabilities, and (iii) the adoption and reimbursement of products changing the traditional business models of pharmaceutical companies.

The discussion of regulatory complexity and adoption leads us to a third topic, widely discussed at debates, forums and conferences: the burden of the regulatory process on companies subject to regulation (of medical devices, in vitro diagnostics and software as a medical device, or SaMd), the effects of which echoes across the health innovation ecosystem. The EU's current regulatory framework includes two regulations with the well known acronyms MDr and IVDR. Regulatory governance is a combination of EC units, competent state authorities, notified agencies and public and private economic operators. It is an expensive impediment to innovation that approves barely more than 10% of what it receives, while companies observe the US and its FDA with defined and structured timetables. Europe has a huge opportunity if it can only harness the revolution that our sector offers[1], effectively converting scientific strengths to impact and helping the world to overcome the most pressing challenges in health and sustainability. A sector that offers solutions but is also a major contributor to global carbon emissions. In a world battling the climate crisis, sustainability is now a non-negotiable, both for healthcare centres and for their suppliers of innovation, products and services.

These reflections, made in the context of the BioRegion of Catalonia, have guided Biocat's 2024-2027 Strategic Plan, drawn up with the collaboration of key public and private agents in the ecosystem, and structured around five major challenges that we will face together in the coming years.

The emergence of innovative technologies is stimulating the **transformation of the health system**, which responds to the first challenge of the BioRegion: a better-functioning, higher quality health system. The adoption of innovation based on value, digital transformation, the education and training of expert professionals and economic and environmental sustainability will be the main areas to focus on over the coming years.

The second challenge is to foster business **growth and consolidation** to ensure the agile and structured implementation of innovative technologies, products and services in the market and in clinical practice, which will require a concerted effort of transfer, public-private investment and the adoption of innovation by the health system.

The exponential increase in chronic conditions, infectious and genetic diseases, those caused by the climate emergency or antimicrobial resistance, among others, are a challenge and a priority for healthcare, and require a system equipped for the **integration of new therapeutic strategies** with strong potential and an impact on the health and quality of life of the general public.

A fourth challenge for the BioRegion is **talent attraction and development**, necessary to deal with the healthcare and technological changes that the sector is undergoing. The scarcity of talent will become even more pronounced with the emergence of innovative technologies, which will require the incorporation of new specialist profiles.

A strong **positioning of the BioRegion** of Catalonia as a benchmark health innovation ecosystem in strategic terms would help overcome these challenges.

Biocat, the driving force behind the health innovation ecosystem in Catalonia, works to scale and consolidate the sector by creating social and economic impact and to project the BioRegion as an international benchmark. The organisation has devised its strategy around these challenges, integrating a Planetary Health approach as a cross-cutting framework for all the actions that it will roll out over the coming years.

[1] https://www.mckinsey.com/industries/life-sciences/our-insights/europes-bio-revolution-biological-innovations-for-complex-problems

1
Overview and key indicators

Photograph: Port of Barcelona

Catalonia's health innovation ecosystem

The life sciences and healthcare sector in Catalonia, commonly referred to as the 'BioRegion', emerges as a key catalyst for innovation, economic and social advancement in the region. Barcelona, hosting 94% of the sector, stands prominently as one of the most dynamic health research and innovation hubs in Europe.

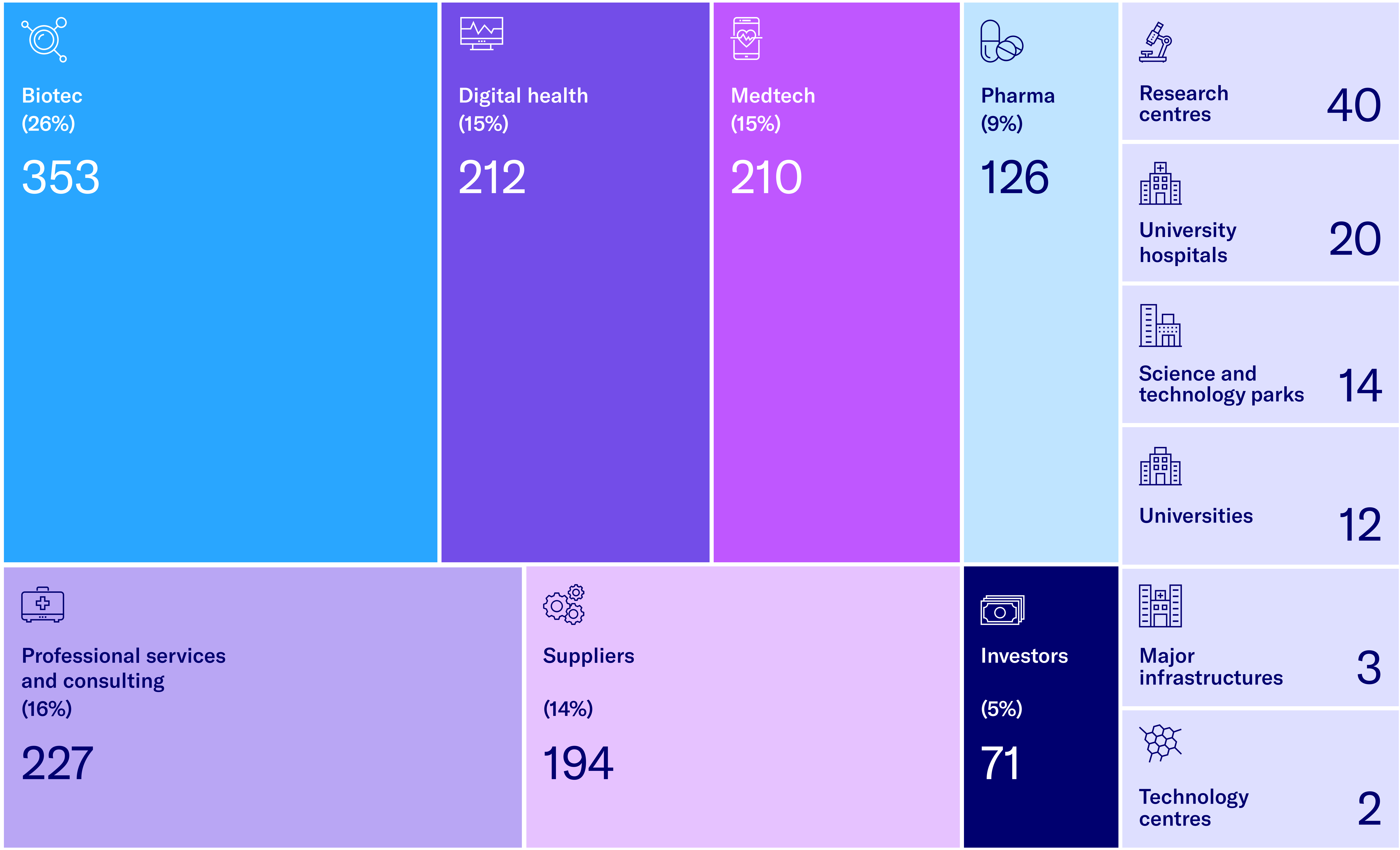
As illustrated, by 2023, the health innovation ecosystem in Catalonia is projected to encompass nearly 1,400 companies and 91 research entities within the region. The collective economic impact of the industry (4.1%) and healthcare activities (3.8%) contributes to a significant economic influence on Catalonia's GDP, accounting for 7.9%. Together, the industry and health services sector generate nearly 264,000 jobs, representing 6.5% of the employed population.

Throughout 2023, most indicators measuring the expansion of the ecosystem evolved moderately or significantly, with the exception, as expected, of investment in venture capital. The sector continues to grow through the development of business initiatives and cutting-edge research projects, the mobilization and attraction of capital, the excellence of science developed in research entities and institutes, the quality and competitiveness of hospitals and the Health System, and the strategic support of the Administration. Ultimately, this growth is attributable to the highly qualified talent, both local and international, driving forward all players of the value chain within this sector.

The BioRegion of Catalonia ecosystem 2023

1,400 companies ↘

91 research institutions ↘



Source: Biocat (december 2023)

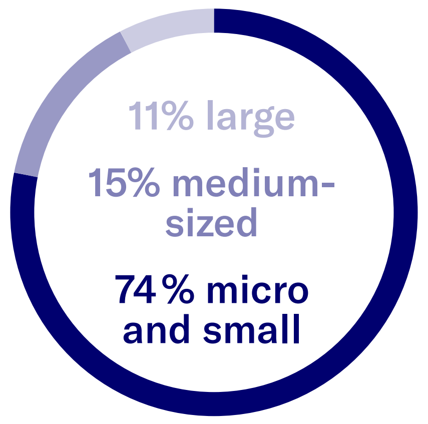
Growth in macroeconomic indicators

The evolution of turnover and employment indicators in the sector's industry shows higher growth than in previous years, with an annual average (CAGR) of 3.81%.

The total turnover of the life sciences and health sector, which includes all companies and health services, exceeded €42,068 million in 2022, representing a 6.8% increase over the previous year. Despite having the smallest number of companies (126), the pharma subsector accounts for 47% of private turnover. On the other hand, the 212 digital health companies represent only 2%, although this segment is experiencing rapid growth, with a 102% increase over the past 5 years.

The industry contributes 56% to the overall business volume of the sector and accounts for 26% of total employment, providing nearly 70,000 jobs in 2022. It's noteworthy that there was a 23% increase in employment over the last 5 years, which has significantly boosted the industry. The total number of professionals working in the sector in 2022 is almost 264,000, accounting for 6.5% of the employed population.

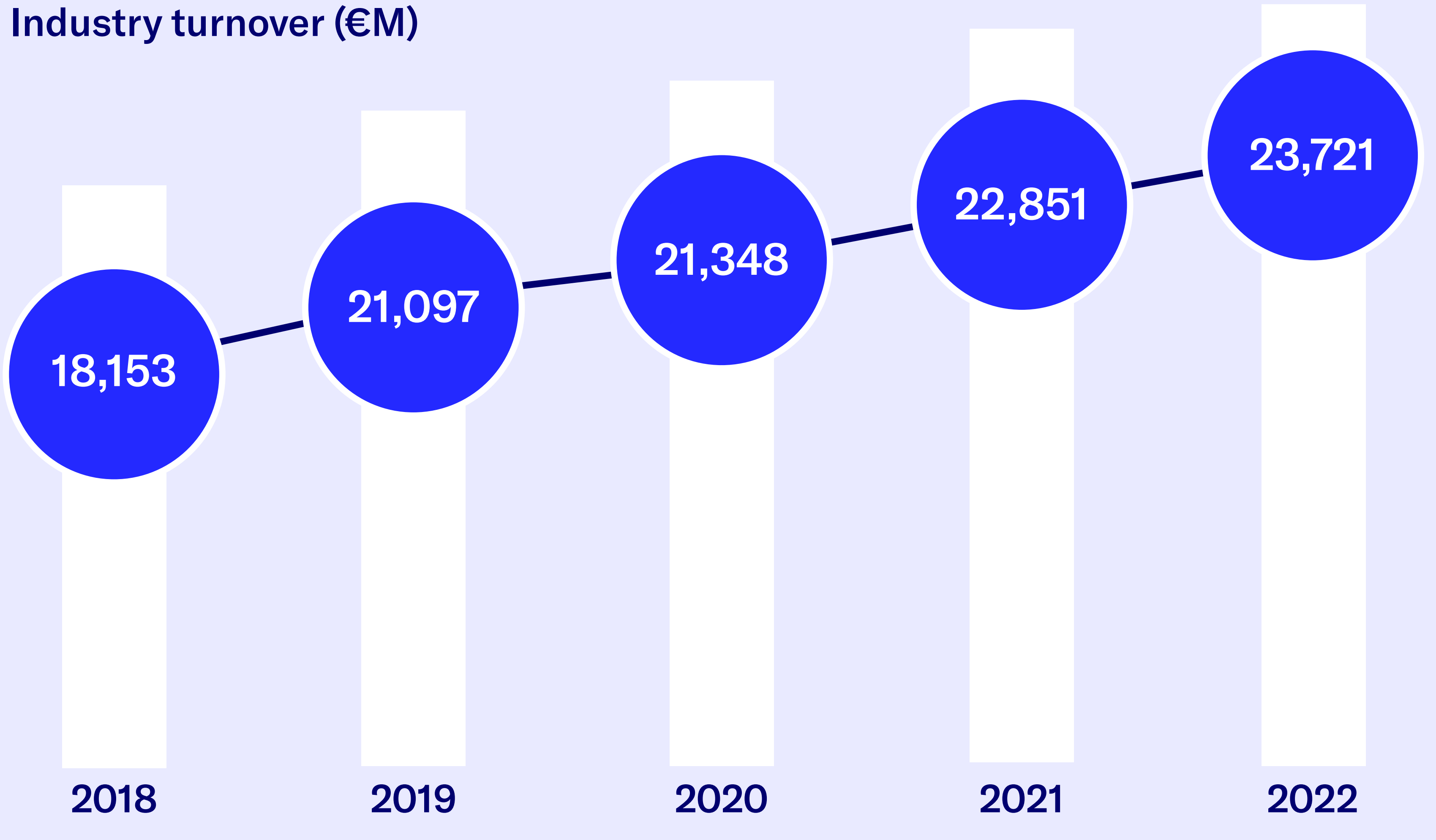
Size and location of the companies ↘



Most of the business network in the sector is made up of SMEs, which account for 89% of the total. 94% are established in the province of Barcelona.

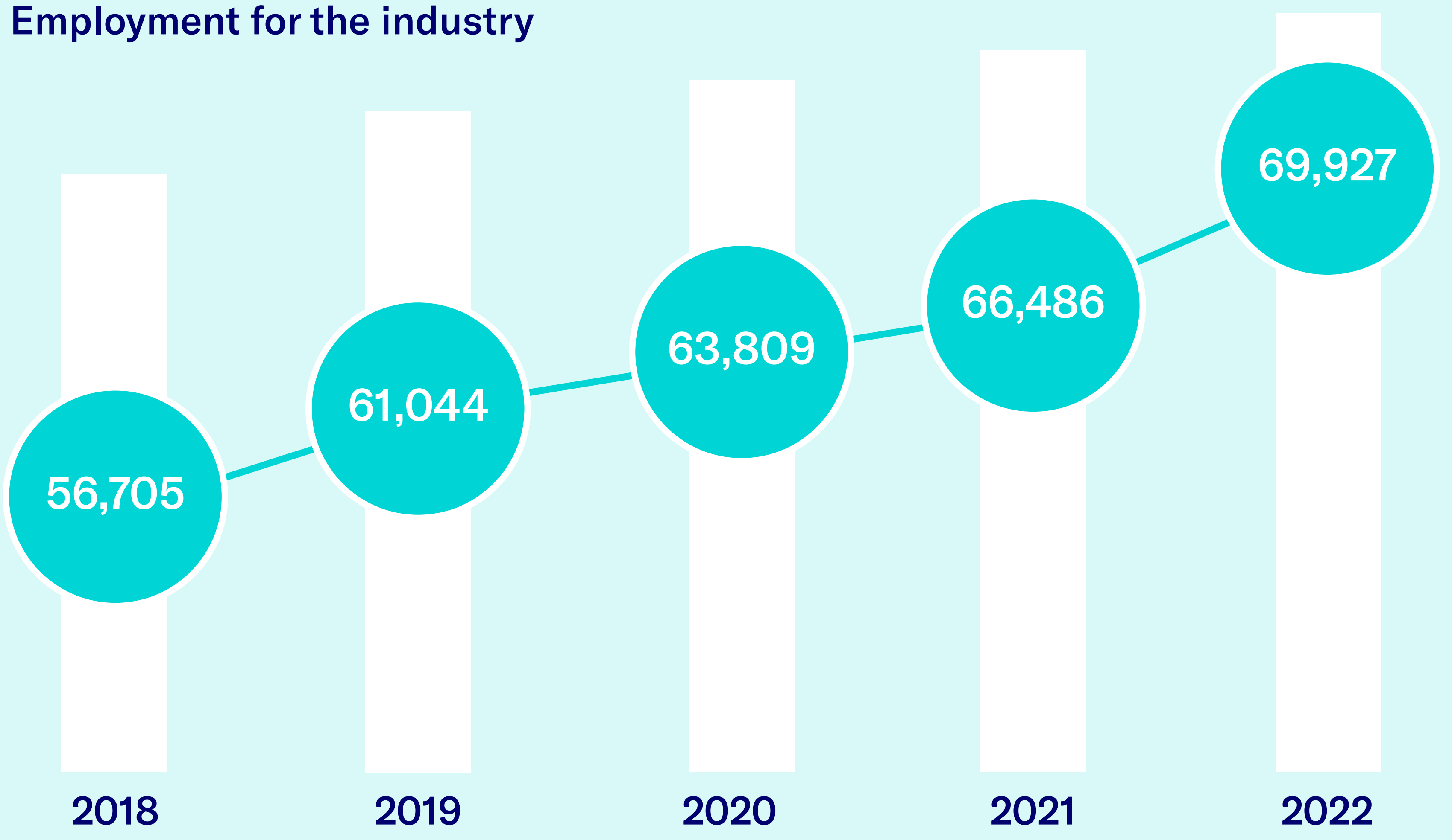
Macroeconomic indicators

Industry turnover (€M)



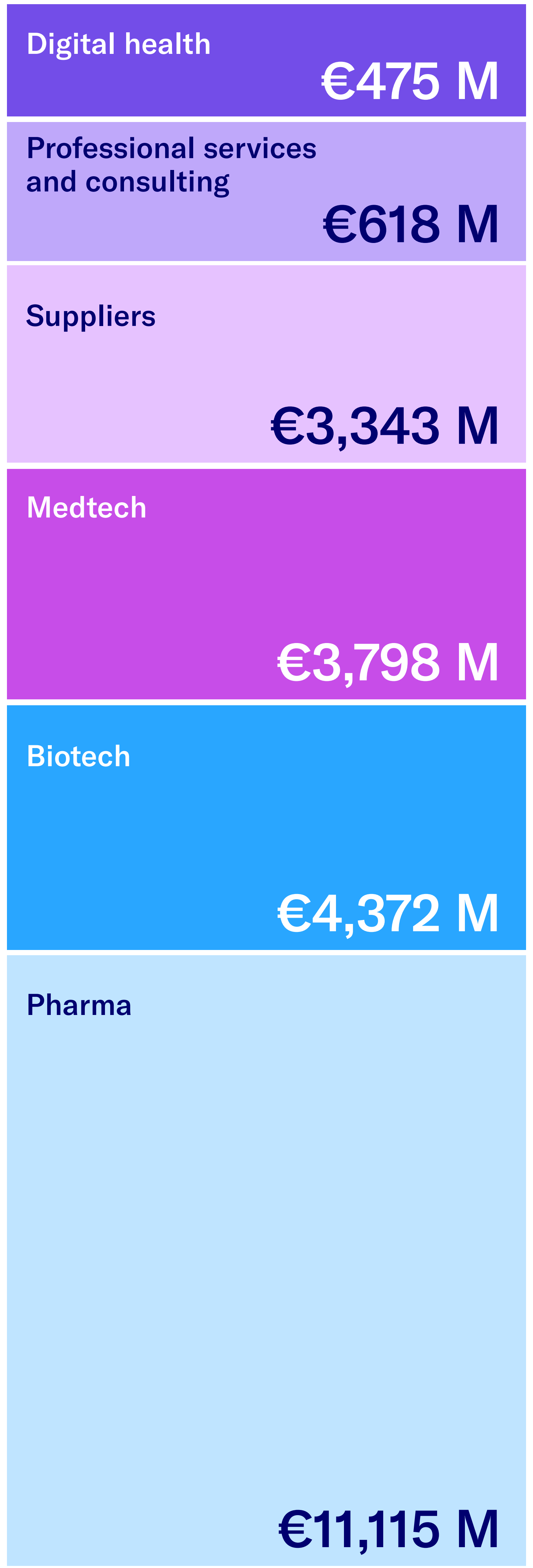
Turnover of the sector 2022

Employment for the industry



Employment for the sector 2022

Industry turnover 2022



Sources: Biocat, SABI 2022 and Idescat 2020

* Healthcare activities: including the provision of healthcare and social services to healthcare institutions providing accommodation and offering diagnostic and medical treatments to patients.

Catalonia's healthcare exports: second leading region in Spain

€8,846 M

Exports of life sciences and health products (2022), 14% up on the previous year

31% of Spain

In 2022, Catalonia dropped to 2nd position in the number of health product exports behind Madrid, which leads the country with 61% thanks to the sale of the COVID-19 vaccines by Rovi and Insud Pharma.

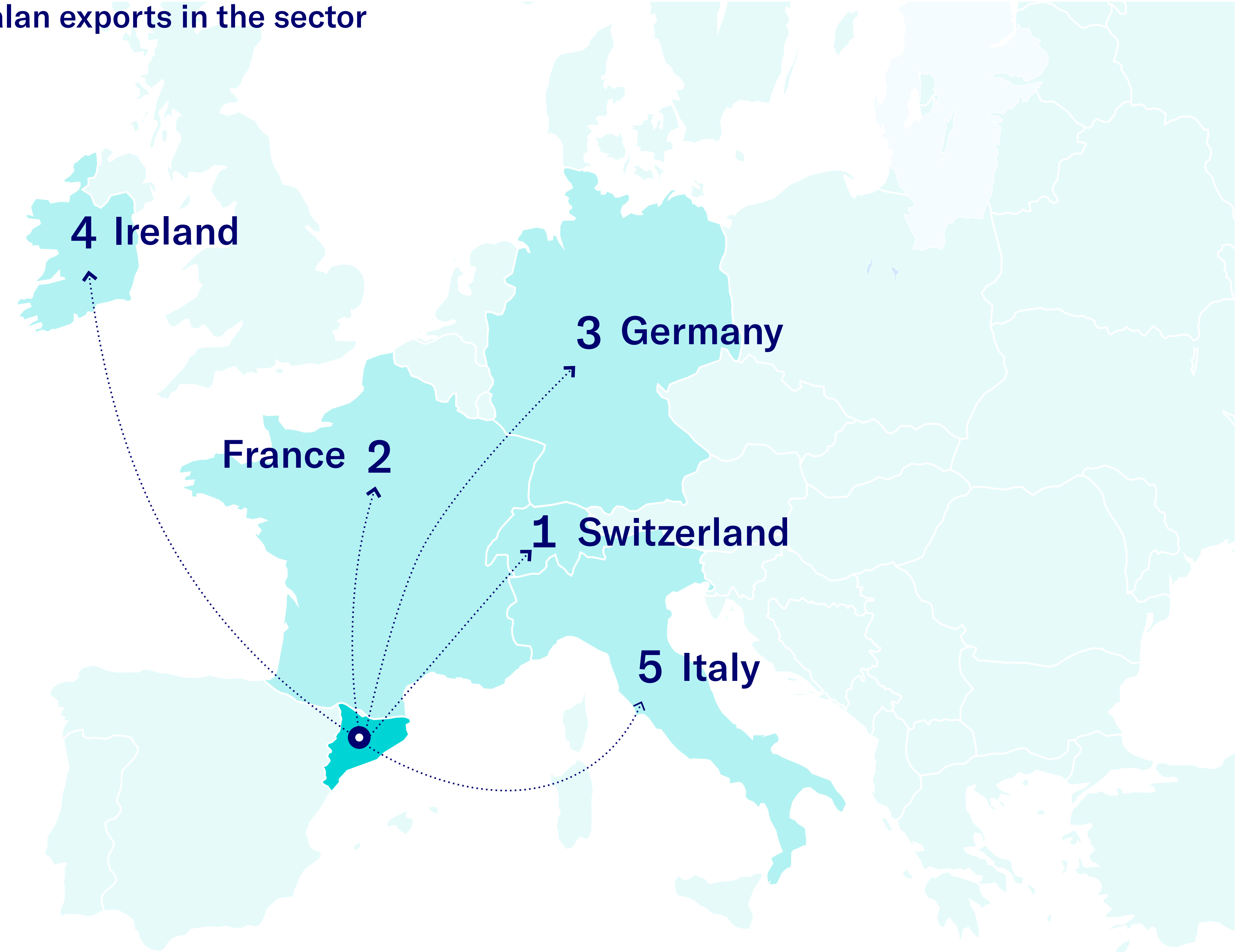
9% Of total Catalan exports

862 Companies regularly exporting life sciences and healthcare products (2022), 22% up on 2021

44% Of the total number of exporting life sciences and healthcare companies in Spain

Source: ACCIÓ based on DATACOMEX, ICEX (Provisional data from 2022, downloaded in October 2023)

Main destinations of Catalan exports in the sector



863 subsidiaries abroad of Catalan companies from the life sciences and healthcare sector ↘

almirall, Bioiberica, Laboratorio Echevarne, Esteve, Ferrer, Galenicum, Grifols, Grupo Indukern, ISDIN, Kern Pharma, Lacer, Matachana, Medichem, Palex, Reig Jofre, Salvat, Synlab, Uquifa, Uriach, Werfen

Source: Census of Catalan companies with subsidiaries abroad, 2022
Illustrative, non-comprehensive list of companies present abroad.

Top class products exported ↘

Manufacture of medical and dental instruments and supplies	0,31%
Radiation, electromedical and electrotherapy equipment	7,8%
Pharmaceutical products	91,89%

Leading regular* exporting companies ↘

almirall, B. Braun, Bioiberica, Esteve, Ferrer, Grifols, Novartis, Sandoz, Werfen

* Companies that have exported over the consecutive past 4 years.

Record in Foreign Direct Investment due to the attraction of AstraZeneca's R&D hub

Investments by foreign companies in the BioRegion between 2019 and 2023 accunted for a total of €1,684 million in direct investment, resulting in the creation of over 4,600 jobs.

