



Ministry of Economic Affairs  
and Climate Policy

# *Technological innovation in the Turkish life sciences & health ecosystem*

*Commissioned by the Netherlands Enterprise Agency*

*>> Sustainable. Agricultural. Innovative.  
International.*



# Technological innovation in the Turkish life sciences & health ecosystem

Data uncovering the triple innovation helix



Version: 16th of February, 2024

Author: Lotte Stam, Rijkstraine Netherlands Innovation Network (NIN) and Netherlands Foreign Investment Agency (NFIA) Türkiye

- Rory Nuijens, and Iclal Arguc Demirtas - NIN Türkiye
- Necla Günay, Kemal Sedefci, and Jonas Liekens - NFIA Türkiye



## Table of contents

Table of contents .....	2
1. Introduction .....	3
2. National Incentives .....	4
2.1 Commitment to Innovation .....	4
2.3 Innovation as a National Priority .....	4
2.2 Key players in implementing innovation policy in the LSH sector .....	5
2.4 Glimpse of the Turkish healthcare system.....	8
3. Sectors in life sciences and health .....	10
3.1 Collecting data and defining sectors.....	10
3.2 Academic publication as first indicator of innovation .....	10
3.3 Patents .....	12
3.4 Startups.....	13
4. Hotspots.....	15
4.1 General.....	15
4.2 Istanbul .....	16
4.3 Ankara.....	19
4.5 Izmir .....	22
5. Conclusions of report.....	24



## 1. Introduction

*“By 2040, people in the Netherlands will live at least five years longer in good health, while the health inequalities between the lowest and highest socioeconomic groups will have decreased by 30%.”*

The ambitious mission set forth by the Dutch government in the Health and Care sector propels us beyond national borders, seeking solutions for societal challenges and strengthening the Dutch economy. Our pursuit extends to not only the best clinical practices, effective lifestyle interventions, and reliable medical products but also to knowledge and expertise in addressing these challenges. And it's not just about acquiring knowledge and expertise; it's equally about valorizing this knowledge in daily practice and entrepreneurship. An essential aspect is fostering entrepreneurship to valorize/commercialize knowledge, translating research into clinical practice and enhancing the quality of life for our citizens. The primary focal points for the international strategy of the Dutch Top Sector Life sciences and Health to achieve this mission are technological innovation and knowledge valorization.<sup>1</sup>

This international strategy to maximize the benefits of technological innovation is a multilevel process, ranging from scientific collaborations between research groups to the exchange of academic experts, and from creating multinational ecosystems to facilitating the soft landing of specialized companies in the Dutch ecosystem.

The mission is not only ambitious but also encompasses a broad and diverse Life sciences, and Health (LSH) sector, spanning from long-term care to innovative biopharmaceuticals and from artificial intelligence-supported software to surgical instruments. Embracing the triple helix theorem characteristic of the innovation sector, research institutes, companies, and the government all play vital roles in achieving socially relevant and sustainable innovations.

Türkiye offers numerous collaboration opportunities that could complement our innovation-driven ecosystems. Notable attributes include a highly educated population, recent investments in research facilities, an impressive globally renowned health transformation program since 2004, proximity to the European Union (EU), and close relations with other Eastern countries. The Netherlands Innovation Network (NIN) team and Netherlands Foreign Investment Agency (NFIA) are based in Türkiye to connect Turkish and Dutch ecosystems and support companies expanding or moving to the Netherlands. Identifying collaboration opportunities poses challenges, especially in a large country like Türkiye, with a population of 85 million, 207 universities, and over 1500 hospitals. This report aims to provide guidance within the expansive LSH sector in Türkiye.

While technological innovation and valorization take precedence in the international strategy outlined in the Knowledge and Innovation Agenda (KIA) Health & Care 2024-2027, this report focuses on showcasing opportunities in technological innovation within the LSH domain in Türkiye. The core of this report adopts a data-driven approach, evaluating the sector based on research output, entrepreneurship, and national incentives for innovation. The characteristics of the Turkish LSH sector

---

<sup>1</sup> Kennis-en Innovatie agenda Gezondheid en Zorg 2024-2027, [Kennis- en Innovatieagenda Gezondheid & Zorg 2024-2027 \(fliphtml5.com\)](https://kennis-en-innovatieagenda.gezondheid&zorg2024-2027.fliphtml5.com)

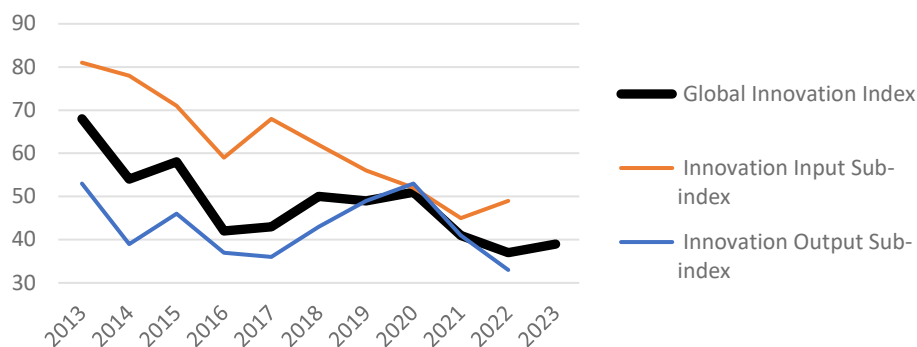
are detailed, and overviews of the LSH ecosystems in Istanbul, Ankara, and Izmir are presented. The report concludes with general recommendations.

## 2. National Incentives

### 2.1 Commitment to Innovation

Türkiye demonstrates a steadfast commitment to fortifying the innovation sector, exemplified by the prioritization of specific sectors in the national development plan, the benefits accorded to research and development (R&D), and the escalating investment in R&D expenditures. The government's proactive stance in funding R&D projects, nurturing innovation, and fostering an appealing environment for research unequivocally signifies its resolve to elevate Türkiye's global standing in research and innovation.