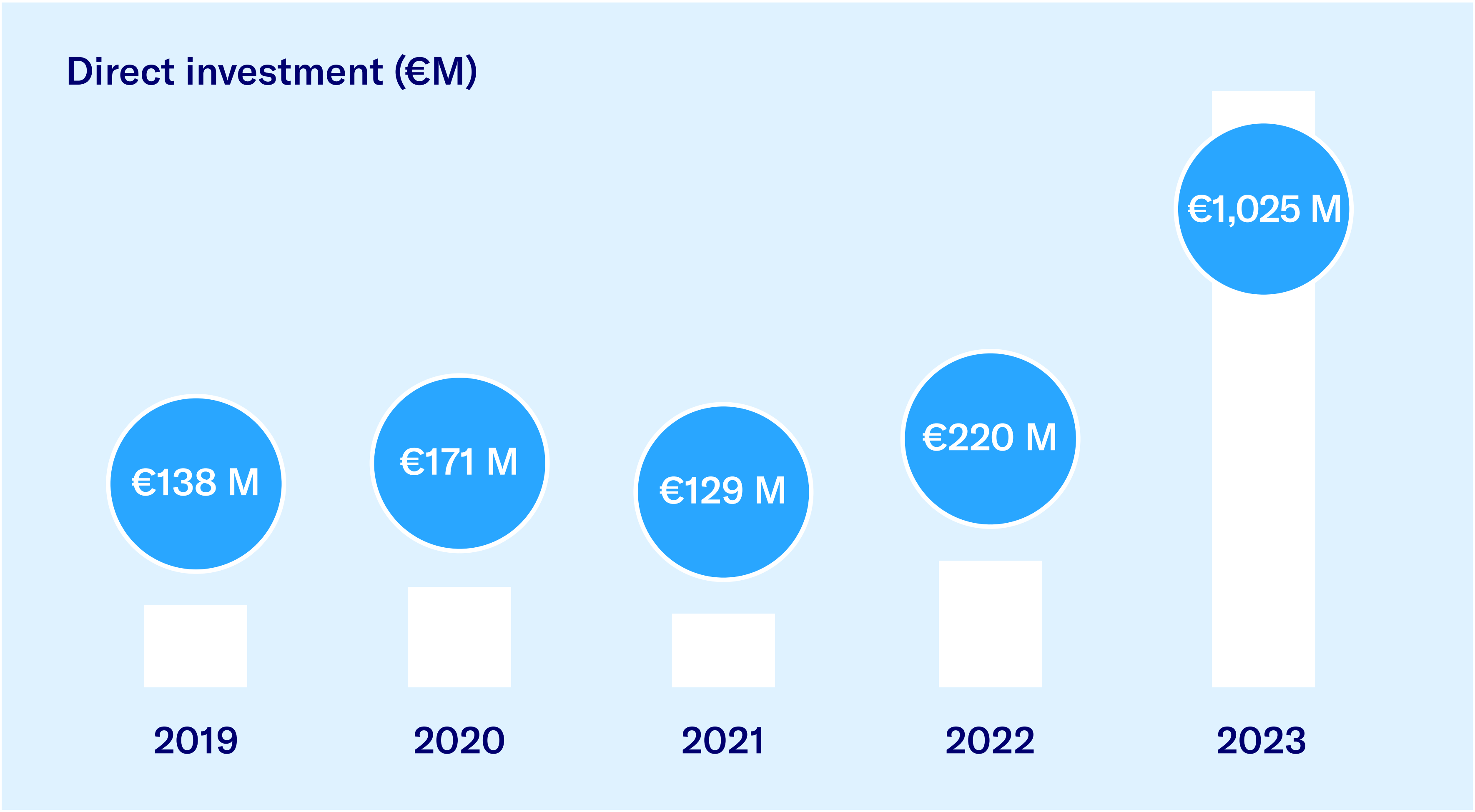
In just the 1st half of 2023, investment increased by 110% ompared to the previous year, and employment by 366%. This boost is the result of the announcement by the Anglo-Swedish multinational AstraZeneca and its division focused on rare diseases, Alexion, regarding the establishment of its Research and Development hub in Barcelona. This is the largest foreign R&D investment project in Catalonia to date, with an investment of nearly €825 million and a goal of creating more than 1,100 jobs.

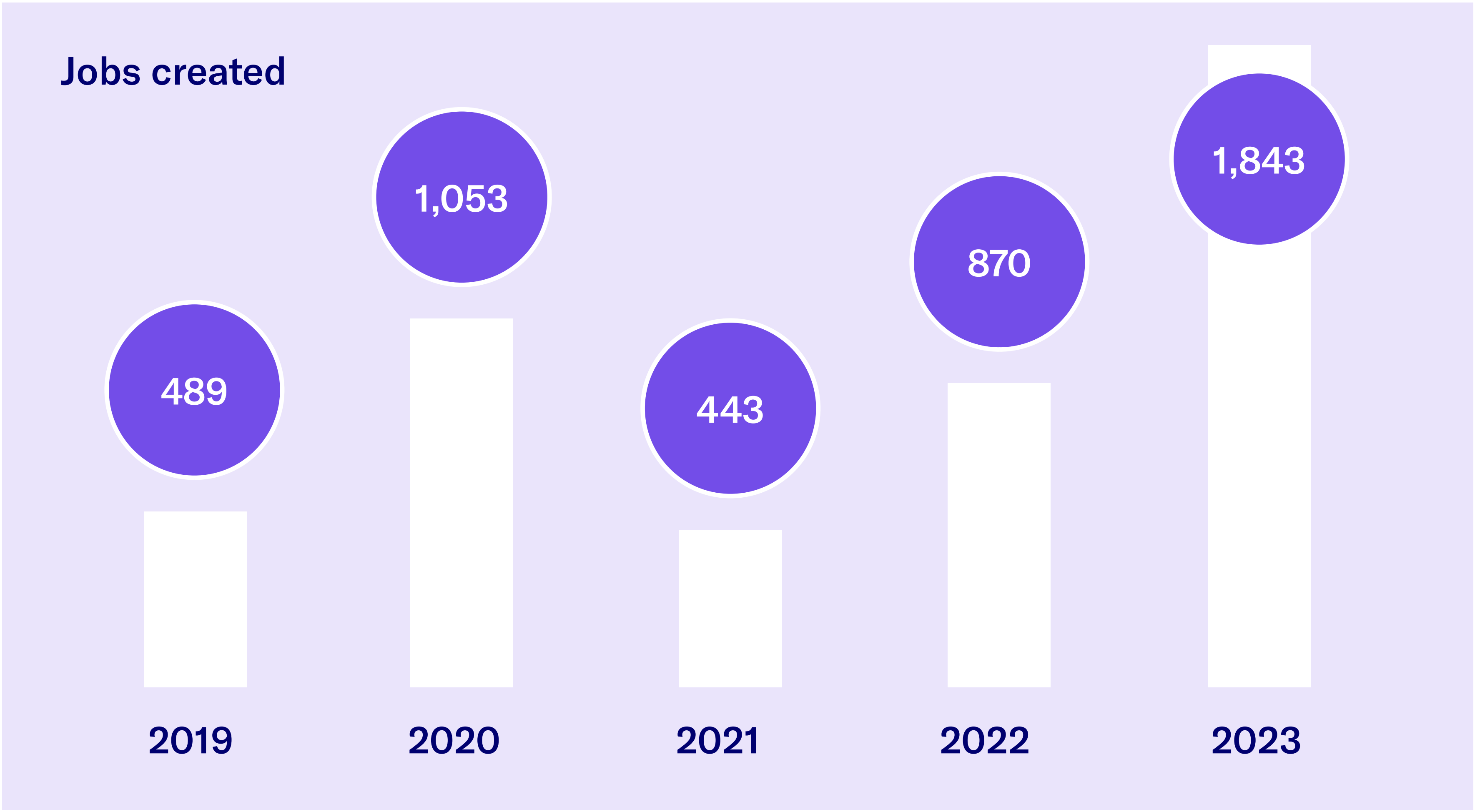
In fact, as illustrated below, the United Kingdom leads the ranking of the main countries investing in Catalonia in recent years, followed by the United States and Japan.

Top 10 countries in terms of investment and jobs (2019-2023) ↘

Direct investment (€M)		Jobs created	
United Kingdom	€824 M	United Kingdom	1,105
Japan	€216 M	United States	1,034
United States	€192 M	France	659
Switzerland	€165 M	Japan	510
France	€112 M	Switzerland	475
Germany	€56 M	India	348
India	€53 M	Germany	296
Netherlands	€48 M	Netherlands	117
Belgium	€8 M	Sweden	84
Norway	€3 M	Belgium	30

Foreign Direct Investment in the BioRegion (2019-2023)





Source: ACCIÓ based on FDI Markets. 2023 Data (provisional)

Global Healthcare Players: Catalonia's Magnet for Multinationals

Between 2019 and 2023, over 20 new hubs of excellence and digital development, tech centres, and subsidiaries of large biotech, pharma, medtech or digital health companies were established in the BioRegion of Catalonia. Among the most prominent during this period were Astrazeneca, Alliance Healthcare, Bayer, Boehringer Ingelheim, Dedalus, Novartis, Roche, Sanofi and Teladoc Health. Overall, over 50% of the main multinationals are present in Catalonia[1].

Catalonia also historically concentrates more than 50% of the Spanish pharma industry and has an outstanding representation of local multinationals that operate internationally from the region. These companies, among others, focus on incremental innovation of medicines. Examples include Almirall, Esteve, Ferrer, Grifols, Hipra, Isdin, Reig Jofré, and Werfen.

The 9,255 global companies established in Catalonia (62% more than 10 years ago[2]) are an essential asset for the competitiveness and economic growth of the ecosystem. They foster innovation, collaboration in clinical R&D and development, attract and qualify talent, facilitate knowledge transfer, and adopt good practices and cutting-edge technology.

Multinationals headquartered in the BioRegion

R&D, production plant and logistics centre ↘

Aldo-Unión, almirall, Bioiberica, Dentaid, Esteve, ferrer, GAES amplifon, Galenicum*, Grifols, Hipra, inibsa, ISDIN, Kern Pharma, Lacer, medichem, Reig Jofre, Rubió, Salvat, Uriach, Vidara, werfen

Hubs and subsidiaries of multinationals in the BioRegion

R&D, production plant and/or logistics centre ↘

Alliance Healthcare, Euromed, Hartmann, Menarini, Novartis, sanofi, Siegfried, Synthon, Towa, zoetis

R&D ↘

Alexion AstraZeneca Rare Disease, AstraZeneca, Bayer, B. Braun, Boehringer Ingelheim, Chiesi, Dedalus, Gebro Pharma, Gedeon Richter, Leo, Roche, Synlab, Teladoc Health

Production plant and/or logistics centre ↘

AGC, Angelini Pharma, Croda, Fresenius Medical Care, Interquim, S.A., Ipsen, Medtronic, Merck, Neuraxpharm, Palex, Pierre Fabre, Zambon

Commercial office↘

Abbott, Allianz, Amgen, Beckman Coulter, CSL Behring, GE HealthCare, Johnson & Johnson, Lundbeck, Olympus, Otsuka, Pfizer, Smith+Nephew, Stada, Zimmer Biomet, ZimVie

*Galenicum only has R&D in the BioRegion, production is abroad.

Sources: ACCIÓ and Biocat

A partial representative sample of multinational companies established in the BioRegion of Catalonia.

[1] ACCIÓ, based on Orbis (National Economic Activities Classification Code, CNAE 21, 325, 266)

[2] Directory of subsidiaries of foreign companies in Catalonia. ACCIÓ, 2023

Attraction, development and generation of qualified talent in Barcelona

Over the coming decade, competition for talent will become increasingly important as a critical element in the competitiveness, innovation, and geopolitical influence of cities, nations, and organizations[1]. In this context, Barcelona stands at the forefront in various international rankings that assess cities based on different indicators, such as being the best city in the world to live and work, the best city in Southern Europe to invest in R&D centers and pharmaceutical production plants, and the best European city to attract startups, scaleups, or entrepreneurs[2].

This strong reputation, coupled with the scientific and technological competitiveness of research centers (such as CRG, IBEC, IDIBAPS, IRB, ICFO, VHIO, etc.), major infrastructures (such as BSC, ALBA, or CNAG), the establishment of significant new research and innovation complexes (such as the Caixa Research Institute or Mercat del Peix), large science parks (such as PCB and PRBB), or public talent recruitment programs (such as ICREA), among other examples, helps propel Barcelona into the spotlight of the scientific community, entrepreneurial community, and international professionals. Additionally, it offers a multitude of opportunities to local talent emerging from major Catalan universities or those already in the workforce.

The attraction of multinational hubs also contributes to the mobilization of talent, with the creation of over +5,000 new jobs announced between 2019 and 2023.

[1] Global Talent Competitiveness 2023
[2] Financial Times Rankings, Startup Heatmap, Dealroom

Talent generation in the BioRegion ↘

Total annual university graduates in scientific fields (2022) ↘

	Total	% women
Bachelor's degrees	15,404	50%
Masters	7,856	51%
PhDs	1,661	47%
Industrial PhDs	3%	

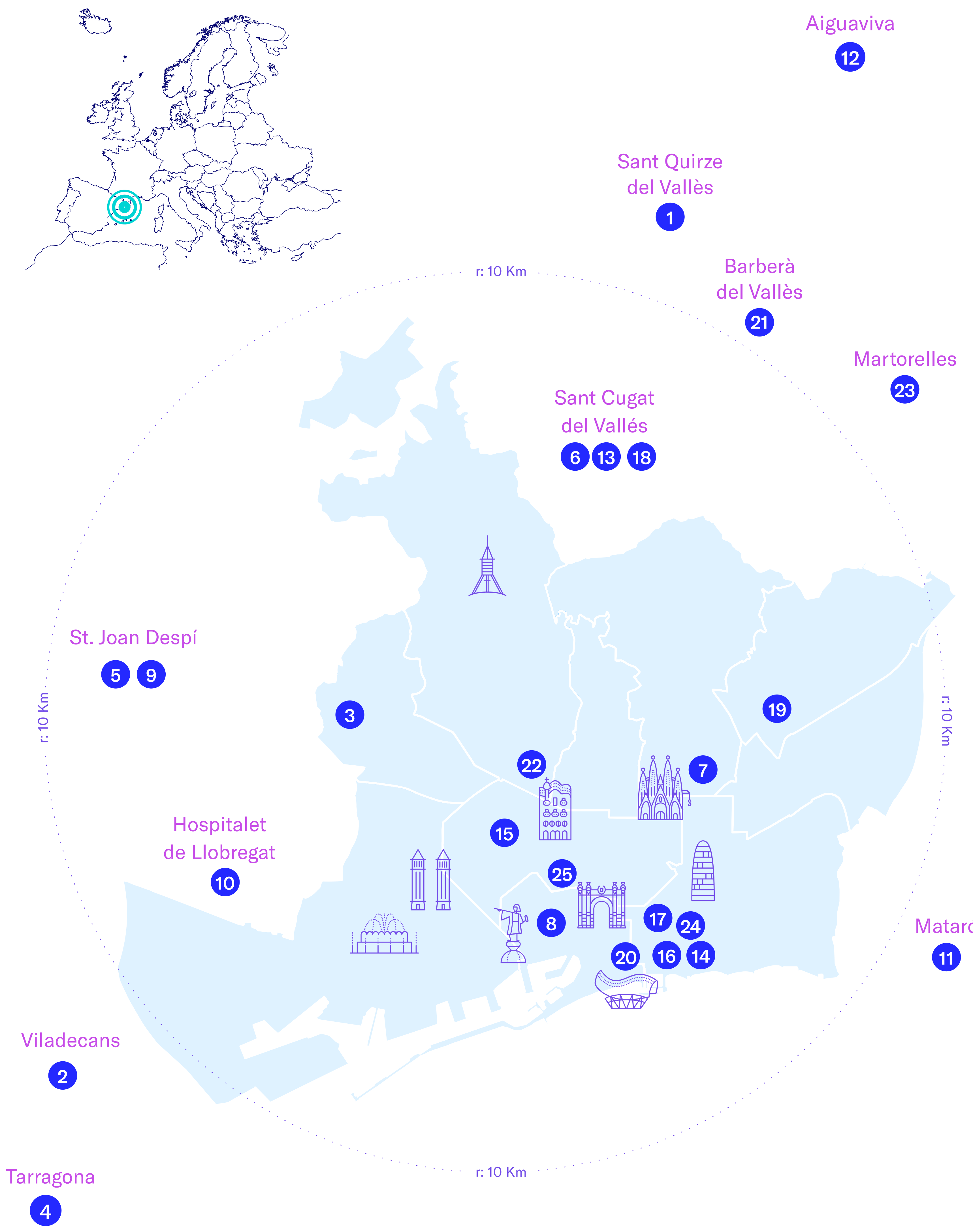
Total research staff in research centres working in life and healthcare sciences* (2021-2022) ↘

	Total	% women
Research staff	+9,600	49%

% women

Source: UNEIX (2021-2022)
*CERCA and CSIC centres
Note: the scientific fields of science include all science, health science and engineering studies.

Attraction of digital hubs and of excellence in health or with applications in the sector (2019-2023) ↘



New jobs created/announced: +5,000

No.	Company	New jobs	No.	Company	New jobs
1	ABB	35	14	Microsoft	100
2	Alliance Healthcare	200	15	NOVARTIS	60
3	AstraZeneca Alexion	1.000	16	NTT Data	1.000
4	BASF	15	17	ORACLE	300
5	BAYER	100	18	Roche	50
6	Boehringer Ingelheim	340	19	sanofi	100
7	Dedalus	64	20	santévet	70
8	ERNI	100	21	Siegfried	40
9	essity	180	22	Teladoc Health	100
10	FESTO	30	23	TOWA	173
11	HARTMANN	50	24	vmware by Broadcom	250
12	HIPRA	590	25	YPSOMED	60
13	hp	80			

Sources: ACCIÓ, Biocat

The pace of business creation remains stable

As depicted in the graph illustrating the number of innovative health companies in the BioRegion since 2014, the the business creation rate remains stable at 1 or 1.5 new startups and/or spinoffs per week, varying depending on the year, resulting in 52 to 75 new companies annually. The data for the last two years fluctuate, as is customary in each edition of the Report, due to the lack of public information, but it is anticipated to return to the average, as observed in 2021.

In terms of company type, the digital health subsector continues to information. However, it is the fastest growth rate in recent years, accounting for 30% and 33% of new companies created in 2021 and 2022, respectively. This is followed by biotech (21% and 30% in 2021 and 2022, respectively) and, finally, medtech (23% and 20% in 2021 and 2022, respectively).

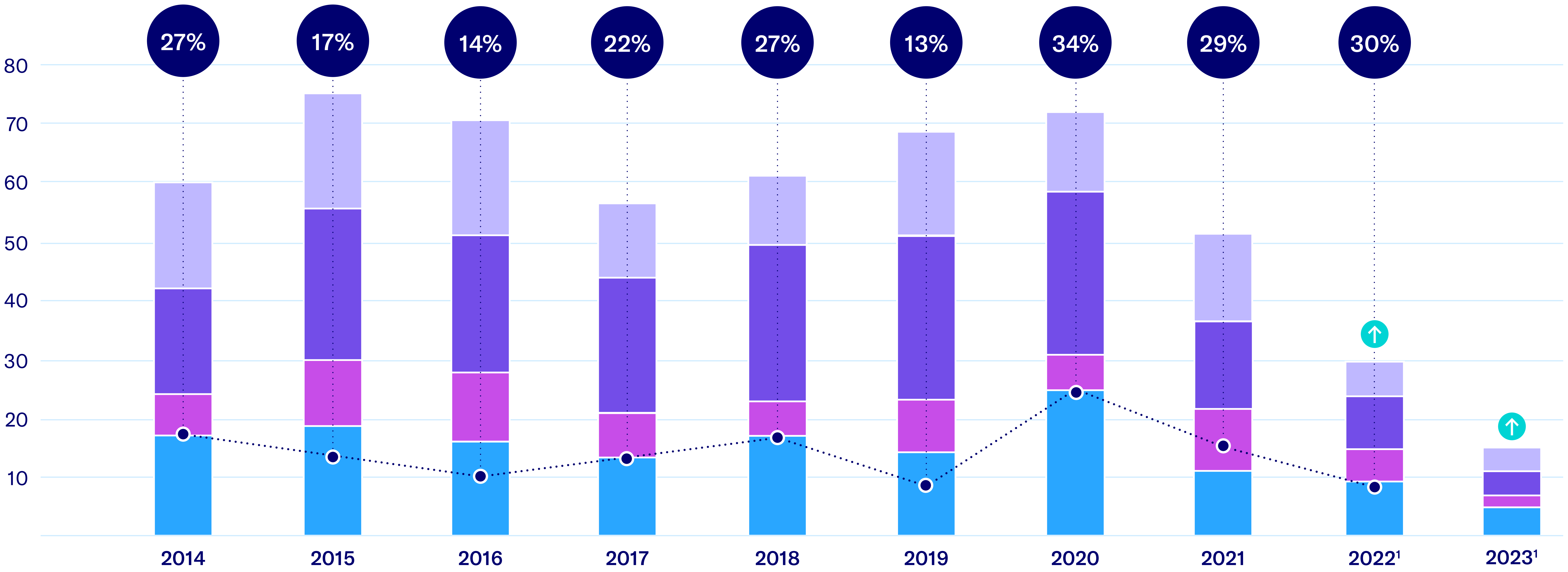
While new innovative health companies are emerging, there is also a trend of new specialized or multi-sector investment firms being established in the BioRegion, which are crucial assets for the survival and development of projects. Specifically, between 2014 and 2023, 21 venture capital firms participating in investment rounds exceeding €2 million were identified.

In the last reporting period from 2019 to 2023, the representation of women in c-level positions grew to 34%, surpassing the percentage of female managers identified in the previous period.

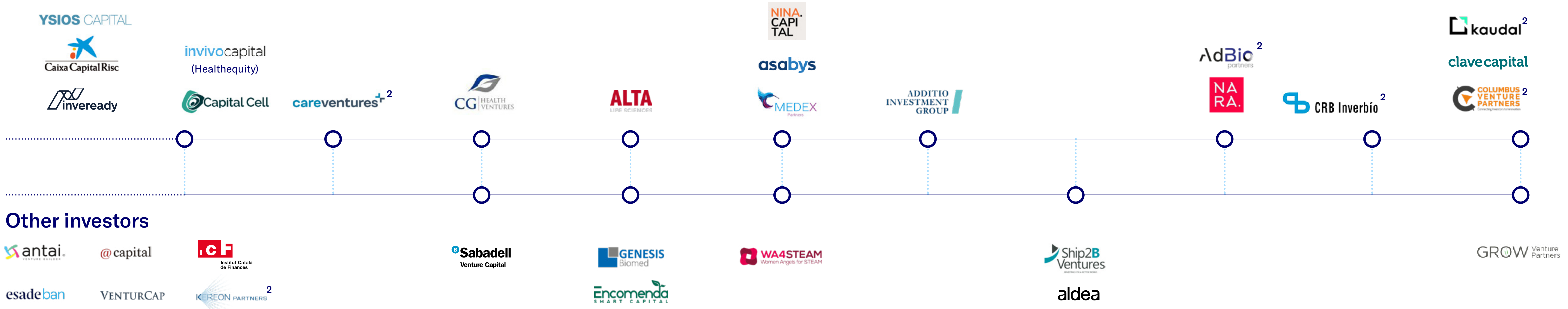
% of startups founded or run by women ↘

29%	2014-2018
34%	2019-2023

Number of startups and spinoffs created



Specialised investment funds



[1] The detection process of activity in new companies does not stabilize until two years later; thus, the 2022-2023 indicator will be scrutinized more carefully in future editions of the Report.
[2] Office in Barcelona.

Source: Biocat

Note: investment funds and other investors includes those who have participated in capital rounds equal to or greater than €2 M. In the case of firms established from 2020 onwards, only those with funds exceeding €20 M are included.

Strengthening Catalonia's healthcare sector with new infrastructures and initiatives

This section showcase a compilation of the main openings, expansions, new infrastructures, new equipment, and/or new government initiatives announced in 2023, which are expected to significantly impact the growth and enhancement of the life sciences and healthcare sector in Catalonia.

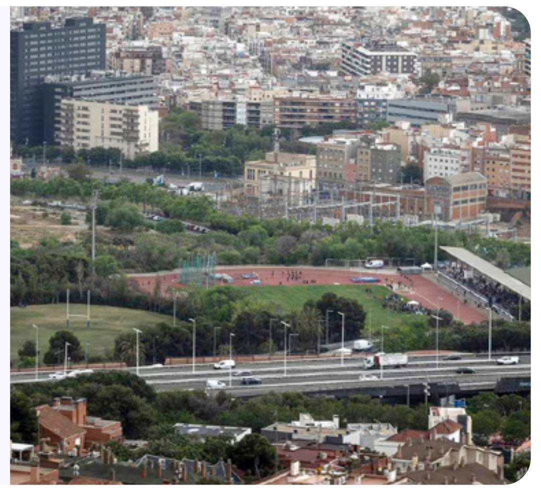
2023 began with the long-awaited annuncement of the expansion of the new Hospital Clínic. Throughout the year, significant developments were observed in the three major scientific and technological infrastructures (ALBA, BSC, and CNAG), as well as in the hubs where a large part of the entrepreneurial community is concentrated (Tech Barcelona Pier 07, Barcelona Health Hub, and a new building, the Norrsken House). Additionally, expansions at the Barcelona Science Park and the inception of the new urban project "Health BioCluster" in the Hospitalet-Esplugues area garnered attention, among many others.

Initiatives and facilities launched in 2023 in the BioRegion

Administration initiative | Infrastructure

January 2023

The Hospital Clínic announces the expansion of the Clinical Campus in Diagonal, an urban development project that is to include the Hospital, the School of Medicine and Health Sciences of the University of Barcelona, and other healthcare, scientific and research facilities.



Photograph: Albert Garcia, El País (2023)

February

Hospital Sant Joan de Déu inaugurates the nuclear medicine centre of the SJD Pediatric Cancer Center Barcelona, a facility equipped with state-of-the-art technology for diagnosing tumors and other diseases. During the same month, it launches the Únicas Network, an international initiative aimed at enhancing the care of pediatric patients with rare diseases through data sharing.

February

Tech Barcelona launches Pier 07, a new innovation space designed to accommodate startups, companies, and entities in the life sciences and health sector. Located in the heart of Barcelona, this facility aims to foster collaboration and innovation within the industry.