One notable example is Türkiye's ascent in the global innovation index ranking, as depicted in **Figure 1**. This index encompasses approximately 80 indicators, including metrics related to the political environment, education, infrastructure, and knowledge creation within each economy. Türkiye's upward trajectory in this ranking, particularly evident in the Input sub-index over the past decade, underscores the enhancement of elements within the economy that facilitate and enable innovative activities.<sup>2</sup>



**Figure 1.** Türkiye's ranking in the Global Innovation Index between 2013 and 2023.

### 2.3 Innovation as a National Priority

The Supreme Council of Science and Technology (BTYK) is a formally established body, chaired by the Prime Minister, tasked with identifying, evaluating, and coordinating innovation policies in Türkiye. Comprising relevant ministers, heads of public and private entities, universities, and non-governmental organizations, the BTYK represents over 100 organizations. It holds responsibility for long-term strategy formulation and the selection of priority areas. Defined as the highest-level national policy document in Türkiye, the National Development Plan (NDP) outlines macro-level national policies and priorities. The NDP, presented every five years, guides the nation's strategic direction.

The 12th NDP (2024-2028) places a strong emphasis on fostering a robust R&D and innovation ecosystem. The primary focus is on augmenting scientific research capacity and enhancing roles in the

<sup>2</sup> Global innovation index. <https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023/tr.pdf>



international arena. Support will be extended to international collaborations, such as participation in EU Research and Innovation framework programs, as well as bilateral and multilateral partnerships with strategic countries. An example is the innovation workgroup with the Netherlands. Critical technology projects, including biotechnology and genome editing, will receive backing to harness global opportunities, address societal challenges, enhance human capital, and invest in scientific research.

The Pharmaceuticals and Medical Devices sector emerges as a prioritized area. Infrastructure for production, R&D, and exports, particularly for vaccines, will be bolstered. The plan includes the development of physical and human capacity for pharmaceutical technology and vaccine production, aiming for self-sufficiency and supply security. The establishment of accredited excellence centers for medical devices is planned to support R&D, prototype development, production, and post-production processes.

Collaboration with the private sector will be encouraged for the development of vaccines, drugs, medical devices, reference materials, diagnostic kits, and health entrepreneurship based on artificial intelligence. The plan also envisions stimulating technology transfer to health from other sectors, notably the defense sector. The establishment of a Health Valley for R&D and clinical research in medicine and medical technologies is proposed, creating an integrated health ecosystem. Additionally, a new Technology Development Zone will be founded to support early-stage startups.

## 2.2 Key players in implementing innovation policy in the LSH sector

As anticipated due to the multidisciplinary nature of innovations, the coordination and implementation of national incentives are overseen by several organizations. Each of these entities plays a distinct role and bears specific responsibilities in cultivating a sustainable innovation environment in Türkiye.

### **National Research Council / *Türkiye Bilimsel Ve Teknolojik Arastirma Kurumu (Tübitak)*.**

TÜBİTAK is a part of the Ministry of Industry and Technology and is headquartered in Ankara. It is responsible for designing and implementing programs aimed at augmenting R&D activities across public and private sectors, as well as universities. Additionally, TÜBİTAK serves as the secretary of BTYK, playing a pivotal role in coordinating national innovation efforts. As the largest provider of innovation resources in Türkiye, TÜBİTAK also serves as the National Contact Point for EU research programs.

TÜBİTAK is actively involved as an associated partner in two Horizon Europe (HE) MSCA calls: "Nanobiotechnologies for Innovative Therapeutic Approaches for Cancer (NANOBIO4SCAN)" and "Technologies and Innovation Doctoral Programme (BIOTIN)." Furthermore, TÜBİTAK is participating in the HE Health program, specifically in "Fostering a European Research Area for Health Research (ERA4Health)."

Adding to its contributions, TÜBİTAK operates two research centers dedicated to LSH research:

- Marmara Research Centre (Tübitak MAM)  
This research center provides contractual research, testing, training, consultancy, analysis, and certification services and operates a technopark. Examples of the focus areas are



theranostics (the combination of using one radioactive drug to identify (diagnose) and a second radioactive drug to deliver therapy to treat the main tumor and any metastatic tumors) based wound dressing and bio-ink for 3D printing. Another example is the 3D printing of bone for the treatment of bone injuries and tumors.

- Genetic Engineering and Biotechnology Institute (GEBI)
- Genetic Engineering and Biotechnology Institute is conducting cutting-edge research on the main topics of biotechnology. The main mission of GEBI as the only national institute in Türkiye specialized in biotechnology is to contribute to the national economic development.

### **Ministry of Health - *Türkiye Cumhuriyeti Sağlık Bakanlığı (MoH)***

The Ministry of Health (MoH) is tasked with proposing and implementing government policies related to health, as well as planning, delivering healthcare, and safeguarding consumer protection. Various sub-organizations operate under its purview, with specific responsibilities for nurturing a robust healthcare system and promoting incentives for innovation.

- Turkish Medicines and Medical Devices Agency (TITUBB) which makes and governs the rules for licensing, manufacturing, sale, import, export, supply, distribution, servicing, storage, etc. of medical products. Türkiye recognizes CE (Conformité Européenne) for medical devices.
- Health Insurance Institute (SSI): The reference pricing system is designed to reduce healthcare expenses by benchmarking prices against the lowest rates in reference countries. This policy compels Turkish pharmaceutical companies to primarily manufacture generic drugs, creating significant challenges for investment in research and development within this specific sub-sector.
- The national health institutes – information provided below.