February

ALBA launches the Joint Centre for Electron Microscopy, a unique infrastructure in Spain that houses two high-end electron microscopes.

March

The PCB houses an ultrahigh field Nuclear Magnetic Resonance (NMR) device, the second of its kind worldwide, funded by Next Generation funds. The Park is also working on expanding spaces: a new 10,000m² building and the adaptation of a complex for offices and laboratories.

March

The Animal Health Research Centre (IRTA-CReSA) is to host the first biobank of farm animal organoids nationwide, which will allow for research into infectious diseases without using live animals.

June

The Health/AI program starts work to facilitate the development and implementation of artificial intelligence tools that aimed at enhancing healthcare and ensuring the sustainability of the health system in Catalonia.

June

The Terrassa Health Consortium presents the Social and Healthcare Innovation Hub (HiSS), an instrument to foster innovative projects that contribute to enhancing people's quality of life.

June

The National Centre for Genomic Analysis (CNAG) becomes a legally autonomous consortium between the Government of Catalonia and the Spanish Government, and is recognized as one of the three major scientific facilities in Catalonia, alongside BSC and ALBA.

September

The IRTA presents the Alternative Protein Innovation Centre (CiPA) to promote the production of alternative proteins for human and animal food, aspiring to become a benchmark in Southern Europe.

October

The Norrsken House Barcelona centre opens its doors in La Barceloneta to host innovative projects with a positive impact on the planet and society.

October

The 'la Caixa' Foundation starts building the CaixaResearch Institute, the first centre in the country and one of the first in Europe focused on immunology. The first research groups are expected to join the centre in 2025.

October

The Catalan Institute of Oncology (ICO) launches Ethos, a radiotherapy machine that treats tumours in real time using artificial intelligence.

October

Barcelona Health Hub opens the La Mercè pavilion, the fourth building that the fourth building provided by the association for entities promoting digital health, located in the Sant Pau Modernist Complex (Barcelona).

October

Entities from the ecosystem and the municipal councils of Hospitalet and Esplugues introduce the Innovation and Health BioCluster, a project that aspires to lead health research and innovation in Southern Europe through biomedical research and innovation.

December

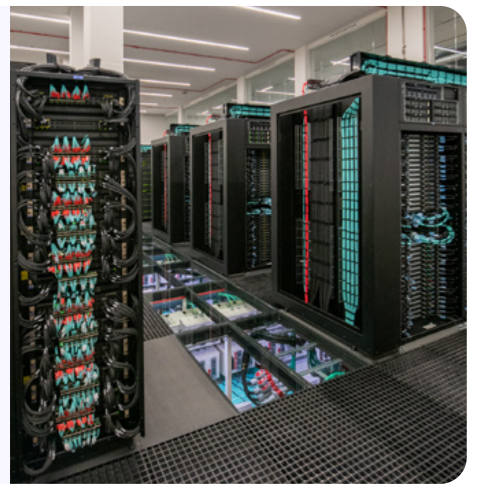
Girona presents the Functional healthcare plan for the future Health Campus, an initiative that envisages a 73% increase in healthcare space compared with the area currently occupied by the Trueta and Santa Caterina hospitals.

December

The Government of Catalonia approves the Strategic Plan for Innovation and Knowledge Transfer (PEITC) to favour the transformation of research in the Catalan system.

December

The BSC inaugurates the MareNostrum 5, a machine boasting twenty times more computing power than its predecessor.



Source: Biocat

2
Investment and funding in startups and scaleups

Photograph: d·HEALTH Barcelona Graduation Day (Biocat)

Startups and scaleups secured €220 M, following the trend set in previous years

After a historic year in terms of investment indicators in the BioRegion in 2022, the complex global geopolitical and economic landscape of 2023 resulted in a foreseeable decline in investment figures. This downturn was primarily attributed to challenges in accessing capital by investment firms and a prevailing sense of caution in financial environments, as illustrated in the table below. These challenges reverberated across international markets. Hence, the €220 million in investments raised by startups and scaleups established in Catalonia in 2023 represents positive news for the sector. This not only signifies a recovery from the trends observed in 2020 and 2021 but also surpasses the €200 million mark, showcasing robust growth and resilience.

By type, venture capital continues to be the main source of funding, representing 52% of the total raised through 37 operations. This year saw an increase in competitive grants, primarily from the European Commission, which doubled compared to the average raised in 2019-2021. These grants helped offset the decline inVC. Additionally, venture debt has continued to gain traction over the last four years, reaching a record €28M.

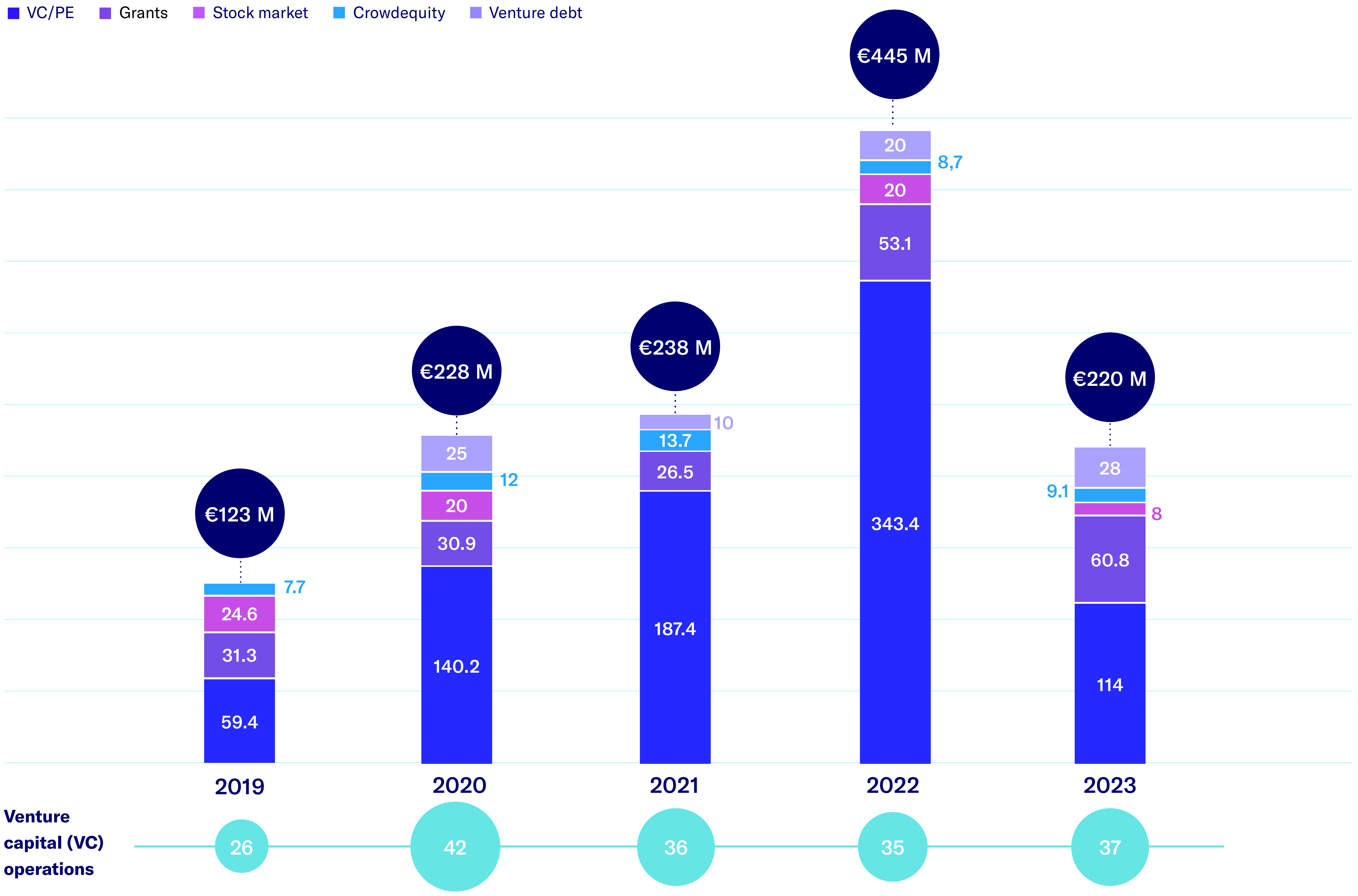
International comparison: year-on-year investment evolution (%) ↘

Regions	2019	2020	2021	2022	2023
Catalonia	10%	84%	5%	87%	-55%
Europe	17%	109%	39%	-42%	-29%
North America	-8%	86%	30%	-29%	-34%
Asia	16%	40%	47%	-34%	-45%

Sources: Biocat and Dealroom

Note: the representation on the right includes capital raised by startups and scaleups in Catalonia in the biopharma, medtech, digital health, and R&D services sectors. It also includes investment in startups working for the life sciences sector, such as suppliers, engineering, and professional service companies.

Investment in startups and scaleups from the BioRegion (€M) (2019-2023)



VC/PE: venture capital / private equity

Source: Biocat

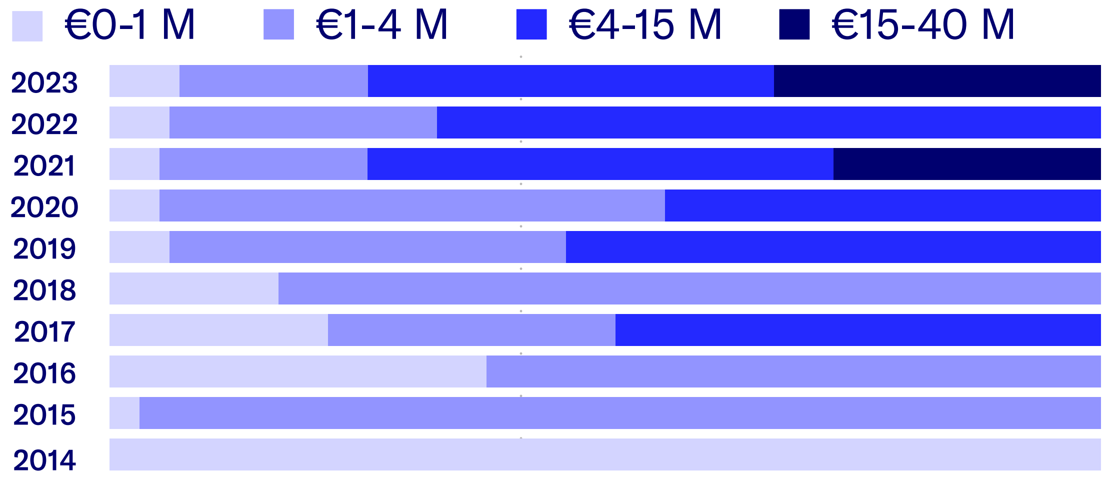
Investment in digital health increases, despite the global context

While global investment in digital health experienced a decline in 2023, Catalonia defied the trend by not only increasing by 61% compared to the previous year but also approaching its historical peak in 2021, reaching €64 million. This notable growth was primarily attributed to three key operations: Qida (€18 million), Iomed (€10 million), and Top Doctors (€8 million). Noteworthy is the surge in both the number and volume of operations in this segment over the past decade, as outlined in the table below. The evolution of this trend will be closely monitored in 2024.

Despite the downturn in 2023, the biotech subsector reaffirmed its position as the primary segment in funding, surpassing €110 million. Prominent operations contributing to this achievement include SOM Biotech (€17 million), Nuage Therapeutics (€12 million), and Oryzon Genomics (€8 million).

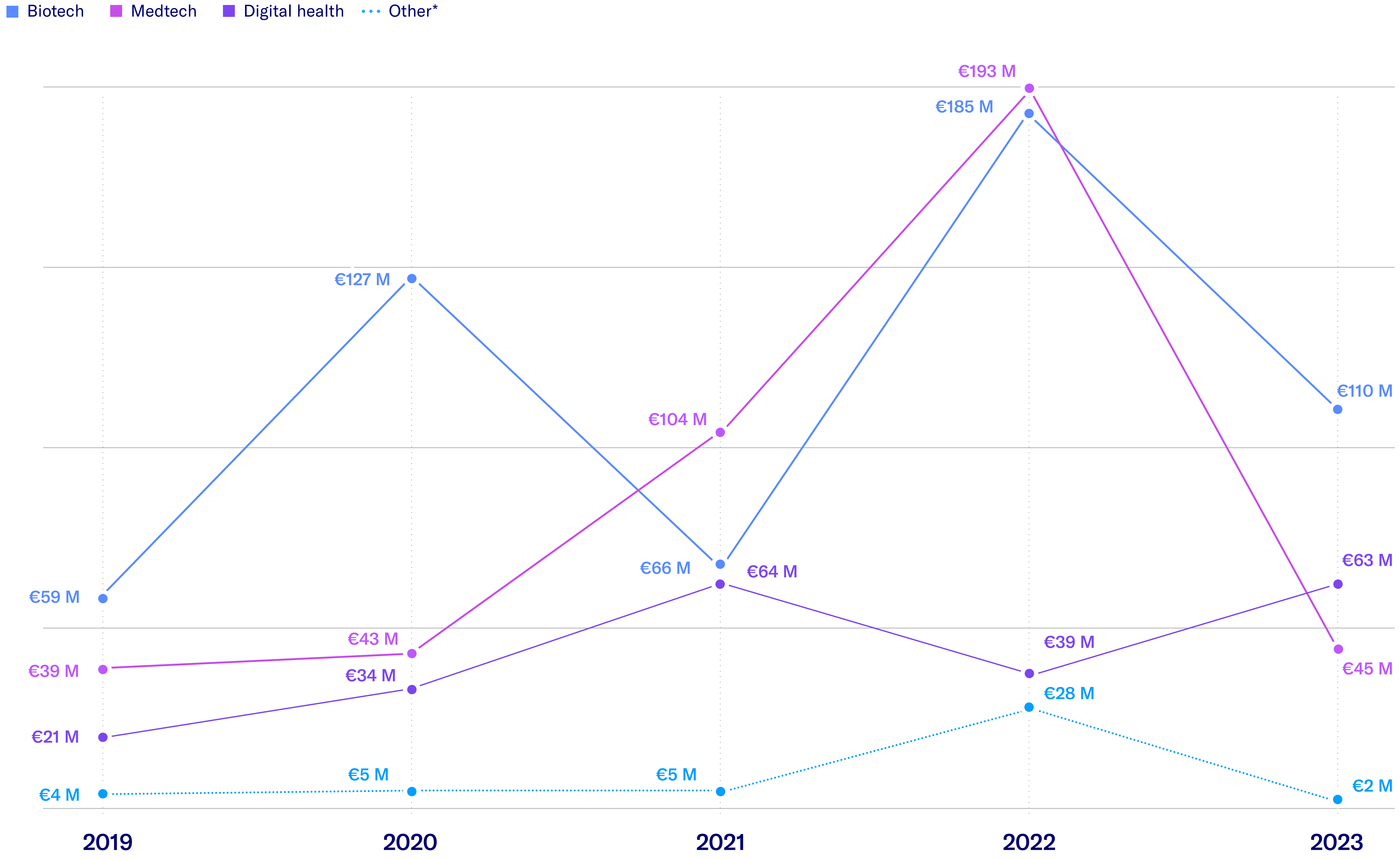
Likewise, the medtech subsector, although facing a decline, has successfully rebounded to investment levels seen before 2021. The three most significant operations in this subsector were Inbrain Neuroelectronics (€20 million), Admit Therapeutics (€5.4 million), and Deepull Diagnostics (€4 million).

Evolution of private investment in digital health (%) ↘



Note: private investment includes VC/PE, crowdequity, stock market and venture debt operations.

Investment in the BioRegion by subsector (€M) (2019-2023)



Source: Biocat

*Other: professional services and suppliers.

Note: investment in biotech includes companies providing therapies, R&D services, and other companies with an impact on human health.

58% of the venture capital raised involves international participation

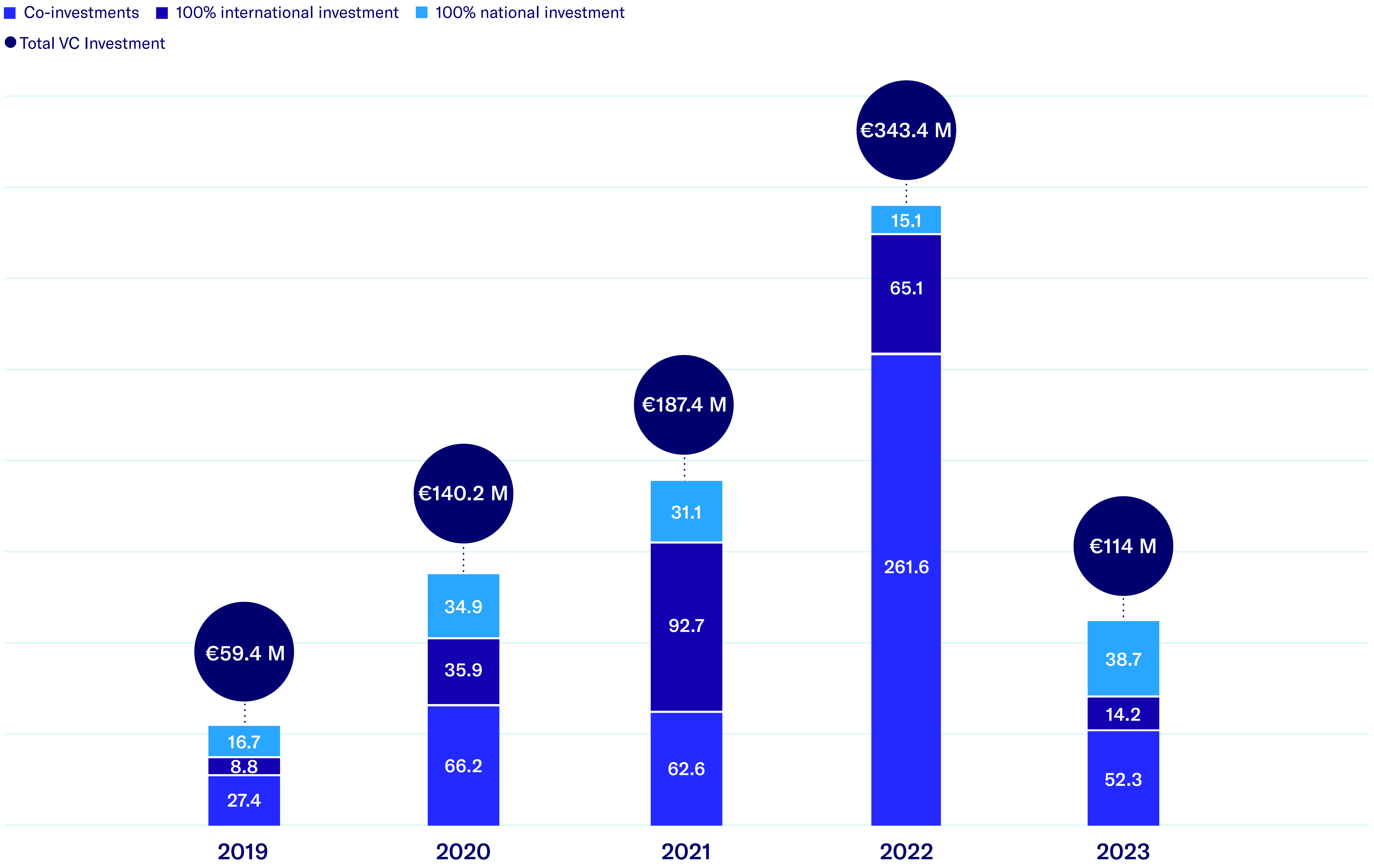
In 2023, the participation of international venture capital in investment rounds fell significantly for the first time in the last three years. This decline can be partly attributed to a decrease in available capital, which made it challenging to secure large investment operations, known as the main lever for attracting international investment firms.

The total of €66.5 million was raised through 7 joint investments (involving both local and international capital) and 6 exclusively international investments, accounting for 58% of the total. However, only €14 million was raised through 100% international operations in 2023, compared to 11 such operations in 2022, which raised €65 million.

Additionally, investment rounds with solely domestic capital increased from 12 in 2022 to 18 in 2023. This increase led to a doubling of the investment raised, reaching a record of €38.7 million.

It is noteworthy that over the past 5 years, 45% of operations exceeding €5 million (21 out of 46) have been led or jointly led by national investors. Following national investors, investors from the United Kingdom (5), France (3), Belgium (3), and the United States (3) have played significant roles. This underscores the importance of the network of specialized investors established in the BioRegion for scaling business projects and attracting international capital.

Evolution of investment in VC (€M) (2019-2023)



Source: Biocat

Note: total VC investment is the sum of the 3 represented categories and additional investment rounds where the origin of the VC is unspecified.

The scale up of rounds, M&A and business exits

In this compilation of transactions, investment rounds, business exits and mergers and acquisitions (M&A) from 2021 to 2023, a notable presence of startups and scaleups is observed across the board. However, in 2023, as previously mentioned, there is a notable absence in the category of large operations (exceeding €40 million) and mega-operations (exceeding €100 million). Additionally, a decline is noted in the number of exits and M&A activities. Noteworthy events include the merger between Amelia and the US company XRHealth, establishing the new entity as a global leader in virtual reality therapies. Furthermore, Palex Medical, a prominent European group specializing in technology and equipment for the hospital sector, made three acquisitions.

M&A activity in the BioRegion 2023 ↘

Acquirer		Target	
Applus	(CAT)	Rescoll	(FR)
BVI	(US)	Medicalmix	(CAT)
Corus	(CAT)	Giraud	(FR)
Grifols	(CAT)	Access Biologicals LLC	(US)
Impress	(CAT)	DW	(UK)
Kriya	(US)	Tramontane TX	(CAT)
Pangaea	(CAT)	Pectus	(CAT)
Palex	(CAT)	burke&burke	(IT)
Palex	(CAT)	Isoder	(PT)
Palex	(CAT)	MTW Iberica	(ES)
Topdoctors	(CAT)	iWantGreatCare	(UK)
XRHealth	(US)	amelia by XRHealth	(CAT)
Zendal	(ES)	Maymó	(CAT)

Note: refer to page 17 of the BioRegion 2022 Report to see all M&A operations in historical context.

	2021	2022	2023
Exits	GoodGut, Infinitec, DR Healthcare, Bioinfogate, DDR, VCN Biosciences, Fisiopharma	Mimetis, Alifarm, Molomics, Vesismin Health, Abamed Pharma, Microptic, Vytrus biotech 1, Labiana 1 2	amelia by XRHealth, Pectus, Tramontane TX, Medicalmix
€100-250 M		Impress B	
€40-100 M	Impress A C	Minoryx C, SpliceBio A	
€15-40 M	Corus, Koa Health A 2	Deepull, Seqera A, Inbrain Neuroelectronics	Inbrain Neuroelectronics, Qida A, SOM B
€4-15 M	Inbrain Neuroelectronics, IMIDomics A, Topdoctors B, Mediktor, VEnvirotech, Anaconda Biomed, Sequentia, Abzu, Roka Furadada A, Seqera, Integra therapeutics A, Aortyx	Pangaea 1 2, Peptomyc, Durcal, amelia A, Kriba 2, timeisbrain, Medsir 2, Oliva, Elem, Nova Meat, Cuideo B	Nuage, Iomed A, OneChain, Topdoctors, Orikine, ADmit A, Oliva A, Peptomyc, Deepull B
€1-4 M	Vitaance, Nuage, HumanITcare, Eodyne, Devicare A, Mediquo, Telomere therapeutics, Oliva, Nova Meat, Aelix, in.bio.motion, Ptadel, Mimark, amelia A, Cebiotex, Qida B, Elem, myn-neuro, VB Devices, Pharmacelera, Kintsugi, Ima	Nanoligent, Tecnic, Methinks, Abzu, Gate2Brain, Vytrus biotech 1, Oxolife, Innerva, Pulmobiotics, Integra therapeutics, Bioo, Biotest, DyCare, AbilityPharma, OneChain, Onalabs, Loop 2, Able, VB Devices, Telomere therapeutics, Mediquo, Floxxics	Mimark, Nimble Diagnostics, Methinks, DDIEL Digital Glasses, Vitaance, Leanbio, Accexible 2, MatchTrial, Gatbio, Glyco Science 2, Aromics, Onalabs, Omniscope 2, FreeOx, Manina Medtech, Zymvol, Oniria, idp pharma, Mediquo, Cuantum Med-Cos, Genie, Renalyse, Kamleon, Sight

A Series A
B Series B
C Series C

[1] Listed on the BME.
[2] Company headquartered outside of Catalonia but with mainly activity in Catalonia.

Source: Biocat

Note: the companies included are those that have successfully closed an operation (either private or a public grant) with a value equal to or exceeding €1 M. Exit is considered when a company is acquired or undergoes an initial public offering (IPO).

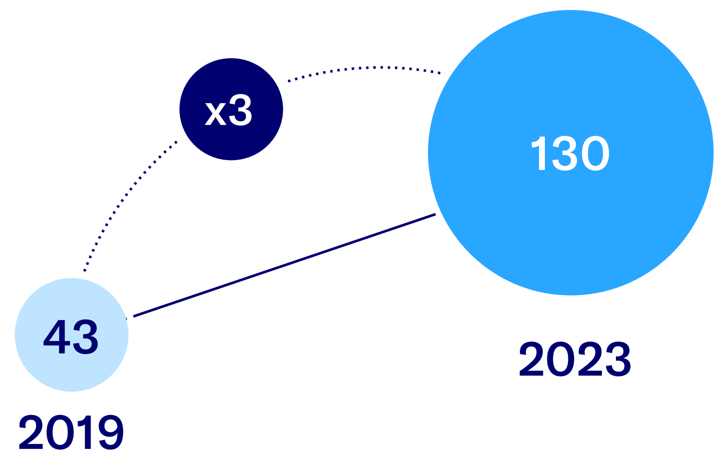
Evolution in attracting investment firms

In 2023, in contrast to the trend of the past four years, national investment firms experienced above-average growth, reaching a total of 36, which is double the number of investors compared to 2019.

Additionally, the presence of individual international investors in 2023 decreased to 25 (14 fewer than in 2022, primarily from Europe), aligning with the decline in the volume of operations observed in previous indicators. American and Asian investors maintained their activity through 6 different operations.