MoH participates in two HE Health calls on Climate Monitoring and Decision Support Framework for Sand Fly-borne Diseases Detection and Mitigation with COst-benefit and Climate-policy Measures (CLIMOS) and the Healthcare Innovation Procurement Network (Procure4Health)

### **The Health institutes of Türkiye - *Türkiye Sağlık Enstitüleri Başkanlığı (TUSEB)***

TUSEB was established with the mission of fostering planned and sustainable development in the realm of health sciences and technologies. These objectives span across scientific research, the advancement of technology and innovation, productization and commercialization, accreditation, and overall health initiatives led by the President.

TUSEB comprises nine research institutes::

- Turkish Maternity, Child and Adolescent Health Institute
- Turkish Biotechnology Institute
- Turkish Traditional and Complementary Medicine Institute
- Turkish Public Health and Chronic Diseases Institute
- Turkish Cancer Institute
- Turkish Health Care Quality and Accreditation Institute
- Turkish Health Policies Institute
- Turkish Vaccine Institute





- Turkish Health Data Research and Artificial Intelligence Applications Institute

In addition to the research institutions, there are such centers as the Aziz Sancar Research and Development Centre (ASAGEM), R&D Directorate Localization Coordination Centre, and Clinical Research Centre.

TÜSEB holds significant importance in guiding the process from conceptualization to product commercialization and indigenization activities. In November 2022, an additional vice president was appointed to the Technology Transfer Office (TTO) and the newly established Department of Indigenization and Project Development in Health Industries. The TTO serves as a supportive entity for other TTOs, aiding universities with processes, regulations, and licensing required for academics to bring their health-related products to fruition. Additionally, small and medium enterprises (SMEs) engaged in innovative work in biotechnology can apply for support in the commercialization of their products.

The Project Support Department, initiated in 2019, provides R&D incentives to the public, academia, and the private sector. The number of supported projects increased significantly from 73 in 2020 to 586 in 2023, with a notable emphasis on oncology-related research, including innovative treatments and omics technologies. TÜSEB's involvement in the HE project on Establishing Cancer Mission Hubs: Networks and Synergies (ECHO-S) underscores its commitment to the oncology field. Another strongly supported area is drug development, encompassing innovative drugs, drug delivery systems, and gene therapy, with support provided across all phases from fundamental research to commercialization processes.

Beyond knowledge valorization, TÜSEB takes a lead in developing ecosystems where public and private entities collaborate on basic, translational, and clinical research. The promotion of personalized medicine, focusing on targeted diagnosis and treatment strategies, is emphasized. To enhance the efficiency of financial resources in health systems, TÜSEB stimulates the development and implementation of preventive and predictive health policies. Furthermore, the organization organizes courses, conferences, educational activities, and events to cultivate qualified human resources and advance the field of health sciences and technologies.

A notable initiative is the TÜSEB Türkiye Genome Project, aiming to sequence 100,000 genomes from healthy individuals, rare and complex disease patients, with the goal of promoting better health for future generations. Additionally, a national Biobanking and Biomolecular Resources Infrastructure has been launched.

### **Digital Transformation Office of the Presidency of the Republic of Türkiye (DTO)**

The Digital Transformation Office of the Presidency of the Republic of Türkiye (DTO) was established to consolidate fragmented activities with a focus on digitalization. Two noteworthy projects in the LSH sector include the "Turkish Brain Project," which aims to develop various artificial intelligence models for detecting anomalies in Magnetic Resonance images. The "digital eye" project is focused on providing decision support and a prioritization system for radiologists in the early diagnosis of breast cancer.





## 2.4 Glimpse of the Turkish healthcare system

The state and organization of the healthcare system play a crucial role as incentives for innovation in LSH. Therefore, the following characteristics of the Turkish healthcare system are outlined below.

### ***Health transformation program***

Despite being initiated over 20 years ago, the impact of the Health Transformation Program (HTP) is still prevalent in today's healthcare system, globally recognized for its remarkable results. Key aspects include the introduction of general health insurance, the practice of family medicine, classification of secondary and tertiary health services as health enterprises, and the establishment of regulatory and supervisory roles for the Ministry of Health (MoH). The Central Hospital Appointment System for online appointments and the implementation of electronic patient records, with the MoH as the data owner, were introduced in 2011. Additionally, the HTP encompassed initiatives for health promotion, pharmaceuticals, and emergency services. Projects targeting cancer screening (2004), combating tobacco use (2008), mental health (2008), and cardiovascular disease prevention (2011) were executed. Despite its success, challenges such as organizational structure issues, managerial appointments, changes in office, healthcare worker dissatisfaction, and communication problems persist.<sup>3</sup>

### ***The 2024 Presidential Annual Program***

Published on October 25, 2023, the "2024 Presidential Annual Program" outlines a macroeconomic forecast with main indicators and targets for 2024. This program introduces alternative reimbursement models for pharmaceuticals, specifically for high-cost medicines, innovative treatments, and orphan drugs. The role of public procurement is emphasized, aiming to leverage its effect in the pharmaceutical and medical device sector to enhance global competitiveness, reduce import dependency, and ensure supply security. The program reports an increase in the share of pharmaceuticals manufactured in Türkiye to 89.5% in 2022 compared to 72% in 2016, indicating a focus on domestic production.

### ***MoH reimbursement policy as an incentive for R&D direction***

In Türkiye, public procurement, primarily by the General Directorate of Public Hospitals, drives the medical sector. The majority of medical device purchases depend on the purchasing policy and strategy of the MoH and the implementation by TITUB. The market in Türkiye is significantly influenced by government approval and purchases, leading to a small market if the product is not approved. The government's emphasis on low-tech, inexpensive medical devices as a cost-reduction measure has created a disincentive for investing in R&D and valorization, particularly for complex products. Similarly, the focus on generics in the pharmaceutical sector has discouraged the exploration of new effective substances. The government is now looking to increase Turkish pharmaceutical exports and is focusing on biopharmaceuticals.