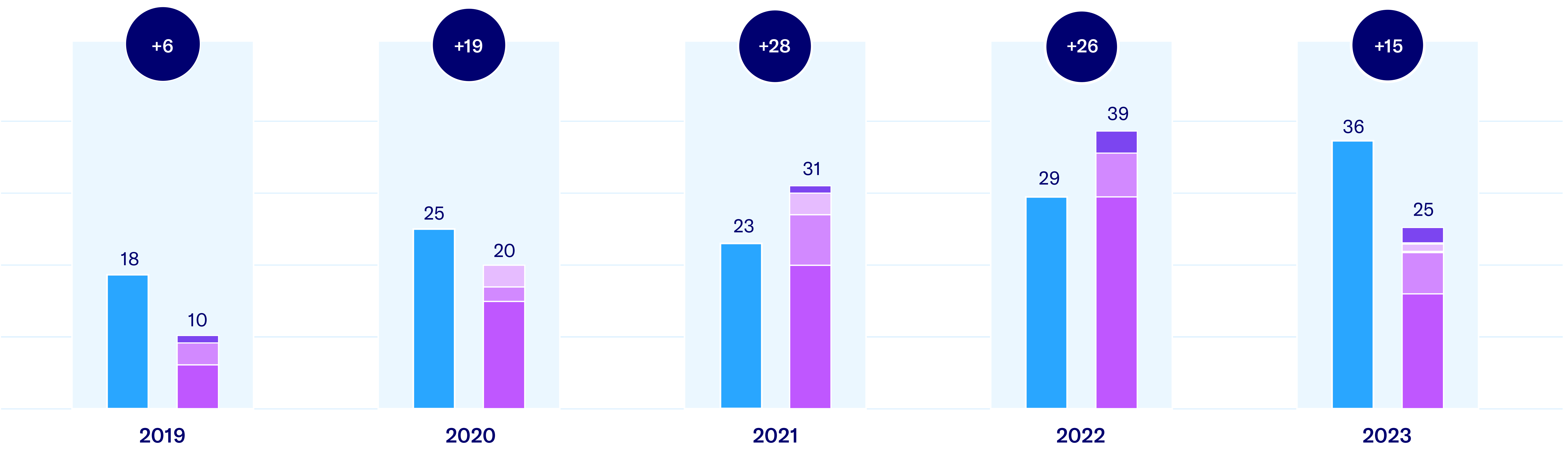
Despite the decrease in 2023, the evident attraction of international capital to the BioRegion is reflected in the consistent annual increase of 15 to 30 new investors since 2020. This trend has culminated in a total of 130 investment firms actively supporting health startups and scaleups established in Catalonia.

Number of international firms that have participated in investment rounds in the BioRegion ↘



Source: Biocat

Number of national and international investment firms investing in the BioRegion of Catalonia



Note: each year, the different investment firms investing in the BioRegion are included. Each investor is counted only once per year.

Most active international investors (2013 - 2022) ↘

AurorA-TT, Boehringer Ingelheim, BoxOne, bpifrance, Bristol Myers Squibb, Chan Zuckerberg Initiative, Chiesi Ventures, European Innovation Council Fund, Fund+, Gilde Healthcare, idinvest Partners, Innogest, Kurma Partners, Mangrove Capital Partners, MTIP, NEA, NVF, Omega Funds, Philips, Pontifax, Roche, Siemens, Speedinvest, TA Ventures, Takeda, UCB Ventures, UNIQA Ventures, wellington partners

Most active investors 2023 ↘

International

AdBio partners, elaia, European Investment Bank, Philips Ventures, Prevail Partners, Sofinnova partners, US Capital

Established in Catalonia

asabys, Sabadell BStartup, CaixaBank, clave capital, Fundación Josep Carreras, invivo capital, Lavanda, NARA, Ship2B Ventures, WA4STEAM

Barcelona, among the leading cities in attracting health investment in EMEA

In this international comparison of investment (2021-2023) in health startups and scaleups, as well as exclusively healthtech startups and scaleups, across cities in EMEA, Barcelona's outstanding position stands out among the top 15 and top 10, respectively.

Barcelona is the only Spanish city in the EMEA ranking for attracting global investment in health, ranking 12th, slightly ahead of cities like Basel or Dublin. Furthermore, in the healthtech subsector (comprising only medtech and digital health startups and scaleups), Barcelona rises 3 positions to rank 9th, surpassing cities such as Copenhagen, Amsterdam, and Zurich.

The comparison in both rankings highlights the leadership of London, Paris, and Cambridge, as well as the significance of the healthtech segment in these and other cities, including Berlin, Stockholm, and Tel Aviv. Between 2021 and 2023, Barcelona raised twice as much healthtech investment as Madrid.

Of the top 15 cities, only 2 in EMEA have experienced a positive investment trend between 2021 and 2023: Milan and Tel Aviv.

The table illustrates how Barcelona is declining at a moderate rate compared to other cities and reflects the overall contraction in investment across Europe.

Ranking of investment in health* startups and scaleups in EMEA (2021-2023)

1	London	$6,300 M
2	Paris	$3,500 M
3	Cambridge	$2,200 M
4	Oxford	$2,100 M
5	Copenhagen	$1,700 M
6	Berlin	$1,500 M
7	Stockholm	$1,100 M
8	Tel Aviv	$1,000 M
9	Amsterdam	$860 M
10	Zurich	$698 M
11	Munich	$684 M
12	**Barcelona**	**$550 M**
13	Dublin	$539 M
14	Basel	$506 M
15	Milan	$338 M

Ranking of investment in healthtech* startups and scaleups in EMEA (2021-2023)

London	$3,000 M
Paris	$1,800 M
Cambridge	$1,000 M
Berlin	$902 M
Stockholm	$847 M
Tel Aviv	$687 M
Munich	$500 M
Oxford	$405 M
Barcelona	**$320 M**
Copenhagen	$240 M
Amsterdam	$227 M
Zurich	$190 M
Madrid	$168 M
Dublin	$149 M
Milan	$129 M

Source: Dealroom

*Health: includes the set of companies in biotech, medtech and digital health.
Healthtech: includes only part of medtech and digital health segment.

International comparison of investment in health* startups and scaleups (2021-2023) ↘

#8 UE	#11 Europa	#12 EMEA

International comparison of investment in healthtech* startups and scaleups (2021-2023) ↘

#5 UE	#8 Europa	#9 EMEA

Variation in health investment (%) (2021-2023)

Milan	+255%
Tel Aviv	+80%
Basel	-22%
Dublin	-43%
Zurich	-52%
Paris	-54%
Copenhagen	-54%
Barcelona	-55%
Berlin	-57%
Cambridge	-57%
London	-62%
Amsterdam	-63%
Stockholm	-73%
Oxford	-82%
Munich	-83%

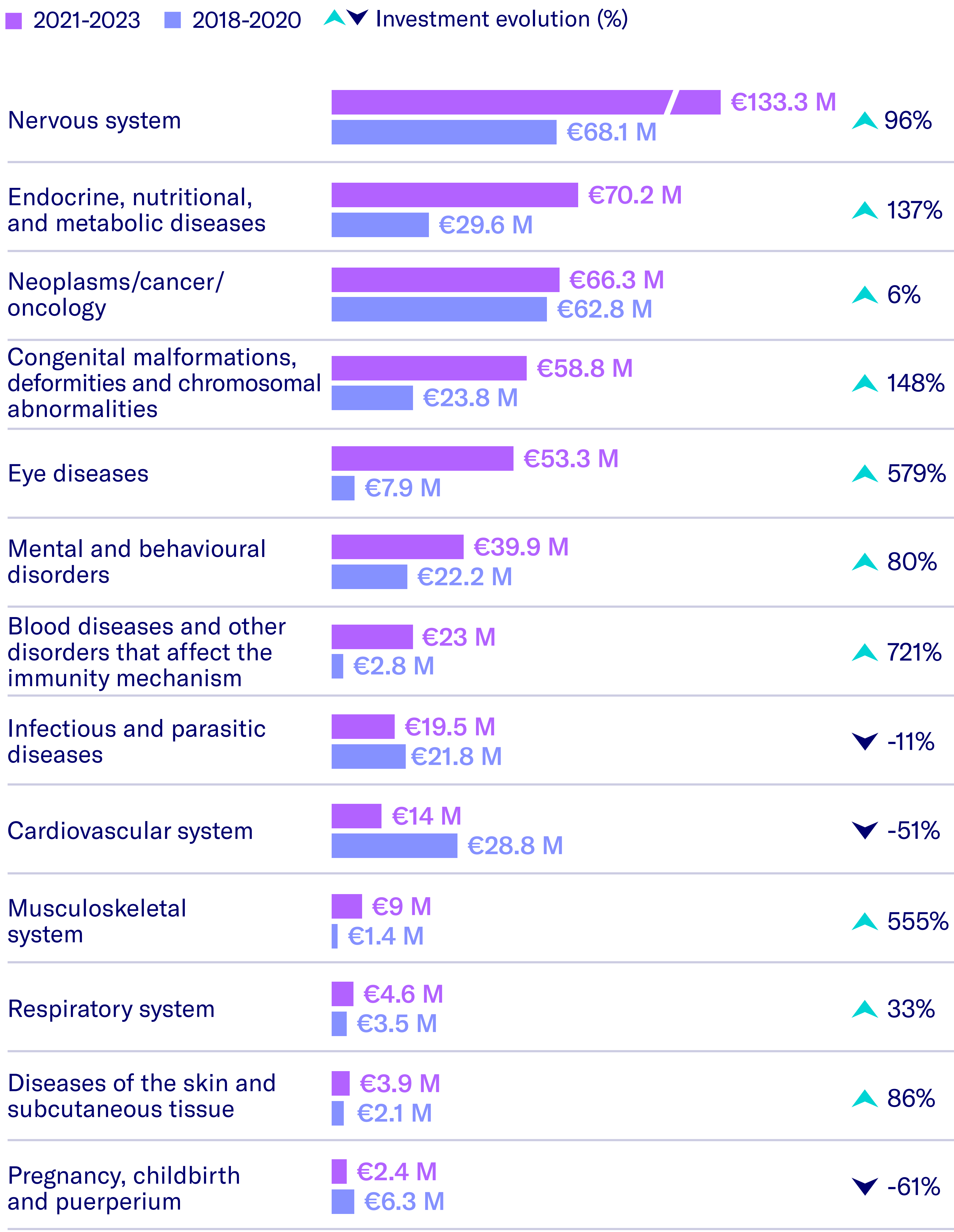
Trends and investment attraction based on therapeutic areas

The trend in investments and the evolution of interest in venture capital and private equity over recent years are depicted in this year-on-year comparison of investment by therapeutic area in the BioRegion and internationally. Factors such as the prevalence of certain diseases, unmet medical needs, and opportunities for cutting-edge health innovations often align investment with business-science projects.

Internationally, startups and scaleups focusing on mental health, diseases of the musculoskeletal system, cardiovascular diseases, and obstetric and gynecological diseases have witnessed increased investment during the period 2021-2023.

In the BioRegion, the investment trend is similar for startups and scaleups focusing on cancer/oncology, with increased investment also seen in blood diseases, the musculoskeletal system, eye diseases, congenital malformations, endocrine diseases, and mental disorders. Examples of these investments include: IMIDomics (€14 M) and OrikineBio (€5.5 M) in blood diseases; Aptadel Therapeutics (€1.7 M) in the musculoskeletal system; Splice Bio (€50 M) and Innerva Pharmaceuticals (€2.3 M) in eye diseases; Minoryx (€51 M) and Integra Therapeutics (€4.5 M) in congenital malformations; Onalabs (€1.8 M) and D-Sight (€1 M) in endocrine diseases; and Koa Health (€15.9 M), XRHealth (€7 M), and Oliva Therapy (€5.7 M) in mental disorders. Notable investments in cancer/oncology include SOM Biotech (€17 M) and Nuage Therapeutics (€12 M), as well as Peptomyc (€8.6 M) and Onechain Immunotherapeutics (€6.7 M).

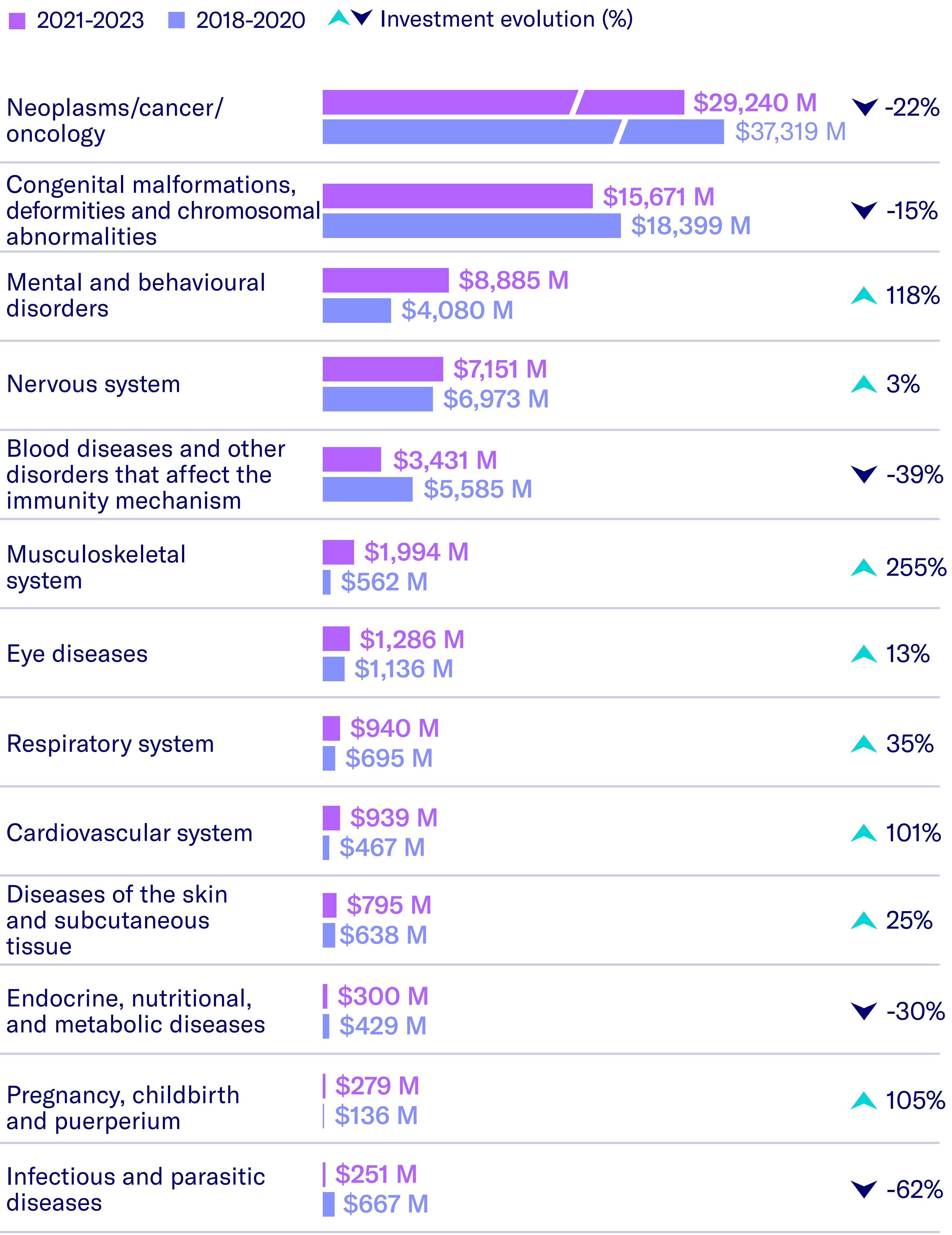
Investment (VC/PE) ranking in the BioRegion by therapeutic area (€M)



Source: Biocat

Note: the investments are counted in all areas in which the company is active.

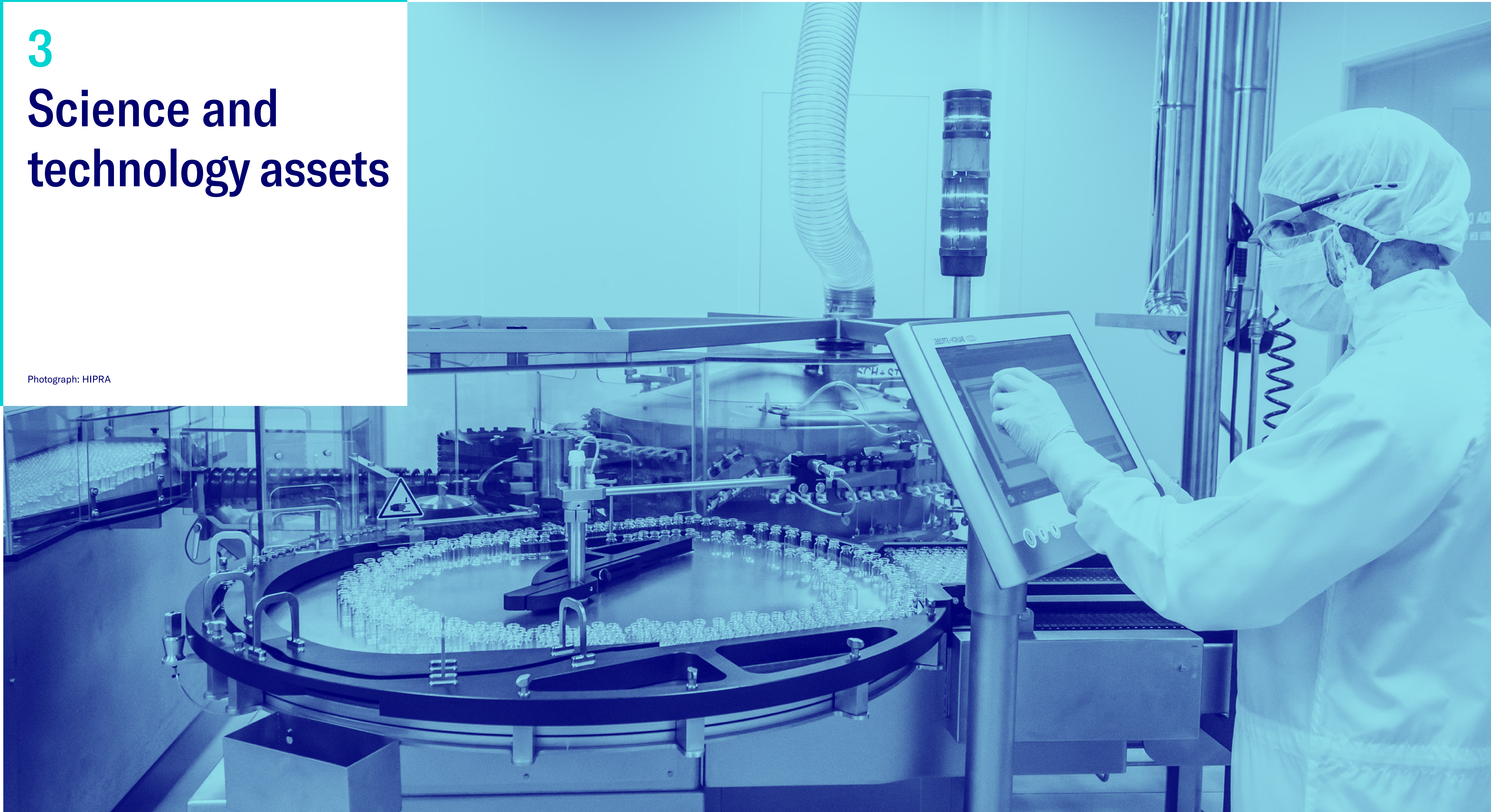
International investment (VC/PE) ranking by therapeutic area ($M)



Source: Dealroom.

3

Science and technology assets



Photograph: HIPRA

Catalonia ranks in the top 3 for Highly Cited Papers with patent citations

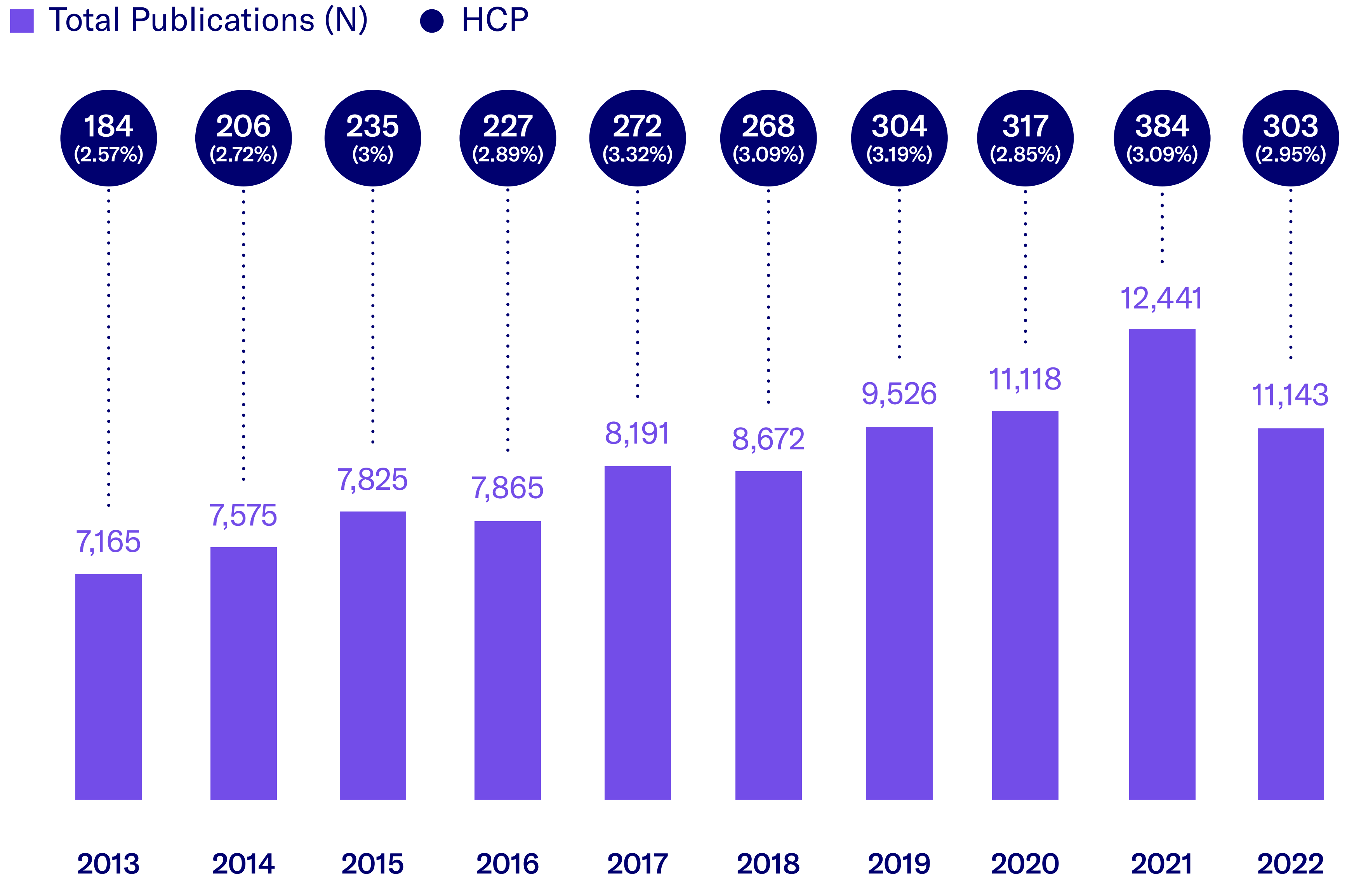
In a new approach to assessing research excellence within Catalonia's life sciences and healthcare sector, we have conducted an in-depth analysis of scientific publications' impact on patent applications worldwide.

From 2013 to 2022, publications in life sciences and healthcare from Catalonia increased by a notable 55.5%. Nearly 3% (2,700) of these publications are Highly Cited Papers (HCPs)[1]. Among these 2,700 HCPs, 35% (955) received patient citations, contributing to 3,340 new inventions (patent families) sought by research entities, universities, and multinational corporations in the sector.