### ***Healthcare organization***

In Türkiye, no referral from a family doctor is required to see a specialist, resulting in high pressure on healthcare specialists, especially in public hospitals where income is tied to the quantity of healthcare delivered. This high workload has led to a limited involvement of clinical specialists in research activities. Working conditions have also prompted many healthcare specialists to leave Türkiye for opportunities abroad, resulting in an insufficient number of clinical specialists. Private hospitals, like Koç University Hospital, offer a lower work pressure, allowing doctors to allocate time for research.

### ***Medical products industry***

Türkiye's pharmaceutical sector has the potential to compete globally due to its geographical location, relatively low cost, and high technology production capability. With around 500 companies operating in the industry, the growth rate in R&D expenditure in the pharmaceutical sector in Türkiye was 241 percent between 2010 and 2017. The main focus is on generic medicines, resulting in less innovation for new active substances. Access to capital remains a significant obstacle to R&D activities for innovative pharmaceuticals. The medical devices sector is also strategically vital for Türkiye, with a notable healthcare cluster in Samsun known globally as the third center for medical equipment clusters. The cluster comprises 44 manufacturers among Türkiye's 183 medical equipment manufacturing companies, providing a significant international market for medical equipment.<sup>3</sup>

---

<sup>3</sup> Healthcare and life sciences review Türkiye, November 2021, [www.pharmaboardroom.com](http://www.pharmaboardroom.com)



## 3. Sectors in life sciences and health

### 3.1 Collecting data and defining sectors

Desk research and information gathered during visits have significantly contributed to insights into national mechanisms and priorities for innovation in LSH. For a more quantitative approach, multiple datasets were consulted, with organizations cataloged in an Excel file based on their presence in one or more datasets. An overview of these datasets is provided below:

1. **Academic output.** Extracted from Scopus in December 2023, the number of published articles by Turkish organizations in health-related fields over the last decade was considered. Only articles written in English were included, and a classification scheme was applied to identify specific fields in healthcare and LSH-related key-enabling technologies.
2. **HE participation.** Turkish participants in LSH-related calls, including Marie Skłodowska-Curie Actions (MSCA), European Innovation Council (EIC), European Research Council (ERC), and widening calls, were identified using the HE portal in November 2023.
3. **Patents.** Utilizing the Techin2B platform for patent analysis, patents applied at WIPO or EPO in the last 10 years were grouped based on a Fraunhofer classification (appendix E). Inactive patent applications were excluded.
4. **Startups.** Data on Turkish LSH startups was collected from Startup.watch, which is verified with the chamber of commerce. Only startups labeled with LSH-related categories (Healthtech, Biotech, Genetics, and Hospital Information System) and specific criteria (alive, not acquired) were considered. The list was cross-checked with internal startup lists, with companies focusing on sectors like agritech, Human Resource, cosmetics, and medical tourism excluded. The remaining startups were divided into three categories: pharmaceutical, biotechnology, and medical devices.
5. **Companies.** Identification of additional companies was based on accredited R&D centers in LSH in Türkiye. An R&D center was defined as having at least 15 Full-Time Equivalent R&D positions in researcher and technician roles. These companies were categorized into pharmaceutical, biotechnology, and medical devices.
6. **World University Ranking 2024.** Rankings and scores of Turkish universities were extracted from the relevant website if the organization was present in one of the other datasets.

#### **Excluded sectors**

Medical tourism, especially cosmetic treatments which have gained popularity for foreigners, was excluded from the scope of this report. While innovation in these sectors may have implications for other healthcare domains, they do not align with national missions for Health and Care. Additionally, results focusing on dental care, dietary products, and biotechnology for agricultural purposes were excluded from the analysis.

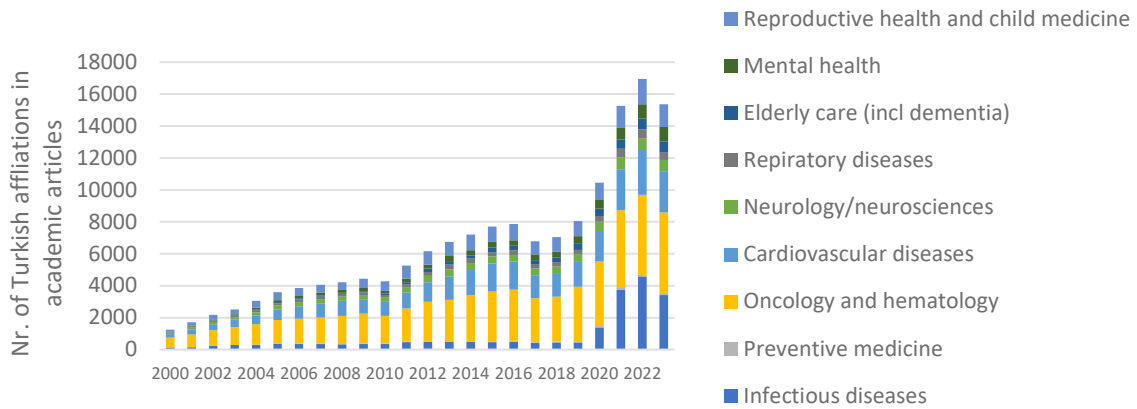
### 3.2 Academic publication as first indicator of innovation

To unveil national trends and directions in LSH innovations, a good starting point is the analysis of national academic output. Academic research often serves as the cornerstone for most innovations,