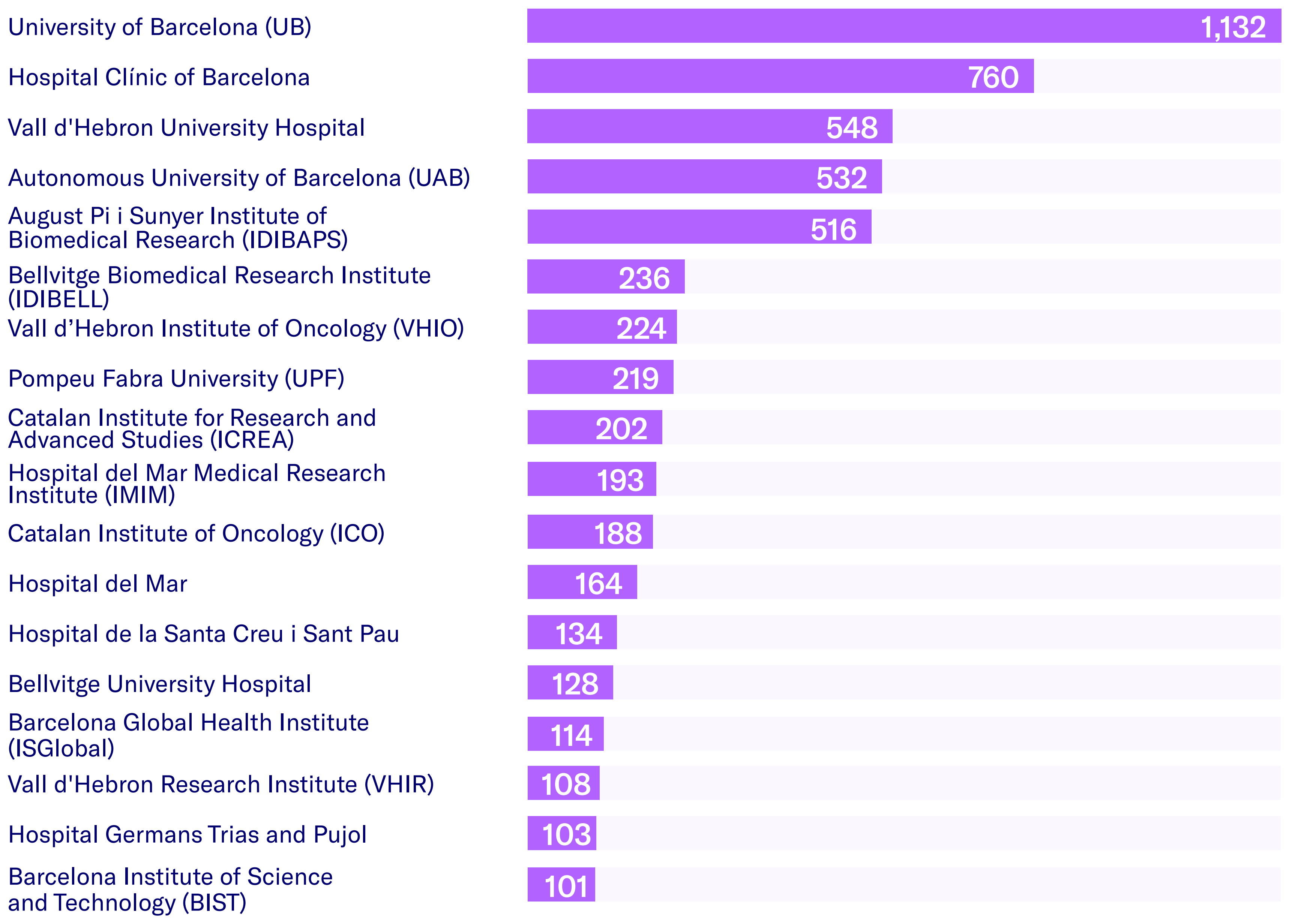
An international comparative analysis for this indicator positions Catalonia 3rd in Europe for both the number of HCPs per million inhabitants (124.49) and the percentage of HCPs per million inhabitants with patent citations (35.37%).

The institutions with the highest number of HCPs include universities, major public hospitals, health research institutes, and research centers from Barcelona. The top therapeutic areas represented among the 2,700 HCPs are oncology (16%), the nervous system (11%), haematology and immunology (11%), and infectious diseases (11%).

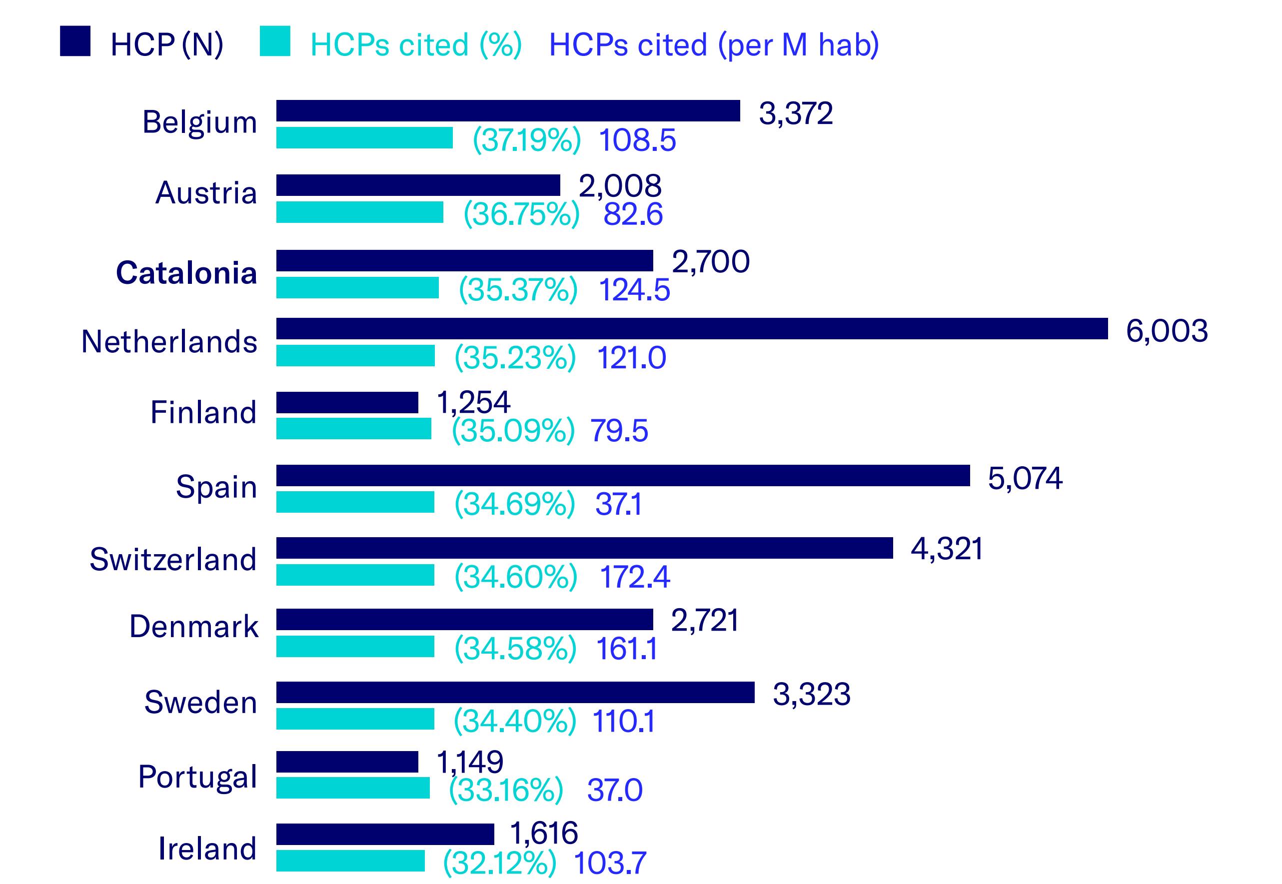
Publications in life and healthcare sciences from the BioRegion (2013-2022)



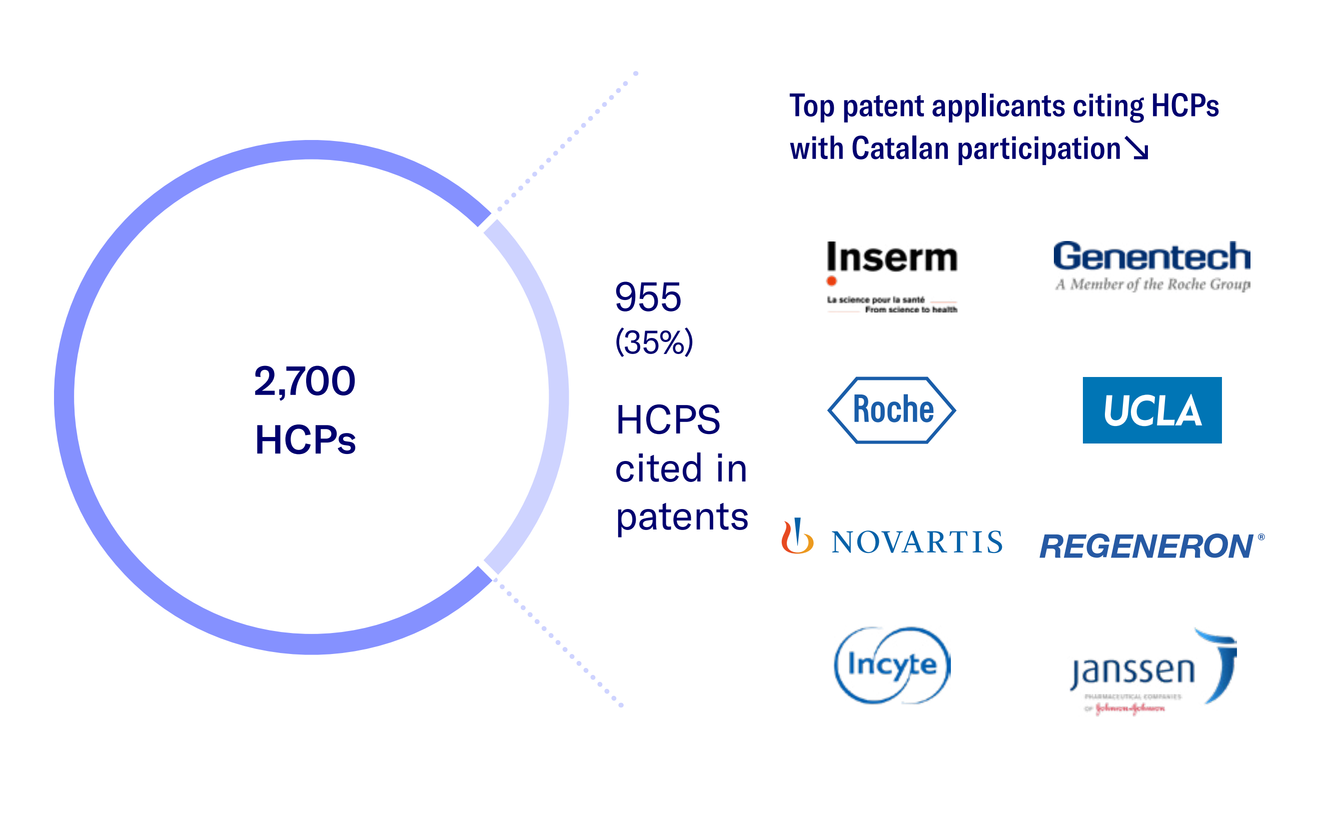
Number of HCPs per entities in the BioRegion (2013-2023)



Number of HCPs cited in patents (2013-2022)



Highly Cited Papers with Catalan participation cited in patents (2013-2022)



Top IPC* codes of patents citing HCPs with Catalan participation

- Antineoplastic agents
- Mixtures of active ingredients without chemical characterization, for example, anti-inflammatory and cardiac
- Medicinal preparations with antigens or antibodies for immunoassays

[1] For further insight into Catalonia's position in the European ranking of publications, refer to page 24 of the BioRegion 2022 Report

Sources: Science Citation Index Expanded (SCI-E, WoS) and Lens.org

Highly Cited Papers (HCP) Articles and reviews among the 1% most cited in their subject-matter and year of publication.

*IPC: International Patent Classification

Catalonia ranks in the top 3 for advanced therapy publications

Catalonia remains a premier destination for the attraction and execution of clinical trials. The pharmaceutical industry underscores its firm dedication to Catalan hospitals and research institutes in advancing clinical research and pioneering state-of-the-art treatments. Catalonia boasts an abundance of Key Opinion Leaders (KOL) and highly skilled professionals across diverse clinical specialties, complemented by a cutting-edge scientific infrastructure, a resilient healthcare system, favorable regulatory environment, and a continuously growing patient recruitment base.

Internationally, when analyzing the number of publications (per M hab) and patent applications in advanced therapies over the past decade across major European countries, Catalonia ranks 3rd, trailing only Switzerland and the Netherlands. Moreover, Catalonia has demonstrated exceptional growth, recording a 156% increase during this period.

In terms of patent applications for advanced therapies, Catalonia's contribution is notable, with 30 international patents filed during 2013-2022, representing 26% of the Spanish total and placing 6th among the compared countries. Institutions such as ICREA, the UAB, and the UB, as well as companies like Esteve, GENTEC, OneChain, and SpliceBio, are among those seeking these inventions.

Scientific publications in advanced therapies by institution (2013-2022)

Institution	Publications
University of Barcelona (UB)	984
Hospital Clínic of Barcelona	578
Autonomous University of Barcelona (UAB)	531
August Pi i Sunyer Institute of Biomedical Research (IDIBAPS)	383
Hospital Universitari Vall d'Hebron	330
Bellvitge Biomedical Research Institute (IDIBELL)	310
Catalan Institute of Oncology (ICO)	276
Josep Carreras Leukaemia Research Institute	230
Barcelona Institute of Science and Technology (BIST)	229
Hospital de la Santa Creu i Sant Pau	229
Institute of Bioengineering of Catalonia (IBEC)	151
Catalan Institute for Research and Advanced Studies (ICREA)	149
Polytechnic University of Catalonia (UPC)	140
Hospital Duran i Reynals	115
Hospital Germans Trias i Pujol	114
Vall d'Hebron Research Institute (VHIR)	106
Vall d'Hebron Institute of Oncology (VHIO)	69
Hospital del Mar Medical Research Institute (IMIM)	66
Pompeu Fabra University (UPF)	61
Hospital del Mar	57
University of Girona (UdG)	55

Total publications and patent applications in advanced therapies (2013-2022) - Ranking per M hab

Sources: Science Citation Index Expanded (SCI-E, WoS platform) and Eurostat (August 2023)
* The indicators for Spain include Catalonia.

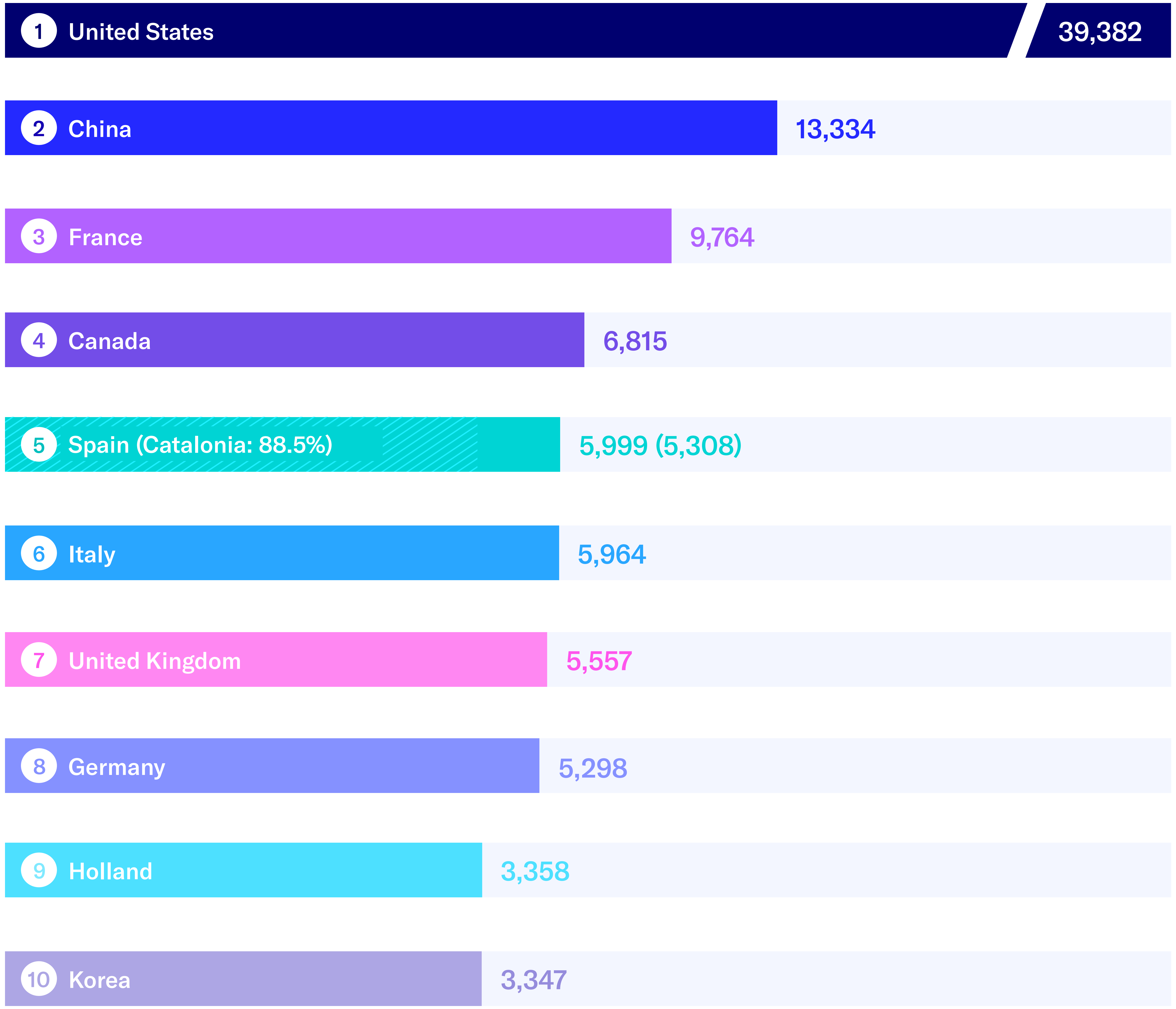
Catalonia ranks 5th in Europe and 8th worldwide in active clinical trials

Catalonia continues to be a preferred destination for attracting and conducting clinical trials. The pharmaceutical industry demonstrates a strong commitment to Catalan hospitals and research institutes for advancing clinical research and developing cutting-edge treatments. Catalonia offers a wealth of KOL and highly skilled professionals across various clinical specialties, state-of-the-art scientific infrastructure, a robust healthcare system, favorable regulatory environment, and growing patient recruitment.

With 88.5% of all clinical trials in Spain conducted in Catalonia, totaling 5,308 active trials, Catalonia holds the 5th position in Europe and the 8th position globally.

Among the various clinical areas, Catalonia particularly excels in oncology trials, which represent 34% of the total, followed by other therapeutic areas such as the immune system and the respiratory system. Catalonia maintains its position within the top 10 in several key therapeutic areas on an international scale.

World top 10
Number of active clinical trials (2023)



Source: Clinicaltrials.gov
Note: Active clinical trials include those in the following recruitment statuses: "Not yet recruiting", "Recruiting", "Enrolling by invitation" and "Active, not recruiting".

Number of trials per clinical area.
International comparison (2023)

Clinical area	Active clinical trials	European ranking	World Ranking
Oncology	1,823	#4	#7
Immune system	586	#6	#9
Respiratory system	515	#6	#9
Nervous system	459	#7	#10
Cardiovascular system	457	#7	#11
Dermatology	385	#5	#8
Digestive system	380	#6	#10
Haematology	295	#6	#9
Mental health	157	#6	#9
Metabolic diseases	155	#7	#10

The pharmaceutical industry supports 76% of clinical trials conducted in Catalonia

This data offers additional insights into Catalonia's position in global clinical trial rankings, underscoring the active participation of 20 multinational pharmaceutical corporations committed to advancing clinical research within the BioRegion. Notably, the pharmaceutical industry contributes funding to 76% of trials conducted in Catalonia. Phase I trials now constitute 20% of the total, while phase II and phase III trials make up 36% and 40%, respectively.

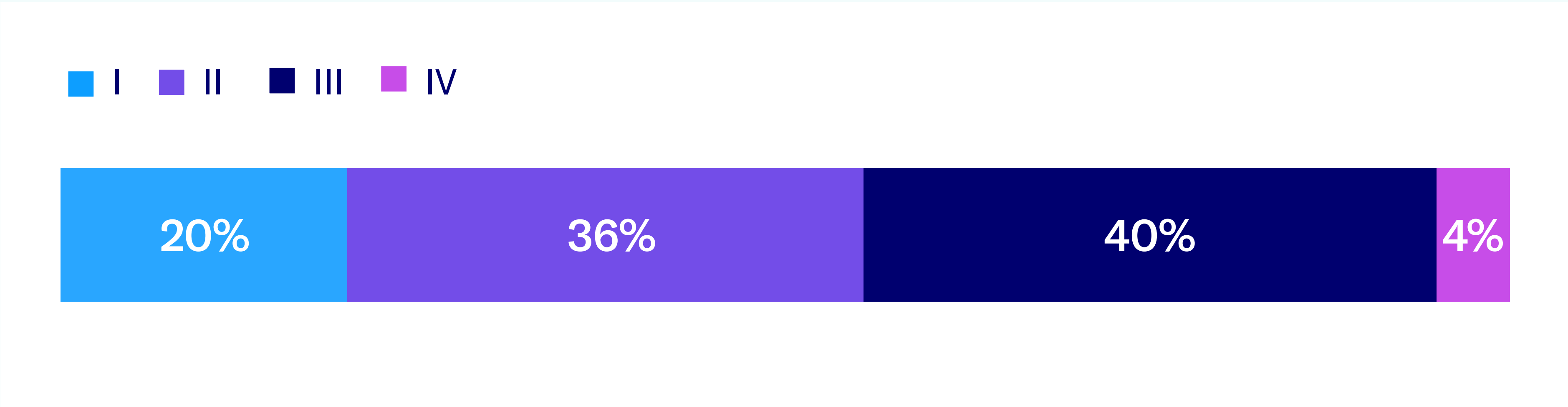
Taking the lead in trial sponsorship, prominent pharmaceutical multinationals, including Novartis, Roche, Bristol-Myers Squibb, AstraZeneca, Pfizer, GSK, Sanofi, Lilly, Janssen, MSD, and AbbVie, are prominently positioned, listed in descending order.

It is worth emphasizing that 24% of non-commercial clinical trials are supported by academic or hospital institutions, scientific societies, or clinical researchers, independent of industry sponsorship. These trials prioritize meeting clinical practice needs over commercial interests. In Catalonia, key sponsors include Hospital Clínic, Hospital de Sant Pau, Hospital Vall d'Hebron, Hospital del Mar, Hospital de Bellvitge, and Hospital Sant Joan de Déu.

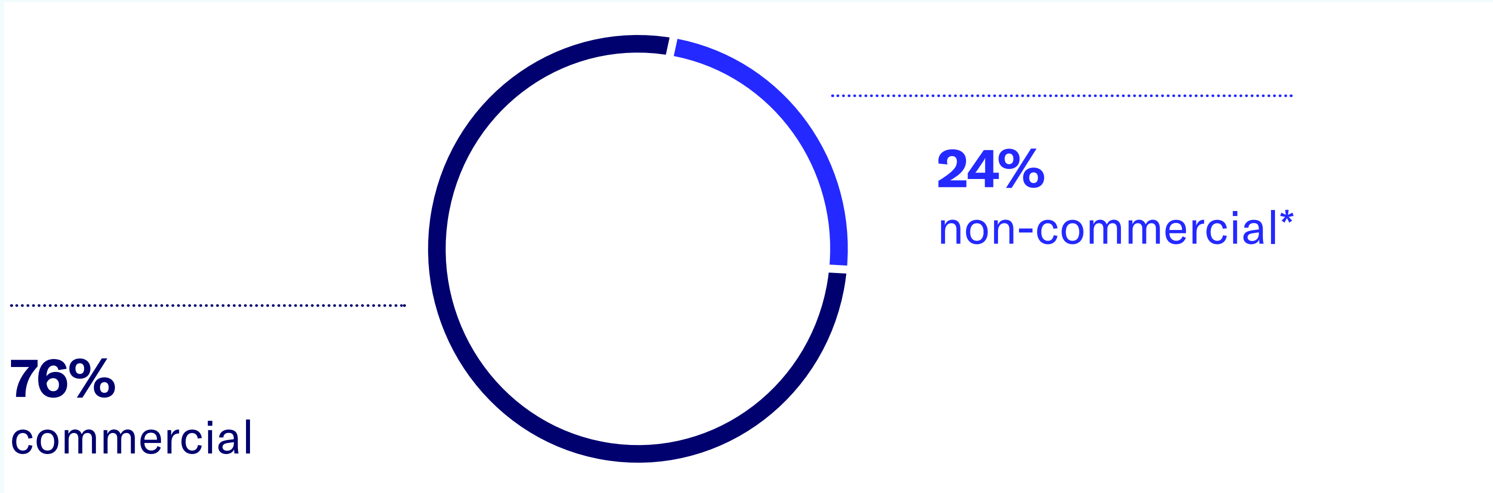
Pharma multinationals developing clinical trials in Catalonia

Hospitals and research institutes developing non-commercial clinical trials in Catalonia

Active clinical trials by phase in Catalonia



Active clinical trials by type of sponsor in Catalonia



Source: Clinicaltrials.gov

*Non-commercial trials are not funded by the pharmaceutical industry

Note: Companies and entities are classified by number of trials.

73 therapies in the clinical development pipeline

In 2023, the clinical pipeline within the BioRegion comprised 54 therapies sponsored by 7 pharmaceutical and 14 biotechnology companies, along with 19 advanced therapies sponsored by companies and hospital research entities*.

This comprehensive overview reveals that 31% of these therapies are in phase I, 51% in phase II, and 18% in phase III or awaiting regulatory authorization. By clinical focus, 31% are in oncology, 20% in the central nervous system, 10% in dermatology, and 8% in rare diseases.

Notable achievements among biotech startups and scaleups this year include positive trial outcomes for Oryzon, Aelix and Peptomyc, the initiation of phase I trials by Connecta Therapeutics (targeting fragile X syndrome) and RemAb Therapeutics (for ICU infection prevention), and licensing agreements between Minoryx and Neuraxpharm (addressing rare CNS diseases) and between SpliceBio and Spark Therapeutics (Roche group) for an inherited retinal disease.

In the pharmaceutical sector, Almirall has initiated phase I trials for a novel biological therapy targeting autoimmune diseases. Esteve has introduced a treatment for Parkinson's symptoms, while Ferrer has incorporated two active compounds for neurological disorders into its pipeline. Grifols has reported promising results in phase II trials for an Alzheimer's vaccine developed by one of its subsidiaries. Notably, the World Health Organization (WHO) approved Bimervax, Hipra's COVID-19 vaccine, in October 2023, marking a significant milestone as the first vaccine of its kind developed and manufactured in Spain and enabling its global use.