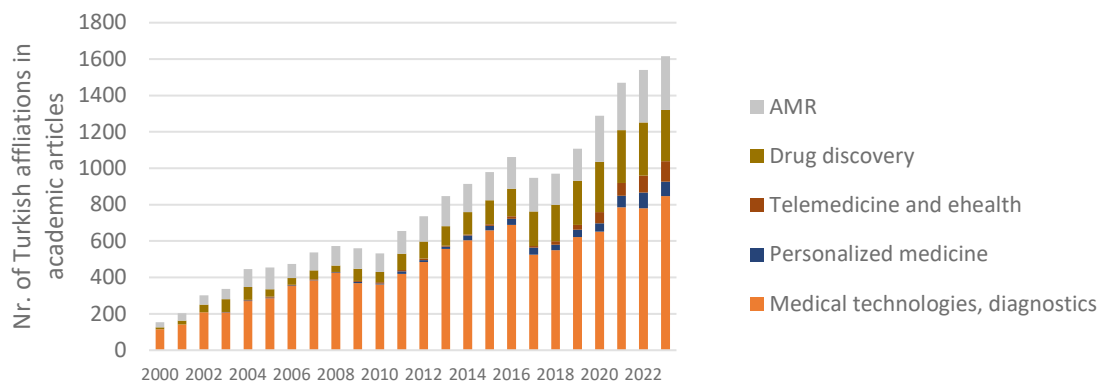
and consequently, the volume of publications in academic journals serves as a reflection of ongoing research activities.

As depicted in **Figure 2A**, there has been a significant surge in academic publications, particularly over the past seven years. The various healthcare sectors identified exhibit comparable relative increases, with the notable exception being the elevated number of publications focused on infectious diseases during the COVID-19 pandemic. **Figure 2B** illustrates a similar equitable distribution among the identified research areas. Notably, **Figure 2C** highlights a remarkably promising surge in academic publications within the realm of LSH-related key-enabling technologies. The spike in research in areas such as nanomedicine and -omics is particularly noteworthy.

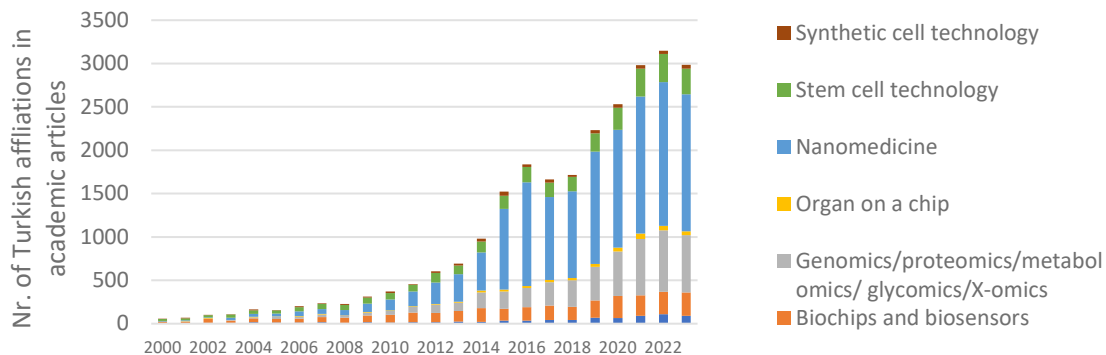
**A. Healthcare fields**



**B. Research areas**



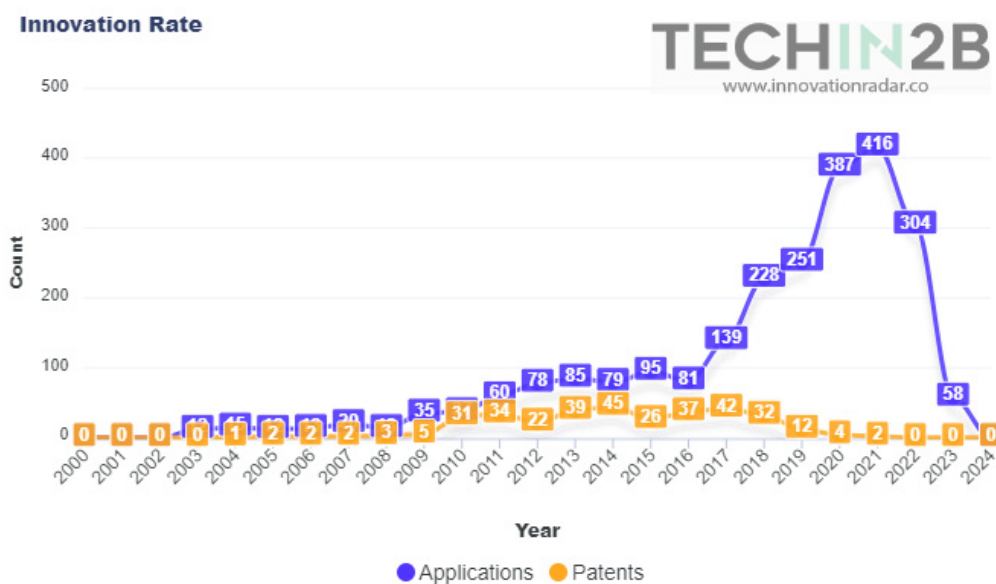
**C. LSH-related key-enabling technologies**



**Figure 2.** Number of academic publications by Turkish organizations in LSH-related fields.

### 3.3 Patents

Since 2016, patent applications in the LSH domain have experienced a substantial increase, as illustrated in **Figure 3**. It is crucial to note that the information regarding granted patents comes with a caveat – the process of granting patents typically spans several years. Consequently, the data for the last couple of years is not complete.