* Refer to the breakdown on the following page

Clinical pipeline of Catalonia 2023

Biotech · Pharma

	Phase I (31%) ↘	Phase II (51%) ↘	Phase III (18%) ↘	MARKET
Vaccines and infectious diseases	RA0127 | RemAb Therapeutics	RUTI | Archivel Farma; HTI | Aelix Therapeutics		
Oncology	RUTI | Archivel Farma; APOC | Ascil Biopharm; APOC RTU | Ascil Biopharm; Omomyc | Peptomyc; CEB-01 | Cebiotex	IDP-121 | IDP Pharma; ORY-1001 | Oryzon Genomics; AQUE | Ascil Biopharm; ABTL0812 | Ability Pharma		
Cardiovascular and haematology	FNP080 | Ferrer	Ox-01 | FreeOx Biotech	Fibrinogen | Grifols	
Endocrinology, diabetes				
Central nervous system	FNP222 | Ferrer	ORY-2001 | Oryzon Genomics; FNP150 | Ferrer; FNP223 | Ferrer; GR6019 | Grifols; GR6021| Grifols; ABvac40 | Grifols; E-52862 | Esteve; SOM0226 | SOM Biotech	FNP122 | Ferrer; FNP002 | Ferrer	
Eye diseases	FNP120 | Ferrer; BS01 | Retinset	AKST4290 | Grifols; SVT-22473 | Salvat	SVT-15473 | Salvat	
Ear diseases		SVT-18651 | Salvat	SVT-15652 | Salvat	
Respiratory diseases		Alpha-1 AT | Grifols		
Digestive system diseases		FNP010 | Ferrer		
Dermatology	ALM223 | Almirall; ALM27134 | Almirall	P309 | Reig Jofre	ALM24001 | Almirall; ALM14867 | Almirall; RJ0265 | Reig Jofre; Lebrikizumab | Almirall	
Musculoskeletal, pain, hepatology		SVT-1001 | Salvat	Albumin | Grifols	
Fertility		OXO-001 | Oxolife; PKB171 | Prokrea BCN		
Orphan and rare diseases	SOM3366 | SOM Biotech; CTH120 | CONNECTA Therapeutics	SOM3355 | SOM Biotech; EGT-101 | Esteve; SOM1311| SOM Biotech	Leriglitazona (MIN-102) | Minoryx Therapeutics	
Other			IVIG-PEG | Grifols; SCIG | Grifols	

Source: Biocat

Note: the molecules at the intersection between phases have completed the previous phase or are progressing to the next phase.

19 advanced therapies in the clinical pipeline

The rise of gene and cellular therapy together with regenerative medicine marks a transformative shift towards the treatment and potential cure of specific diseases. This innovative approach utilizes cells, tissues, molecules, and other biological components to restore tissue form, function, and properties, including damaged organs. In 2023, top-tier Catalan hospitals and research institutes were involved in the development of 19 advanced therapies.

The primary focus of research was in oncology, where Hospital Clínic (FCRB-IDIBAPS) pioneered the first CAR-T therapy in Europe for multiple myeloma and CAR-T ARI-0003, its third proprietary therapy targeting lymphoma. Hospital Sant Joan de Déu (FSJD) initiated a new Phase II study using CAR-T for pediatric patients with B-cell acute lymphoblastic leukemia, while Hospital de Sant Pau (IR Sant Pau) developed a novel CAR-T therapy for lymphoma patients. Hospital Vall d'Hebron (VHIO) and Hospital de Bellvitge (IDIBELL) are also exploring other innovative cancer treatments.

Catalonia is strategically positioned to emerge as a leader in advanced therapies within Europe. In 2023, it launched the Action Plan for the Advanced and Emerging Therapies Hub, designed to ensure patient access to personalized therapeutic solutions. The plan aims to boost the number of clinical trials, stimulate industrial development, and amplify the economic and social impact of these innovative treatments, characterized by their high added value.

Clinical pipeline of advanced therapies in Catalonia 2023

● Biotech ● Pharma ■ Hospitals and Research institutes

	Phase I ↘	Phase I / Phase II	Phase II ↘	Phase III ↘
Oncology	■ **NEXTGEN-TIL-ACT** | VHIO ■ **VHIO 20002** | VHIO ■ **FSJD-RTB-2015** | FSJD ● **CARxALL** | OneChain Immunotherapeutics ■ **ARI-0003** | FRCB-IDIBAPS	■ **HSP-CAR19M** | IR Sant Pau ■ **ARI-00001** | FRCB-IDIBAPS	■ **PULSE-UM** | IDIBELL ■ **TILS-001** | FRCB-IDIBAPS ■ **SMARCA4 / B1 TILs** | IDIBELL ■ **CART19-BE-03Ped** | FSJD ■ **HSP-CAR30** | IR Sant Pau ■ **ARI-0001** | FRCB-IDIBAPS ■ **ARI-0002h** | FRCB-IDIBAPS	
Cardiovascular		■ **PERISCOPE** | IGTP		
Central nervous system	■ **TOLERVIT-MS** | IGTP		■ **TolDecCOMBINEM** | FRCB-IDIBAPS ● **ESTEVE-SANF-201** | Esteve ■ **BST-SCI-02** | BST	

Entities developing

Banc de Sang i Teixits · Esteve (Advancing health together) · IDIBAPS · Clínic Barcelona / Universitat de Barcelona · IDIBELL · IGTP · OneChain Immunotherapeutics · SJD Sant Joan de Déu Institut de Recerca · Sant Pau Campus Salut Barcelona / Institut de Recerca Sant Pau · VHIO Vall d'Hebron Institute of Oncology

Source: Biocat

Comprehensive overview of healthtech pipeline 2023 (I)

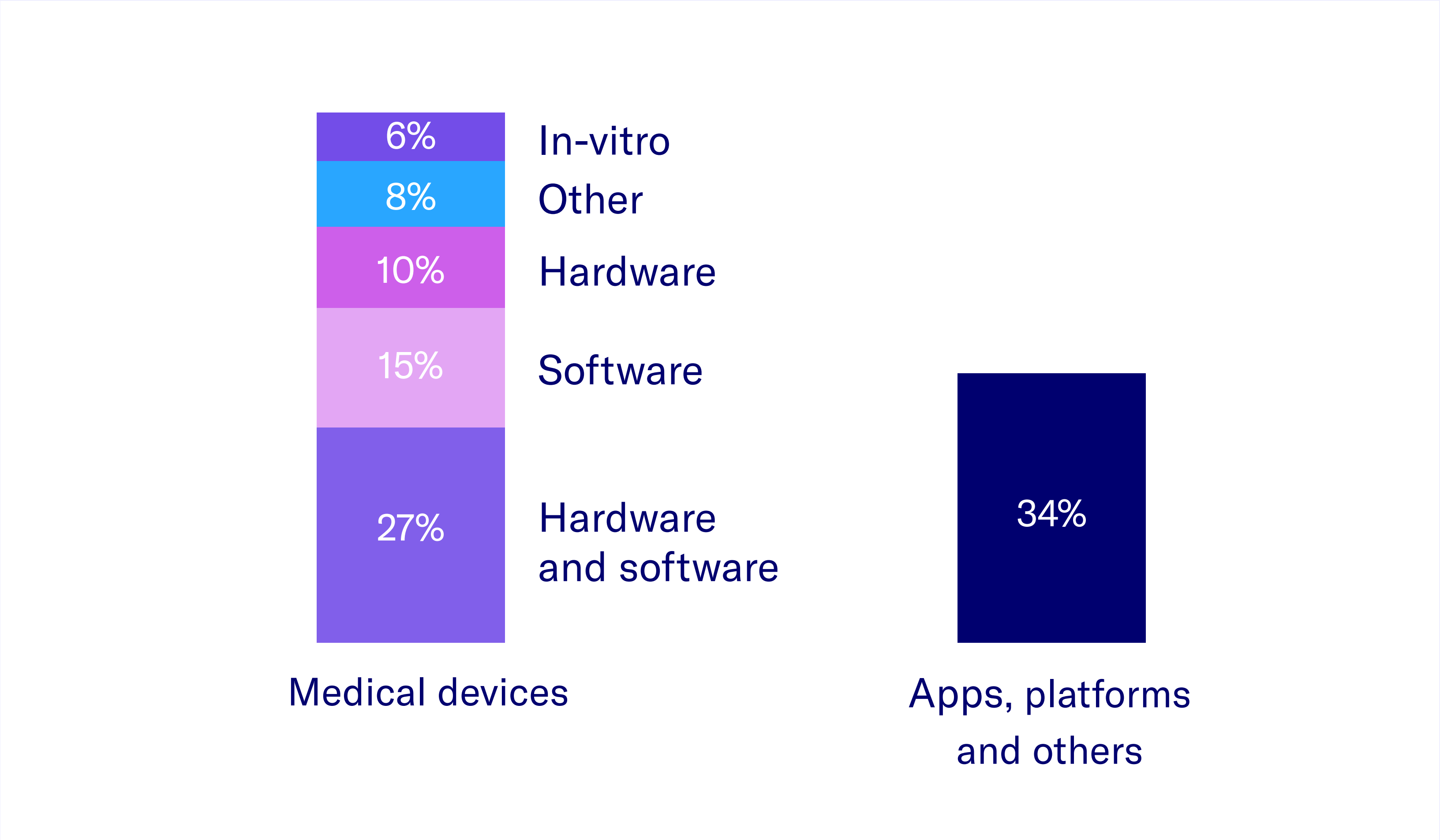
Building on the methodology initiated in the previous report to scrutinize the array of healthtech products and services in Catalonia, we conducted a new survey* in 2023, in collaboration with Fenin. This survey, focused on startups and companies, delved into their innovative pipeline of medical devices and products/services in digital health. From the insights gleaned from this survey, we draw conclusions regarding their characteristics and current development phase:

- The majority (66%) are developing medical devices. The remainder (34%) are developing apps and/or digital platforms.
- 38% have a regulatory classification of low-risk products (I/A and IIa/B). 35% have no classification, as they are apps or platforms.
- 45% of the products/services of the startups are on the market (in fact, +53% of startups have at least one product on the market). In terms of the previous phase, 55% of the products/services are distributed between technological development or prototyping, validation, PoC, or regulatory.
- Clinical evidence has increased compared to the previous survey: 60% already have a pilot test or proof of concept, and 36% already have clinical studies.
- Lastly, 40% of the startups have at least one patented product.

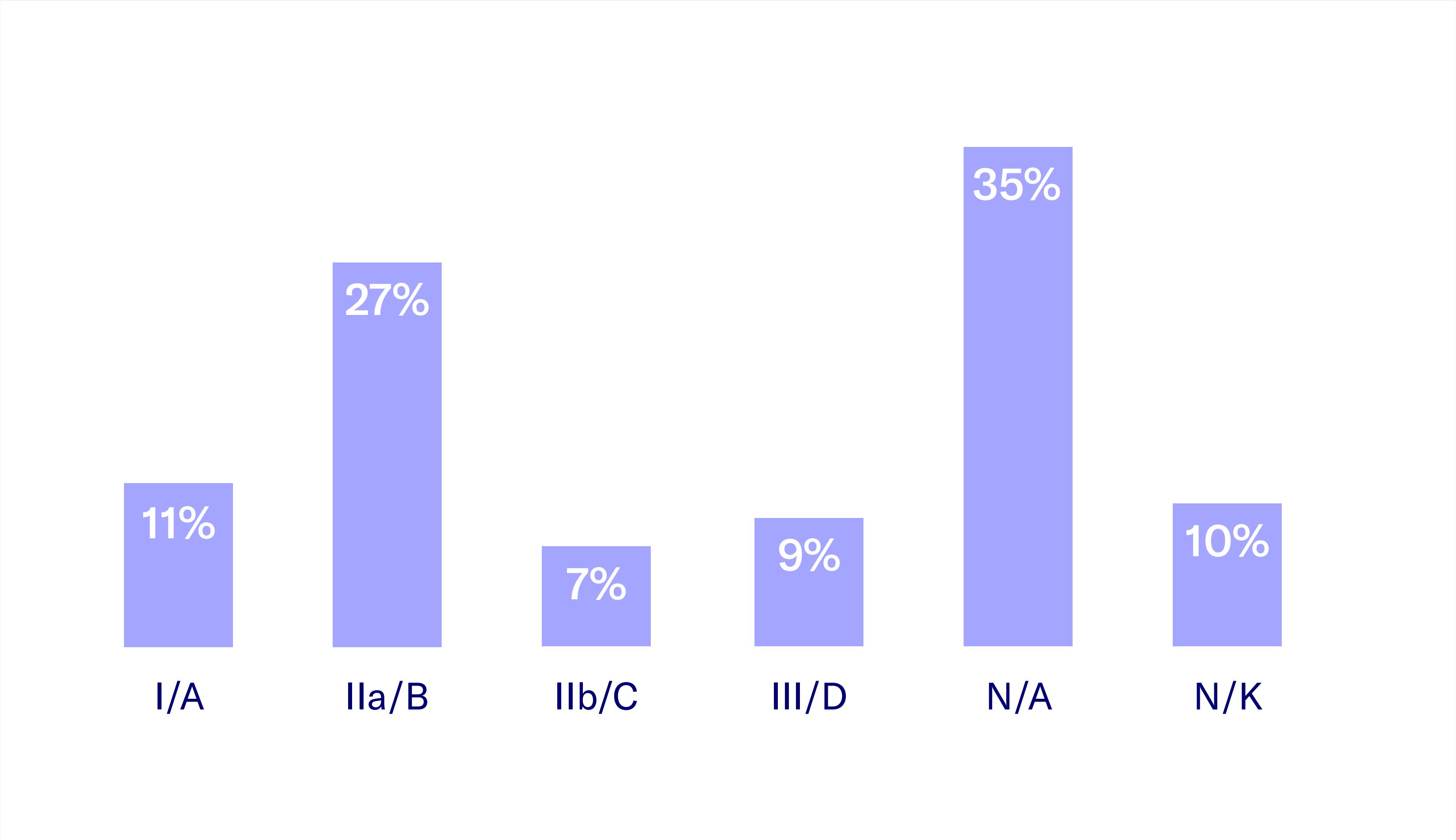
*Survey of 386 healthtech companies in Catalonia in 2023, with a 28% response rate. 78% of the responses are from startups

Type and classification of healthtech products and services

Product/service type ↘

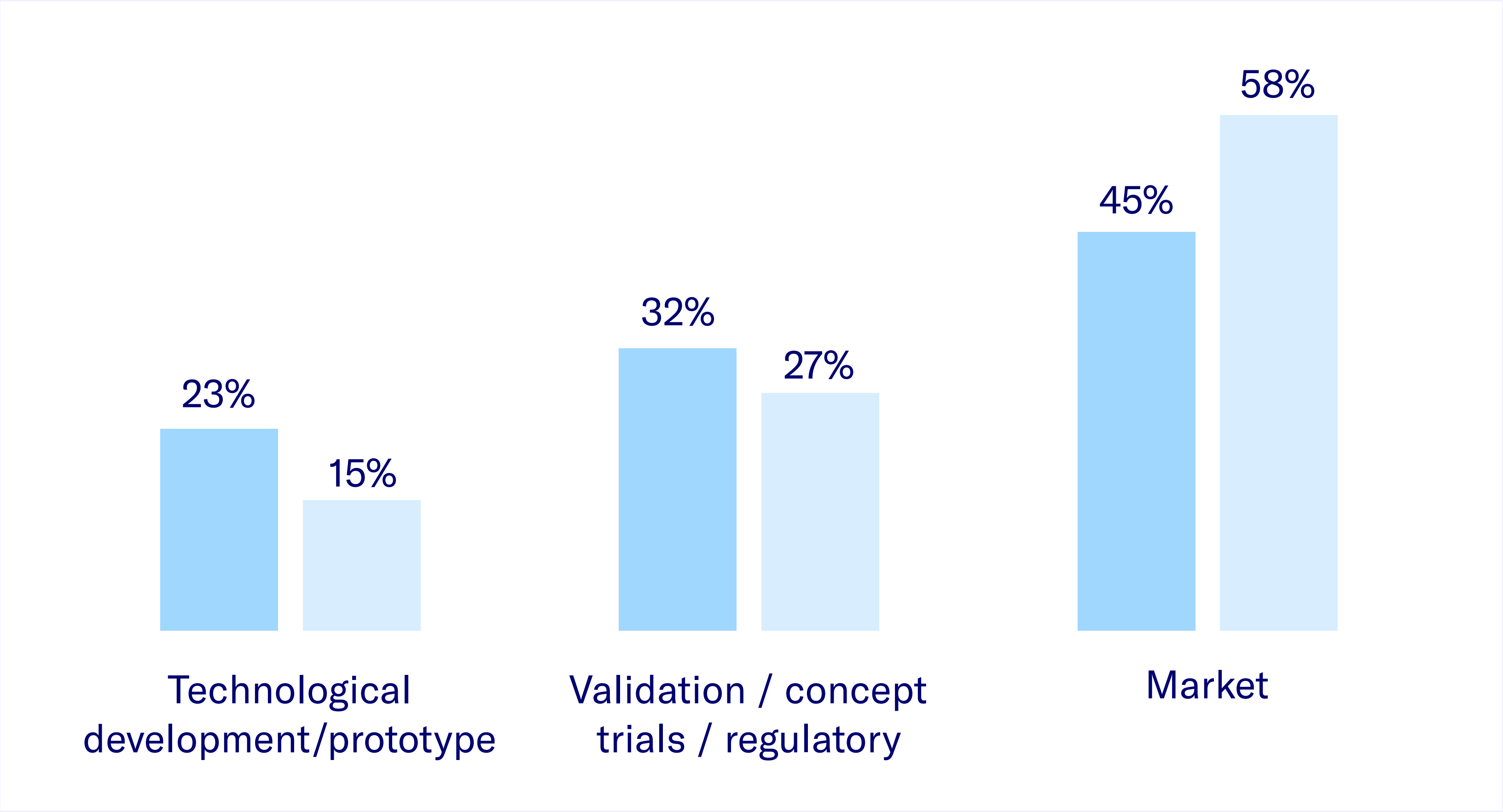


Regulatory classification of the products/services ↘



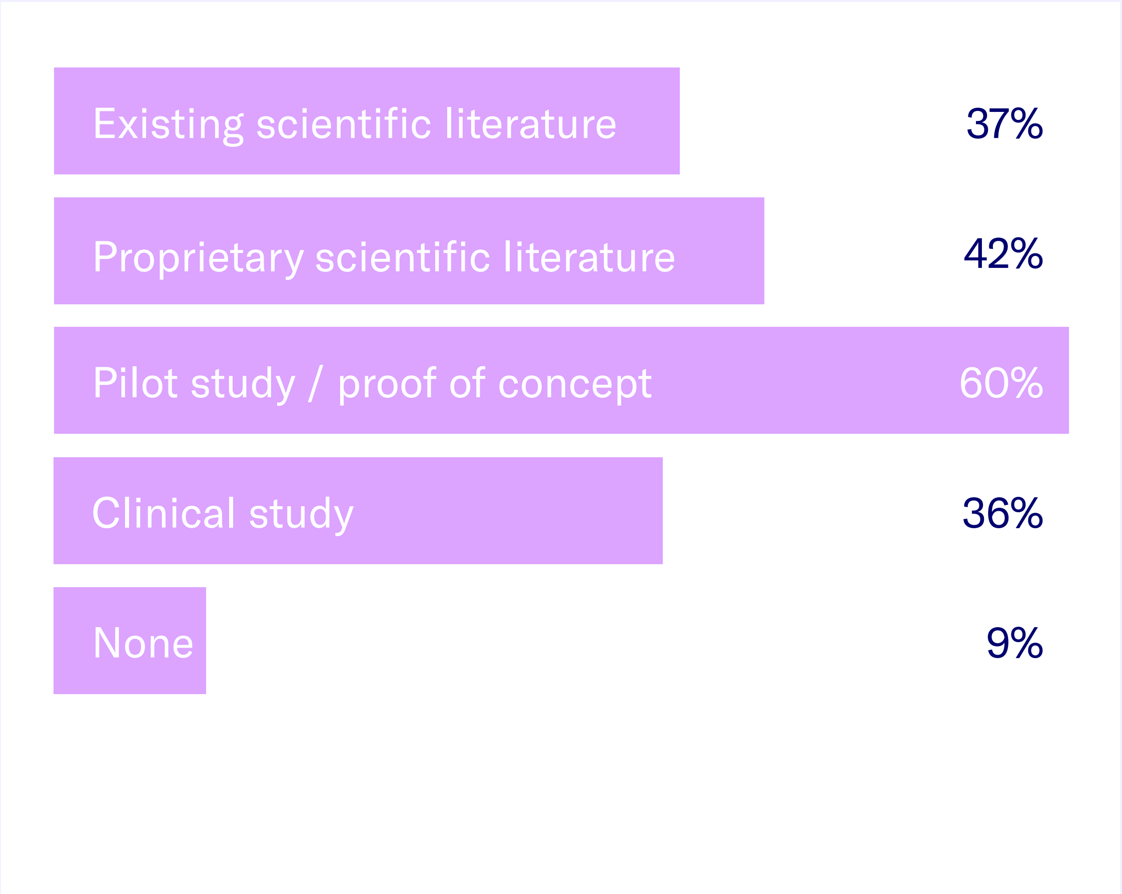
Development phase of the products/services ↘

Startup* Company

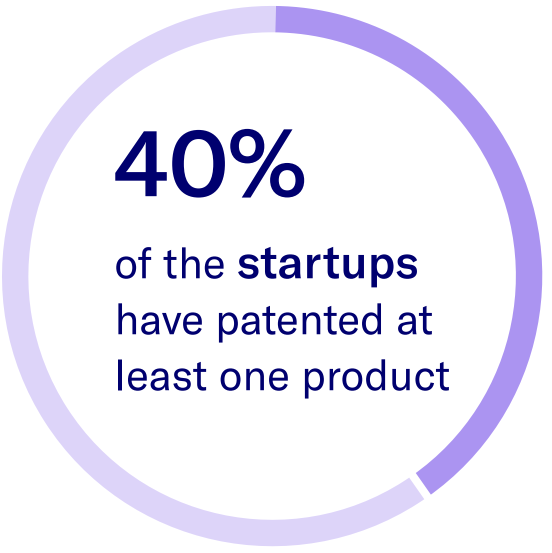


*Year of foundation ≤10 years

Level of clinical evidence of products/services ↘



Products patented by healthtech startups ↘



Business models and collaborations involving the healthtech pipeline (II)

The survey* further explores topics concerning collaborations and the business models adopted by startups and companies. A significant 32% of the most innovative products are developed in collaboration with hospitals, either as customers or collaborators. Notably, key Catalan hospitals involved in these collaborations include Hospital Vall d'Hebron, Hospital Clínic, Hospital Sant Joan de Déu, Hospital de Bellvitge, and Hospital Germans Trias i Pujol.

Most prevailing products are developed in collaboration with hospitals (32%), either as customers or collaborators. Among them, the main Catalan hospitals are: Hospital Vall d'Hebron, Hospital Clínic, Hospital Sant Joan de Déu, Hospital de Bellvitge, and Hospital Germans Trias i Pujol.

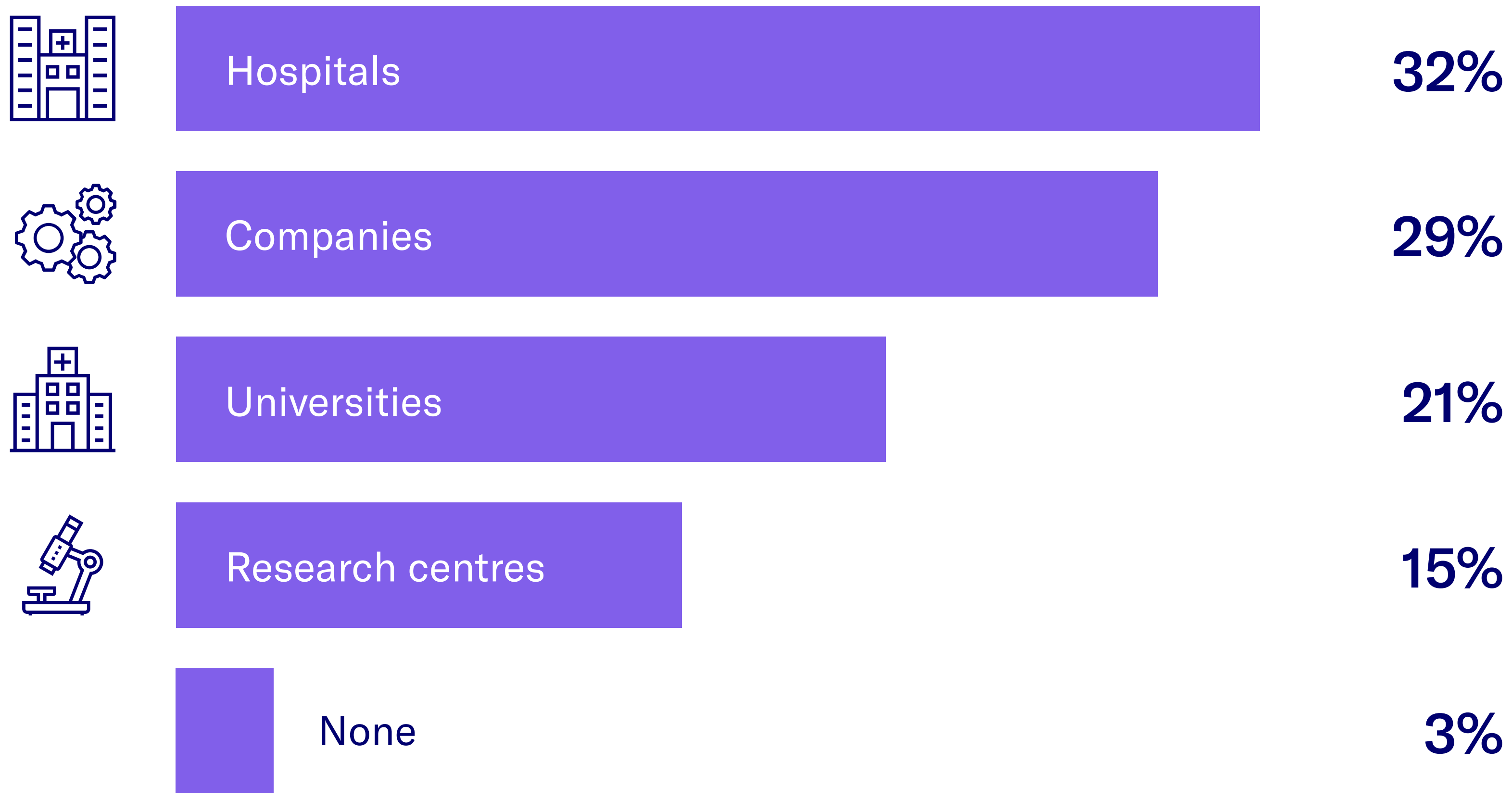
The predominant business model is B2B (73%). The majority of these customers are private hospitals, clinics, and insurers, accounting for 29%. In more detail, 34% of B2B companies that sell to private hospitals/clinics/insurers have between 1 and 10 customers; 55% of those selling to entities of the public health system also have between 1-10 clients. However, 43% of those selling to private companies have between 10-50 customers. The B2C model is specified as 27% of customers (patients or end users), where most companies have more than 1,000 customers, as they are apps or platforms. 51% of all companies in the market have international customers.