**Figure 3.** Patent applications in healthcare field by Turkish Assignees.

A commonly employed method to assess trends in patent applications involves visualizing the number of patents per IPC category over the years, as illustrated in **Figure 4**. It is important to note that not all IPC categories necessarily indicate innovative patents. However, the evaluation of the individual patent value was beyond the scope of this project. Noteworthy trends can be observed for the following categories:

- G01N: Investigating or analyzing materials by determining their chemical or physical properties



- A61P: Specific therapeutic activity of chemical compounds or medicinal preparations
- A61M: Devices for introducing media into, or onto, the body; devices for transducing body media or for taking media from the body; devices for producing or ending sleep or stupor
- A61F: Filters implantable into blood vessels; prostheses; devices providing patency to, or preventing collapsing of, tubular structures of the body, e.g. stents; orthopedic, nursing or contraceptive devices; fomentation; treatment or protection of eyes or ears; bandages, dressings or absorbent pads; first-aid kits
- A61B: Diagnosis; surgery; identification
- A61K: Preparations for a medical, dental or cosmetic purpose

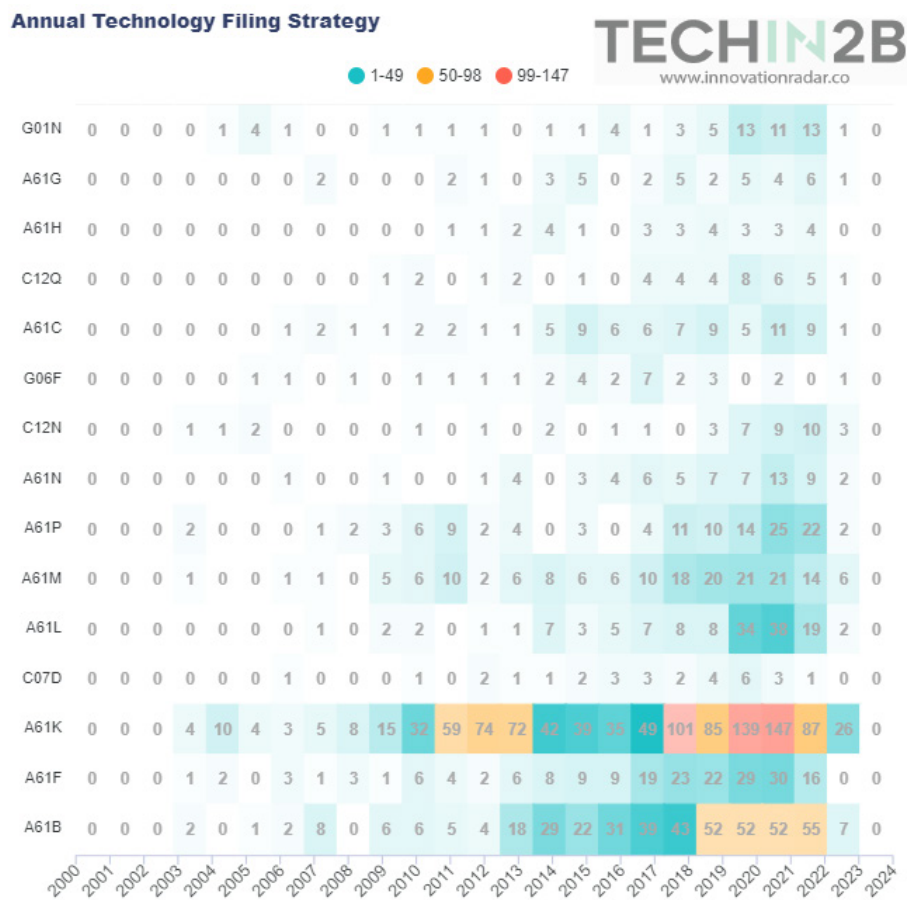
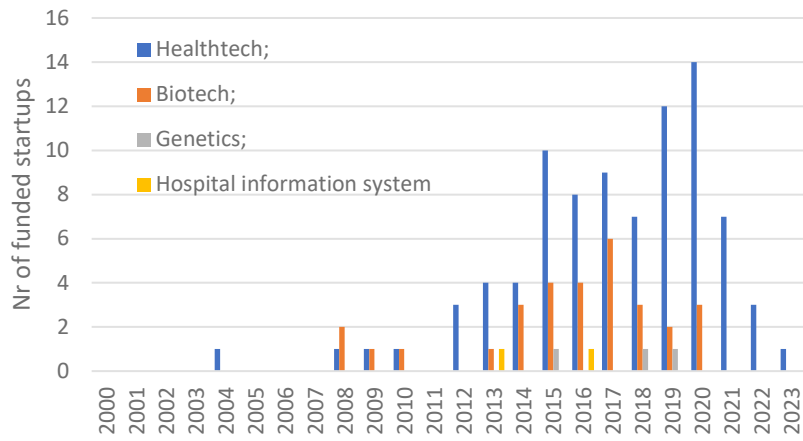


Figure 4. Heatmap depicting number of patent applications per LSH-related Patent heatmap for LSH related fields.

### 3.4 Startups

Figure 5 illustrates the growth of new startups over the years, with a notable emphasis on the activity of healthtech and biotech companies.