Much of the startups (67%) have a turnover of less than €1M or no turnover (20%). Only 14% have a turnover between €1-10M. Among the most established companies, the range of turnover widens, and 32% have a turnover of more than €10M.

*Survey of 386 healthtech companies in Catalonia in 2023, with a 28% response rate. 78% of the responses are from startups

Business development of healthtech companies in Catalonia

Type of collaborators ↘



Main customers or collaborators ↘

#1 Vall d'Hebron

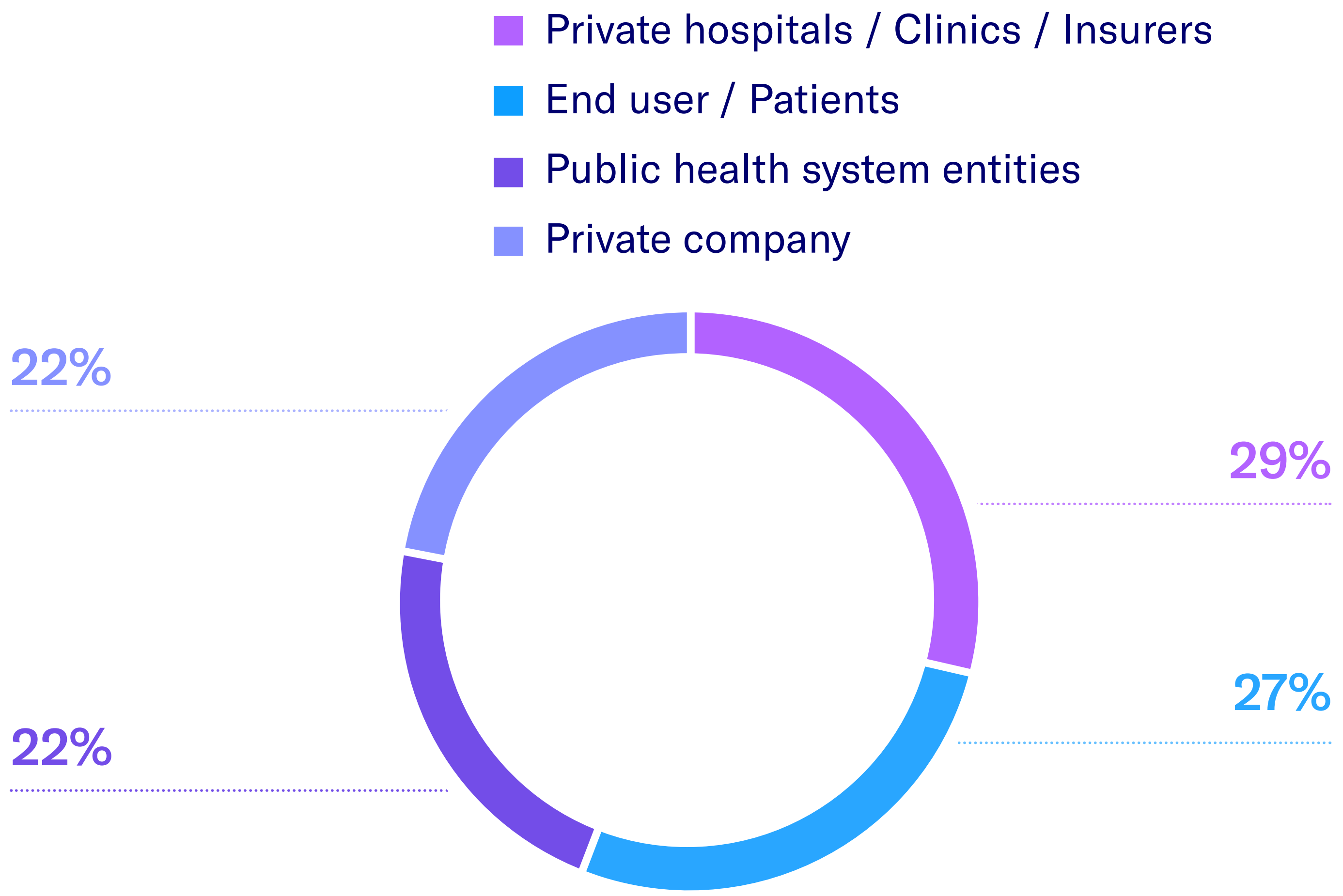
#2 Clínic Barcelona | Universitat de Barcelona

#3 SJD Sant Joan de Déu Barcelona · Hospital

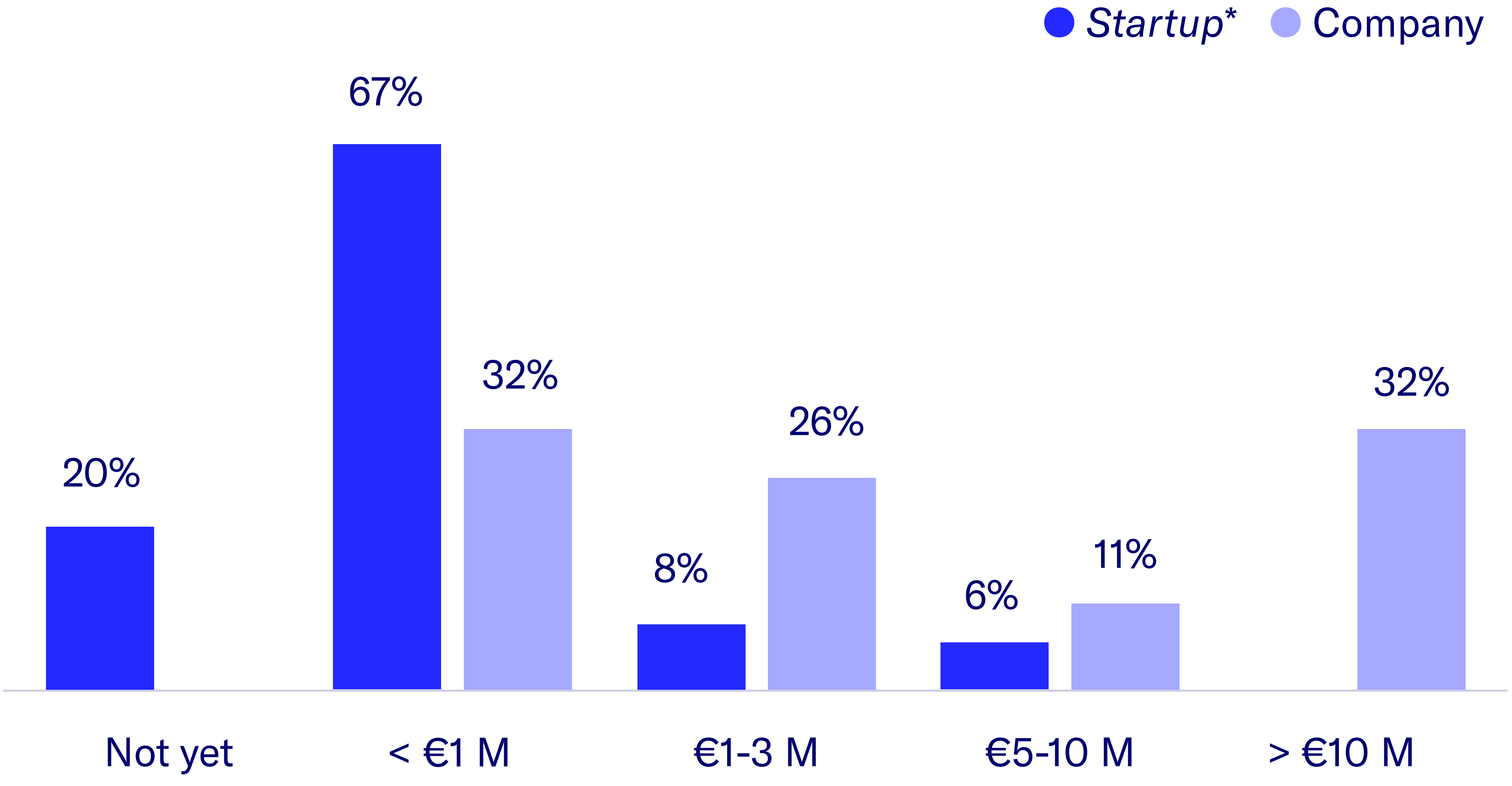
#4 Bellvitge Hospital Universitari

#5 Germans Trias i Pujol Hospital

Main business model ↘



Annual revenues from sales ↘



*Year of foundation ≤10 years

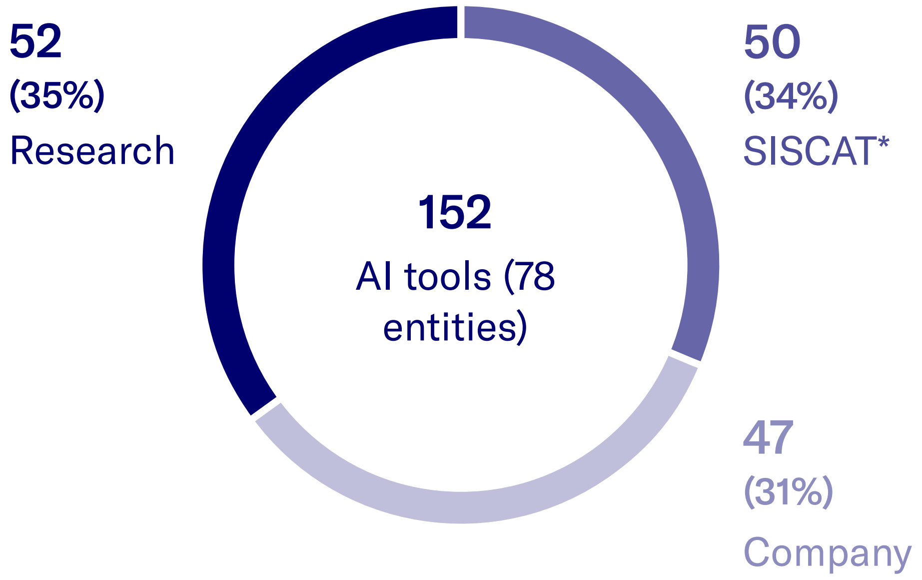
Presence of AI in the Catalan Health System

In 2023, the Generalitat de Catalunya approved the establishment of the Health/AI Programme, aimed at fostering and advancing artificial intelligence in the Catalan Health System. The initiative seeks to create a conducive environment for innovation in healthcare, with a particular focus on prioritizing prevention, spearheading the implementation of AI solutions, and enhancing the overall quality and sustainability of the healthcare system. This section showcases a curated set of indicators collected by the AI Observatory in Health through an open form. By December 2023, 78 entities had filled it out, providing valuable insights that culminate in the following conclusions:

- The 78 entities collectively possess a total of 152 registered AI tools, distributed equitably among CERCA centres (34.9%), SISCAT* centres (33.6%), and private initiatives (31.5%).
- Of the 152 tools, 38% are in the most advanced stages of maturity and are being applied in real environments (TRL 8-9), 35% are in intermediate stages of validation (TRL 4-7), and 27% are in initial laboratory stages (prior to concept testing, TRL 1-3). Notably, 73% of these AI tools find application in hospital environments.

53% of public-private collaborations between SISCAT* centres or CERCA centres and private Catalan companies are for developing or validating AI tools, whereas 24% are for business acquisitions.

Number of AI tools registered in Catalonia

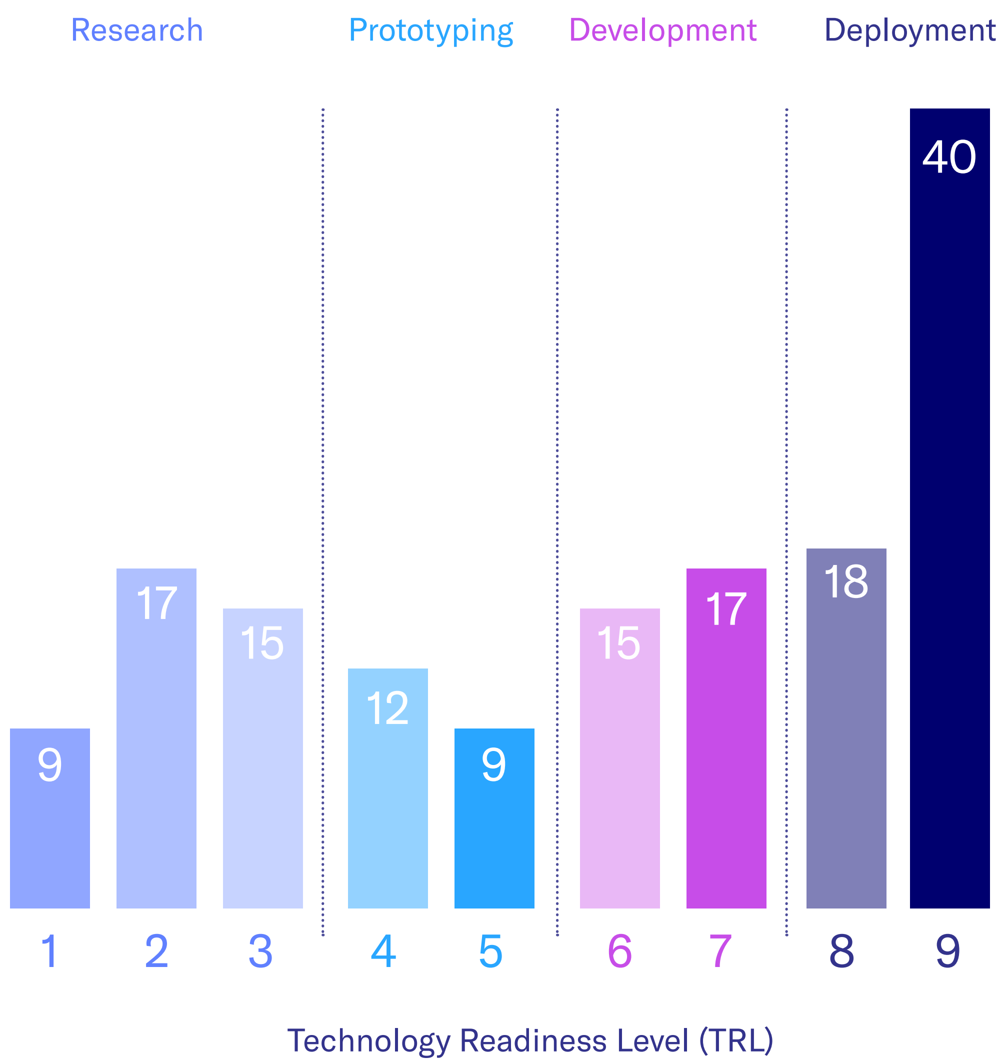


+70%

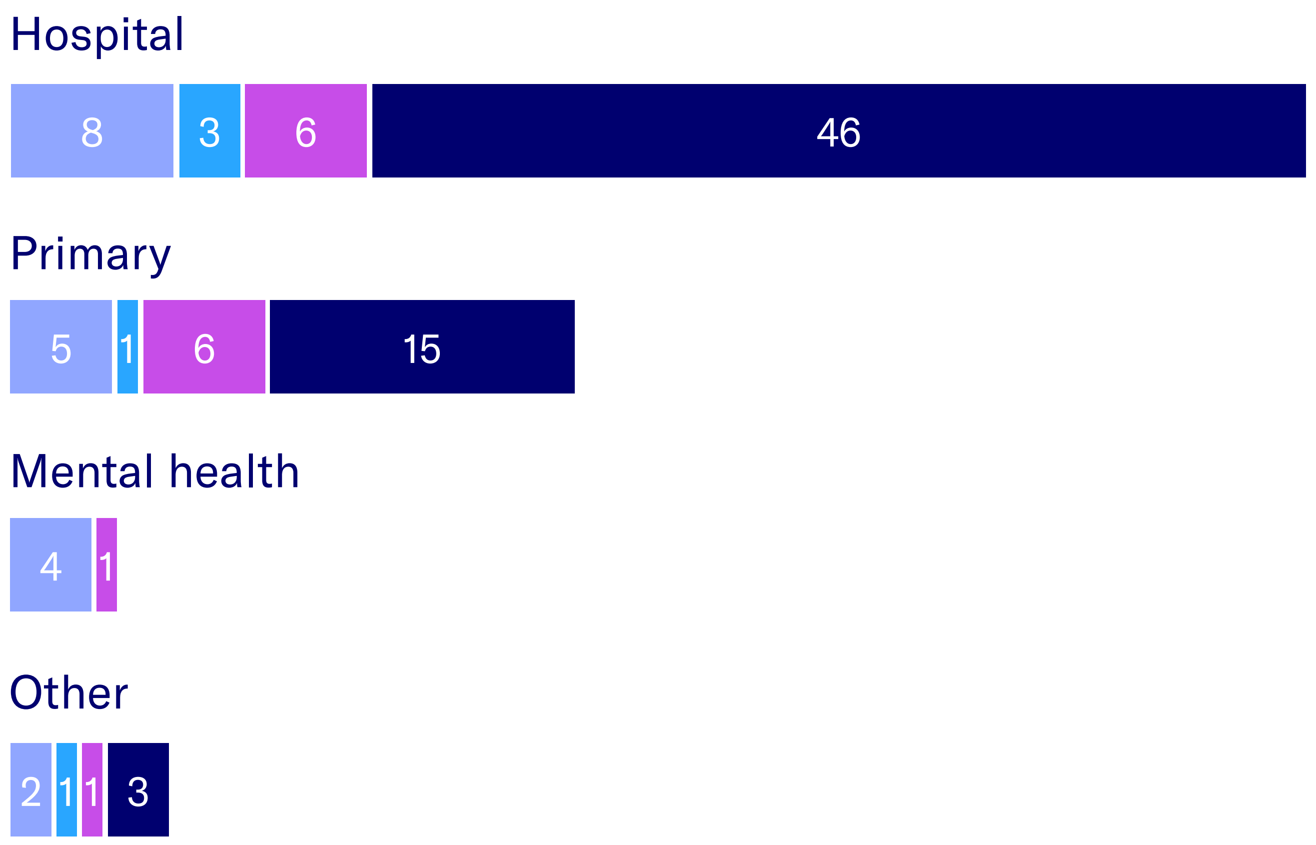
Use interoperability and scalability standards

Have published scientific evidence

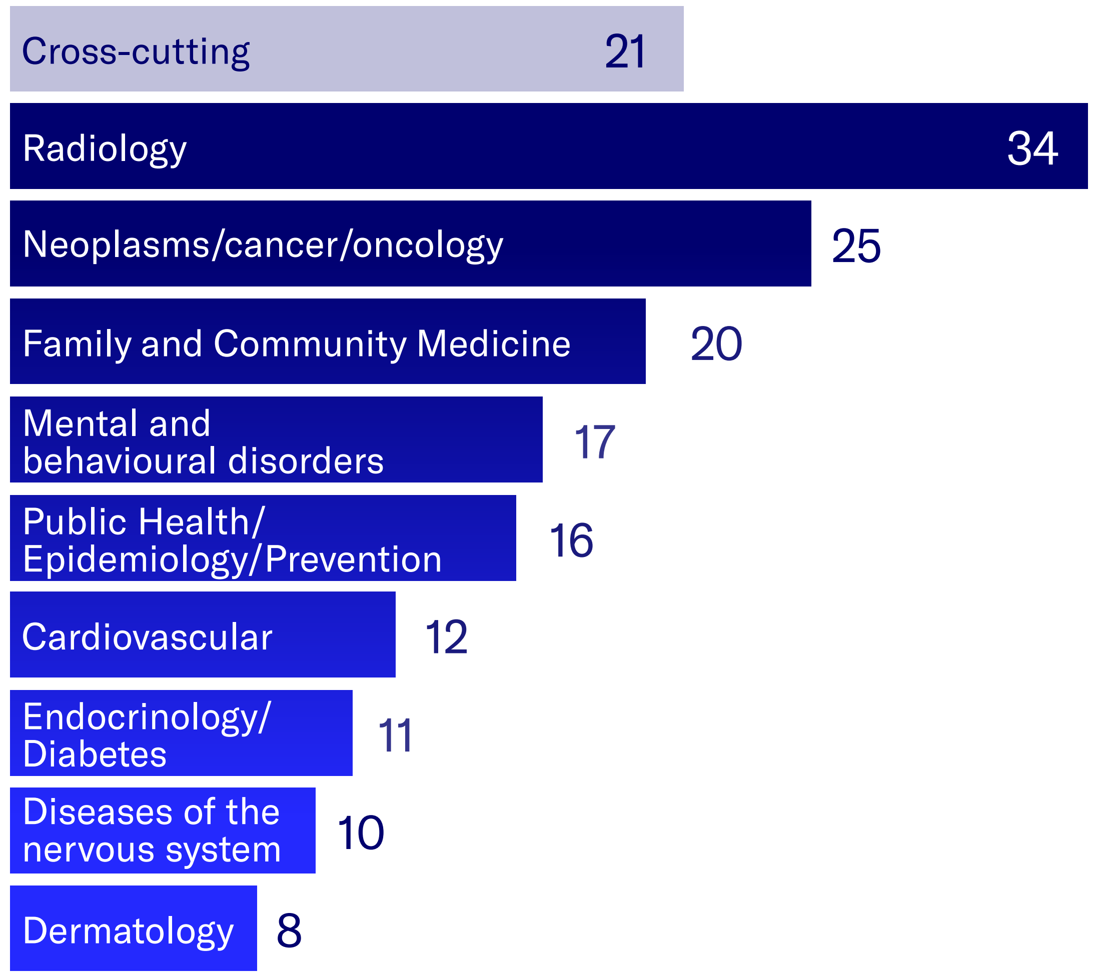
Level of maturity



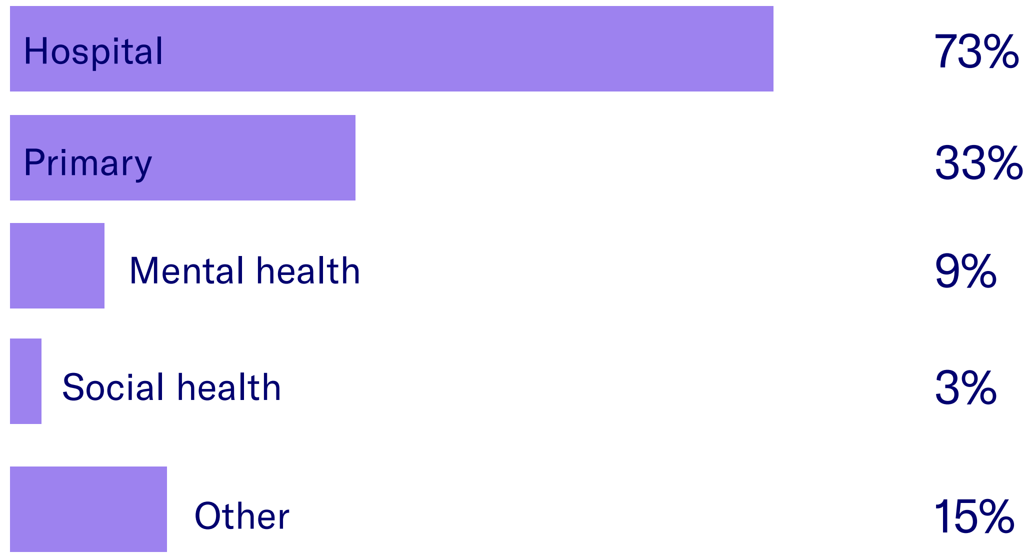
Level of maturity by scope



Top 10 medical specialities ↘



Scope of action ↘



Types of public-private collaborations ↘

Development or validation of AI tools 53%

Business acquisitions 23.5%

Undetermined 23.5%

* SISCAT (Comprehensive Public Health System of Catalonia)

Source: AI Observatory in Health. Programme for the promotion and development of Artificial Intelligence in the Health System. Social Health ICT, Generalitat de Catalunya, December 2023

Note: percentages may exceed 100% if the selection allows for multiple answers.

85 startups and scaleups working on AI applied to healthcare in Catalonia

After observing the deployment of artificial intelligence tools in Catalonia's centers, hospitals, and healthcare system in 2023, we delve into the application of AI by companies established in the BioRegion.

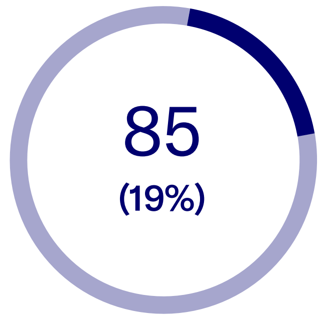
19% (85) of all healthcare startups and scaleups in Catalonia (nearly 450) are engaged in applying AI to their products or services. More than half (56%) are digital health companies, 22% are biotech companies, and 13% are medtech companies.

Investment in AI among healthcare startups and scaleups has continued to grow since 2019. 92% of the total investment attracted (€251 M) has been raised in the last five years, with medtech (€120 M) and digital health (€97 M) receiving the most investment.