**Figure 5.** Startups sorted per founding year and based on their focus area.



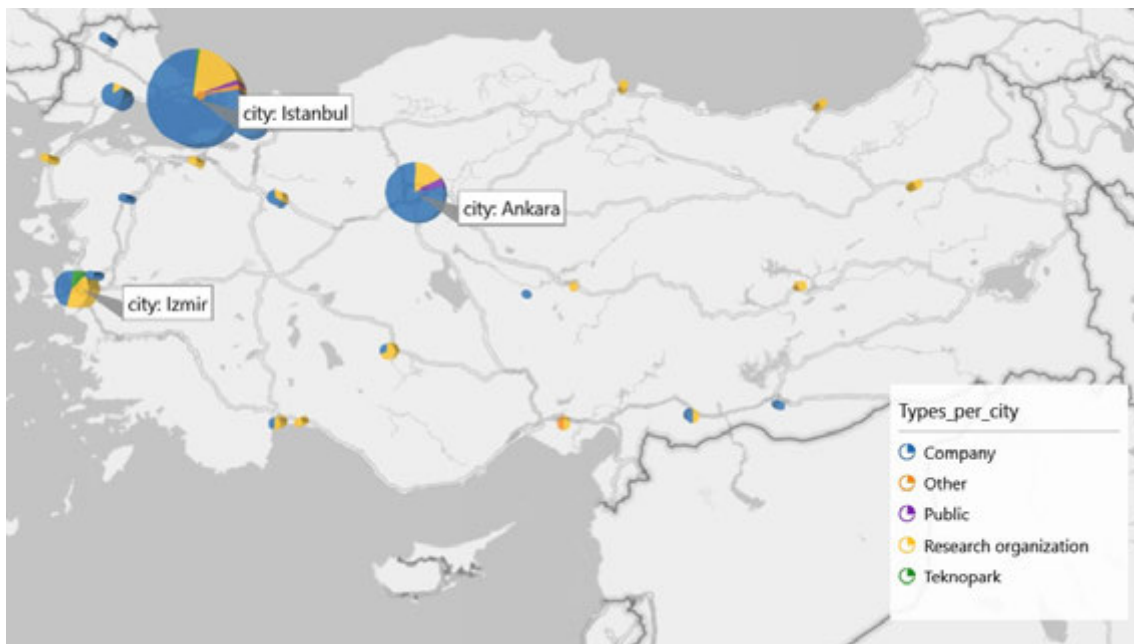
## 4. Hotspots

### 4.1 General

The majority of research organizations and companies are concentrated in the three major cities of Türkiye: Istanbul, Ankara, and Izmir. Before delving deeper into these clusters, it is worth mentioning two other cities.

Tekirdağ is marked by pharmaceutical companies with accredited R&D centers, including Deva, Humanis, Koçak Farma, Polifarma, Ulkar, and Vemilac. However, these companies lack a patent portfolio or HE participations.

Kocaeli, housing Gebze Teknik University and Kocaeli University, presents an intriguing ecosystem. While specific information on patents, HE, and academic publications is limited, a compelling combination of startups and larger companies is evident. Six larger companies with R&D centers focus on pharmaceuticals and medical devices, alongside noteworthy startups such as Adbioink, Idil Biotech, Moltek, PhiTech, and Surgitate, engaged in deep-tech solutions in biotechnology and medical devices.



**Figure 6.** Types of organizations per city in Türkiye

## 4.2 Istanbul

Istanbul showcases a diverse and extensive ecosystem, ranging from leading research universities to potential startups, well-established companies, and robust collaborative clusters. The overview of the ecosystem in Istanbul can be found as **Figure 7**. Insights in the academic output and patents can be found in **Figure 8** and **Figure 9**, respectively.



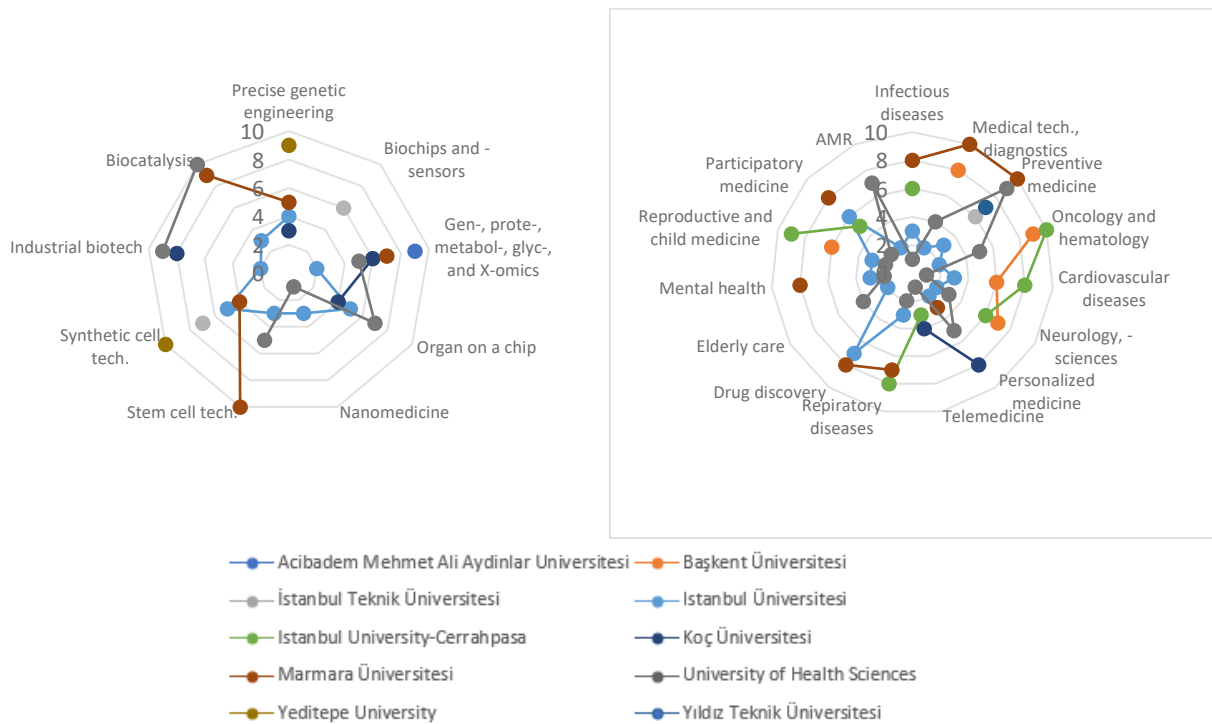
**Figure 7.** Types of organizations in Istanbul

### Research organizations

Examining the research organizations, Koç University and Sabanci University stand out as Türkiye's premier educational institutions. These private universities boast a diverse patent portfolio, coordinate numerous HE calls, and feature prominently in the list of universities with the highest academic publications. Sabanci University's output primarily focuses on biotechnology and nanotechnology, while Koç University maintains a broader focus. Particularly impressive is Koc University's participation in HE, holding five coordinator roles, including three ERC and EIC grants, primarily concentrated on medical devices and biotech.