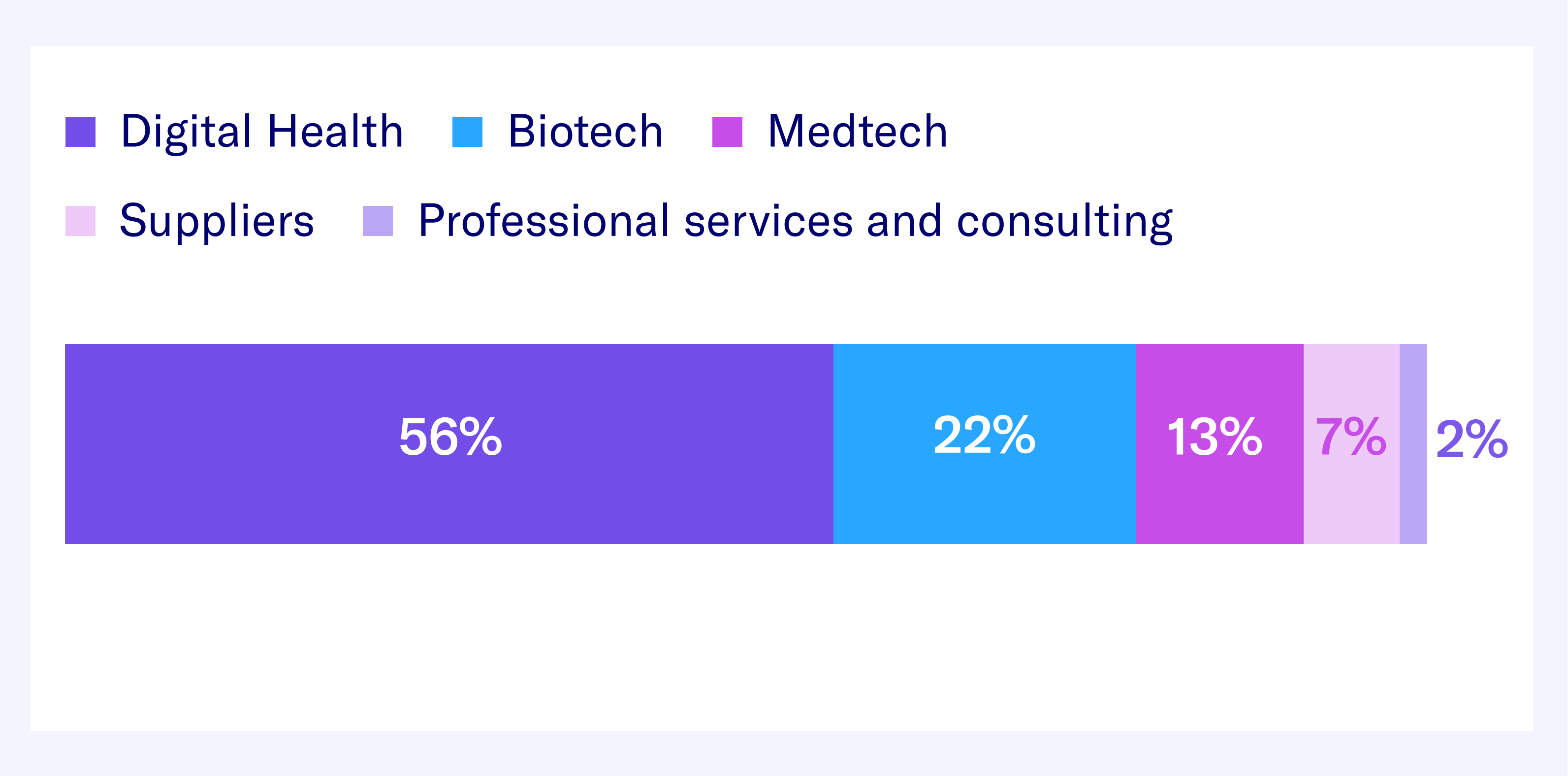
The potential of AI in healthcare is already evident in accelerating drug discovery, optimizing remote care, enabling precision diagnosis, facilitating continuous monitoring, and improving operational efficiency, among other areas. The integration of generative AI in healthcare is poised to augment AI's transformative capabilities in product simulation, creation, and customization, ultimately enhancing research efficiency and the delivery of personalized and accurate healthcare services. We have identified two startups* actively engaged in IAGen within the BioRegion so far, a segment we anticipate witnessing rapid growth in the near future.

* Registry of AI tools. Health/AI

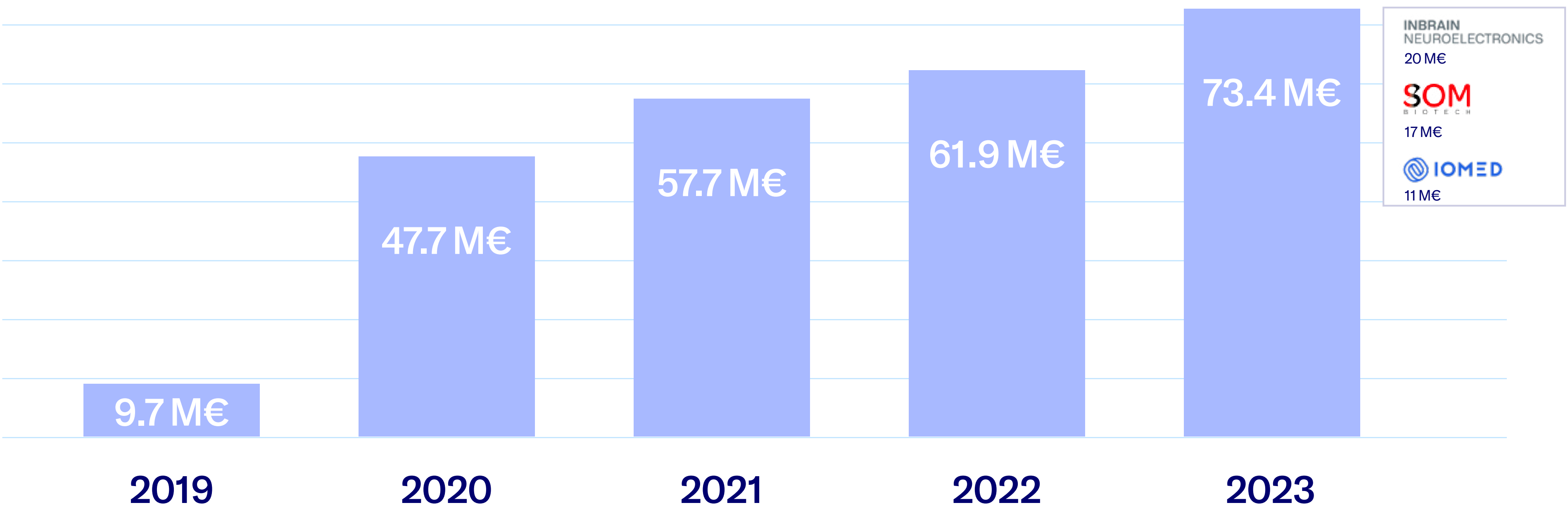
Startups & Scaleups working on AI applied to the healthcare sector in Catalonia ↘



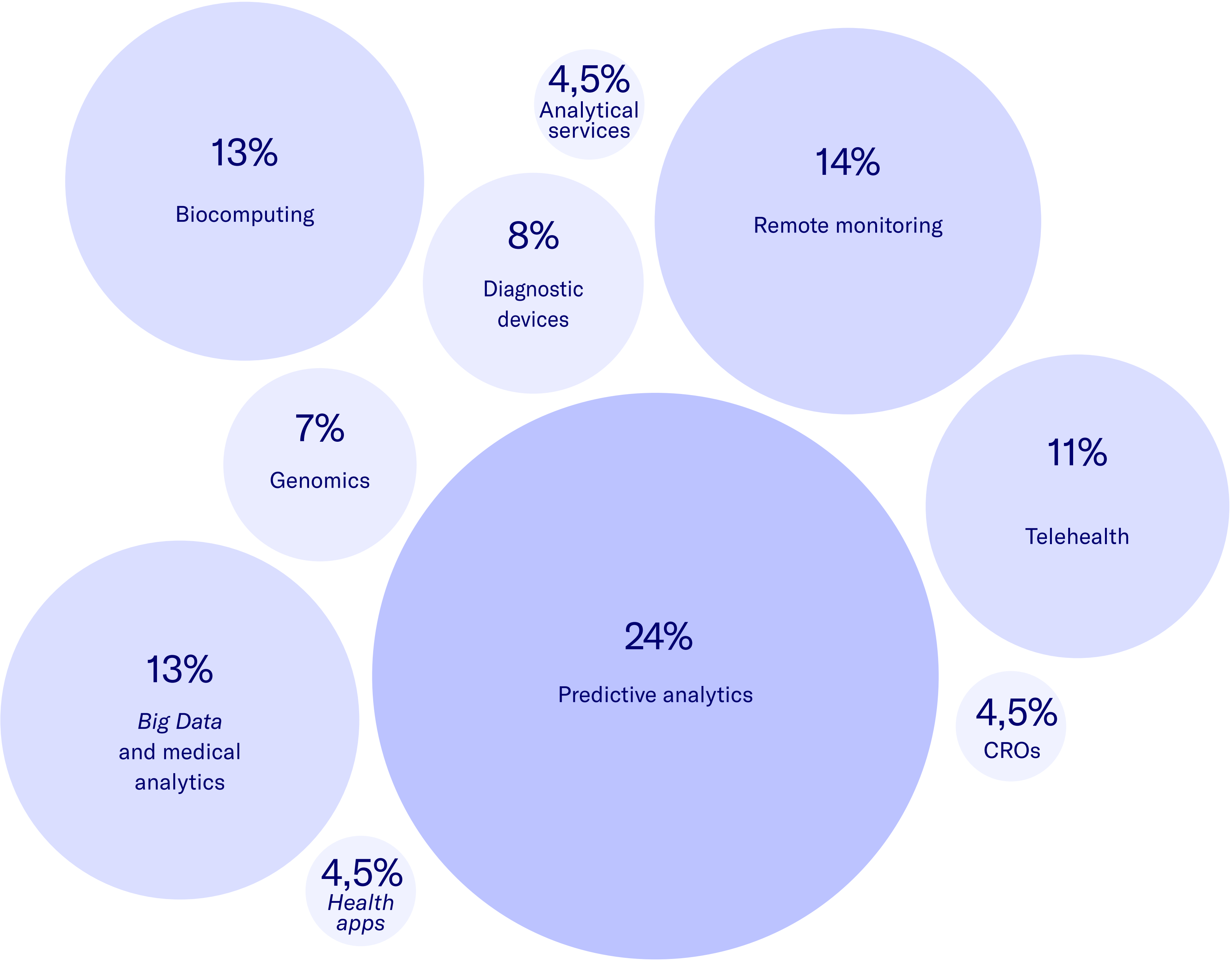
Types of companies



Evolution of investment (2019-2023)



Main subsectors



Source: Biocat

Main therapeutic areas

Diseases of the nervous system
16%

Neoplasms/cancer/oncology
16%

Mental and behavioural disorders
11%

Cardiovascular
5%

Musculoskeletal system
5%

Respiratory
5%

Collaborations and investment in R&D in the industry

This section, extracted from the CataloniaBio & HealthTech and EY 2022 study*, provides an analysis of R&D collaborations in the industry. The findings indicate that 52% of companies in the sector are seeking partners for collaborations, with 32% collaborating with public institutions and 20% with other companies.

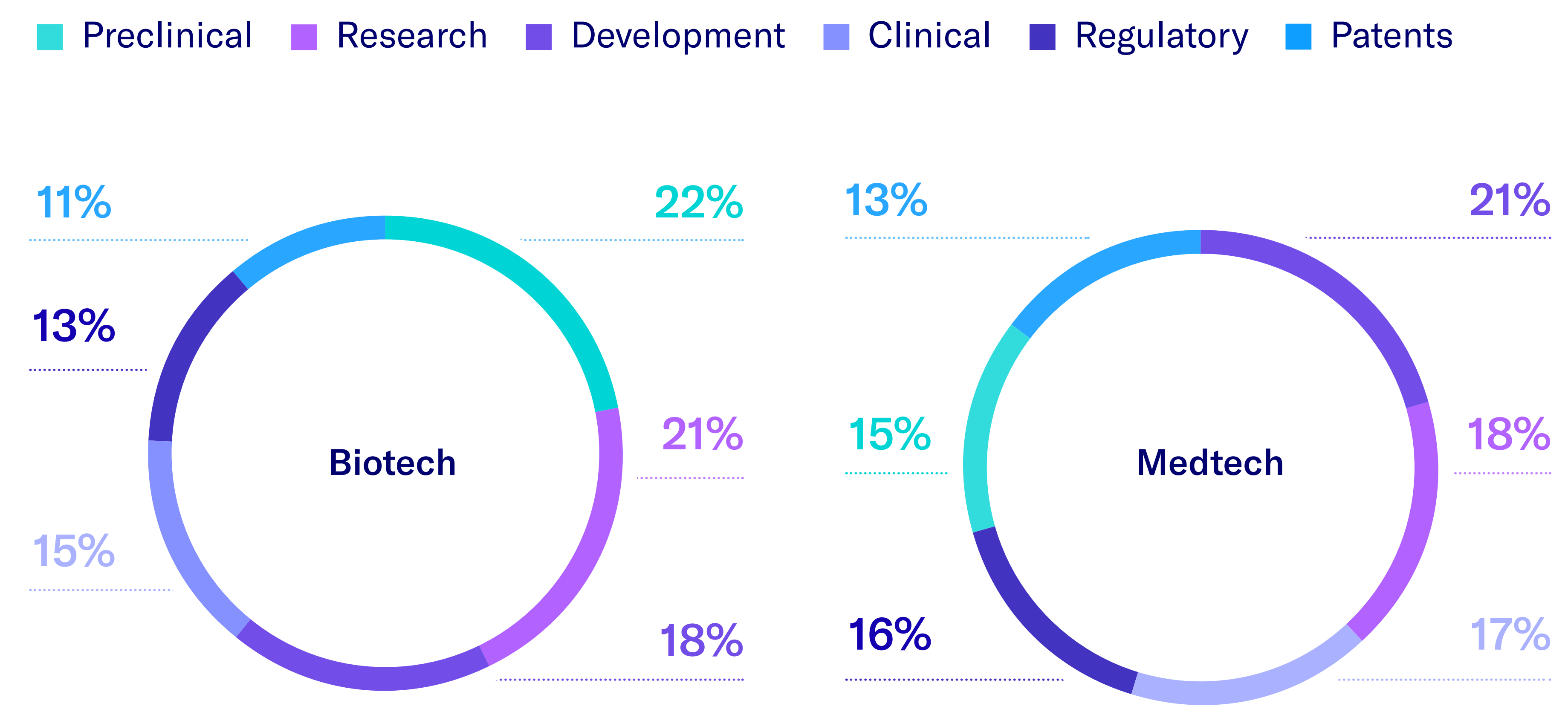
In terms of subsectors, 56% of biotech companies collaborate with other startups or SMEs, while 39% engage with research centers and hospitals, with only 5% collaborating with large companies. In the medtech subsector, collaboration is evenly distributed among various entities, with a majority (30%) partnering with hospitals.

Investment in R&D across different phases of product development shows varying intensity levels, with biotech companies focusing more intensely on preclinical phases, while medtech companies prioritize regulation. However, investment distribution across other phases remains balanced and similar.

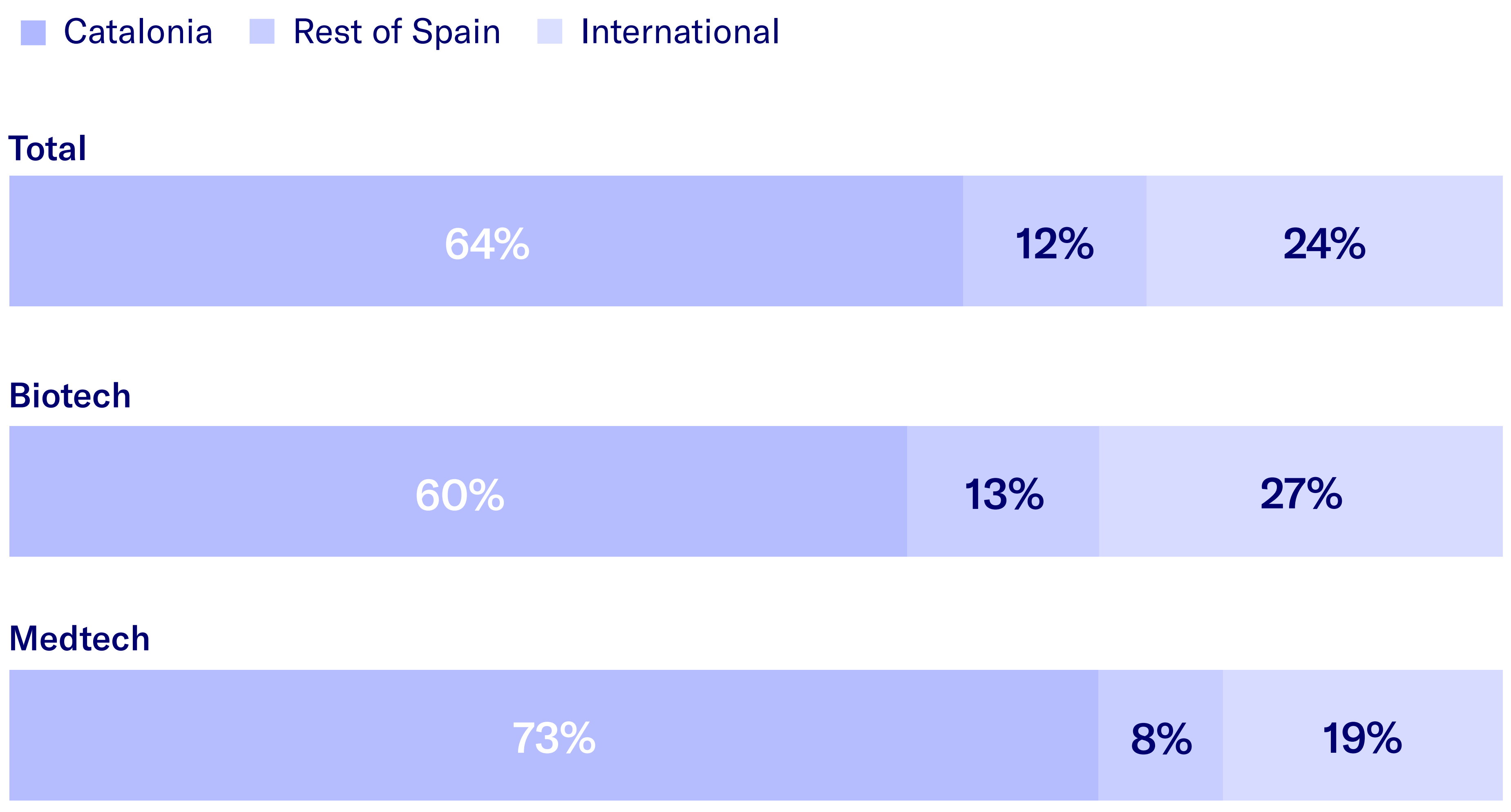
Regarding the geographical distribution of R&D investment in health, Catalonia attracts the majority of investment in both subsectors, particularly in medtech. This trend underscores the confidence of Catalan companies in the network of research centers, hospitals, and service companies within the BioRegion.

* Survey of companies associated with CataloniaBio & HealthTech 2022

Distribution of R&D investment by phases and activities

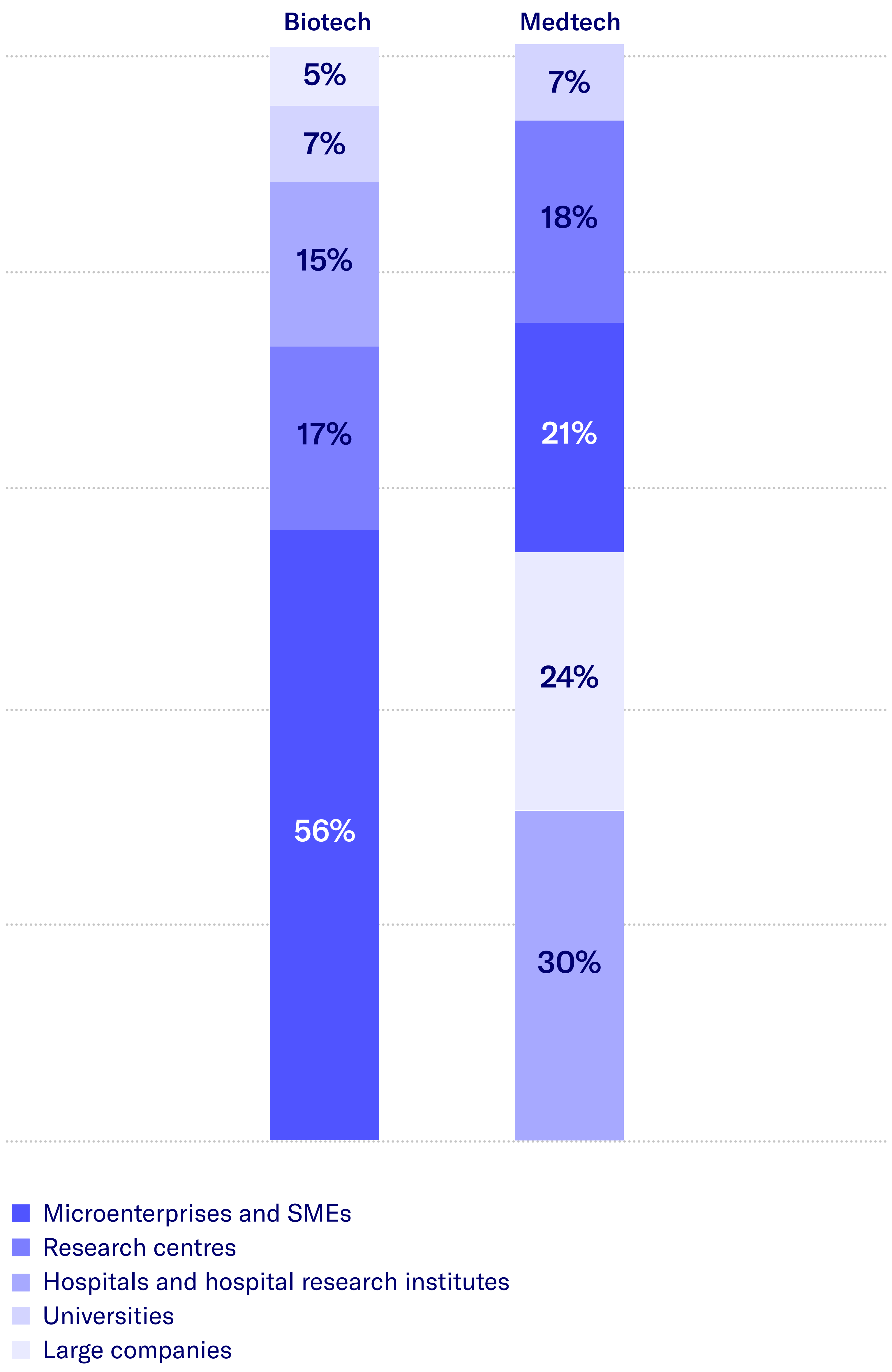


Geographical distribution of R&D investment



Source: Study on healthcare investment in Catalonia 2022. CataloniaBio & HealthTech and EY. April 2023

Distribution of collaboration agreements by partner typology



Methodology

The Catalonia BioRegion is the life sciences and healthcare innovation ecosystem of Catalonia and is the subject of this sector report, which Biocat has been preparing, editing, and publishing since 2009.

The basis for the analysis in the report is extracted from the Biocat Directory (Catalonia Health & Life Sciences Data Platform), which includes nearly 1,700 companies and entities operating in Catalonia in the field of life sciences and health innovation (synthesized under the concept of the "Catalonia BioRegion"). These data are cross-referenced with Biocat's CRM, which contains over 11,000 entities and more than 33,000 contacts. Throughout the report, we refer to "subsectors" to group the main company segments: biotech, pharma, medtech, and digital health (which, in some indicators, we also treat as healthtech). For definitions of the companies belonging to each subsector, you can visit the Directory's Definitions page at this link.

The analysis of company turnover and employees is extracted from SABI (Iberian Balance Sheet Analysis System), a database that collects information from the annual accounts filed with the Commercial Registry (the latest available data being the 2022 financial statements). Companies operating in the territory but not headquartered in Catalonia are not counted. The methodology for calculating the sector's weight on GDP (gross domestic product) can be found on page 45 of the 2017 edition of the BioRegion Report available on the Biocat website.

The information on fDi Markets is a collaboration with ACCIÓ. The methodology is published in Section II of their report "Foreign Investment in Catalonia 2022."

The analysis of the chapter "Investment and Financing in Startups and Scaleups" is the result of Biocat's sector monitoring of emerging and innovative companies in the main subsectors established in Catalonia. It covers public or private capital with formal investment instruments or vehicles. The usual source of data is the company itself or public sources (press releases, news, investors, VC reports, or personal contacts). International investment analyses are conducted under license from Dealroom, the global provider of data and intelligence on startups and technology ecosystems that currently offers the best coverage of venture capital activity and competitive financing in innovation in Europe.

For the analysis of publications and patents in advanced therapies, we have included a perspective of comparable countries (which we call "peer countries") where we consider territories with similar socio-economic characteristics (European, democratic countries with populations between 5 and 20 million inhabitants).

The approach to the healthtech pipeline in Catalonia is a collaboration with Fenin, the Spanish Federation of Health Technology Companies. It is the second consecutive year that a survey has been conducted with companies, and this year a total of 107 startups and companies operating in Catalonia in the field of medical devices and digital health participated (July-October 2023).

If you have any questions or concerns about any of the indicators or information included in this or other editions of the BioRegion Report, or if you find that your company or entity is not correctly reflected, you can contact Biocat's Competitive Intelligence Unit via email at businessintelligence@biocat.cat.

Finally, we would like to thank the professionals of all the entities, both public and private, national and international, who have provided us with the updated data and necessary information to present the analyses and conclusions that we include in each edition of the Report.

2023 BioRegion of Catalonia Report

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#BioRegionReport

comunicacio@biocat.cat

Barcelona, December 2023

Biocat is a strategic stakeholder and catalyst for promoting, transforming and projecting the Catalan life sciences and health innovation ecosystem, known as the BioRegion of Catalonia. It was established in 2006 as a public-private foundation at the behest of the Government of Catalonia and the Barcelona City Council to identify the needs of the BioRegion and implement a strategy and action plan to maximize the economic and social impact of the sector.

REPORT biocat

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In collaboration with:

ACCIÓ Catalonia Trade & Investment, Generalitat de Catalunya, CataloniaBio & HealthTech Connecting companies, farmaindustria, Fenin