Istanbul University, one of Türkiye's oldest public universities, is renowned, particularly in academic publications, both in specific fields and key enabling technologies. However, their involvement in HE is comparatively limited. Concerning patents, Istanbul Medipol University, Yeditepe University, and Yıldız Teknik University possess the most extensive patent portfolios.

The Nanotechnology Research and Application Center - Sabanci Universitesi Nanoteknoloji Arastirma Merkezi (SUNUM) is a national research infrastructure focusing on nanotechnology and the application of nanomaterials in life sciences.



**Figure 8.** Ranking of Istanbul Universities based on their contribution in specific Life sciences and Health and related key-enabling technology fields.

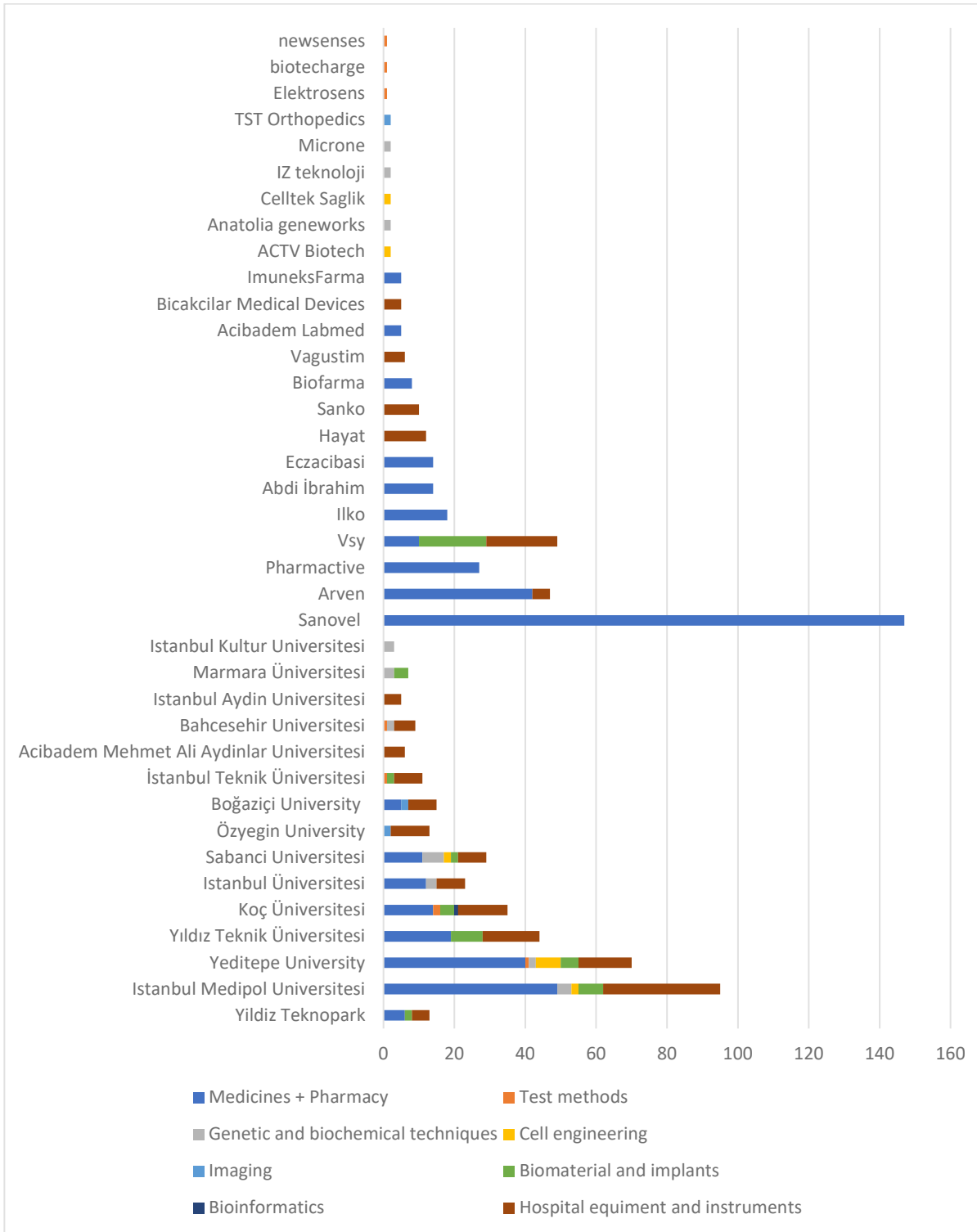
## Companies

In Istanbul, significant patent portfolios are held by companies, especially major pharmaceutical companies such as Sanovel, Arven, Pharmactive, Ilko, Abdi Ibrahim, and Eczacibasi, which predominantly focus on pharmaceuticals. Smaller companies hold patents in cell engineering, genetic and biochemical techniques, test methods, and imaging.

The Istanbul Health Industry Cluster Association (İ-SEK) is a collaborative structure conducting studies on fundamental issues such as health technology development, strengthening the national medical device industry, supporting the entrepreneurial ecosystem in this field, and bringing together entrepreneurs and investors. İ-SEK comprises 200 companies, 22 research centers, 14 NGOs, and 2 public organizations, with the majority in medical devices (70%), 11% in drug development, and 18% in biotechnology.

Startups are dispersed throughout the city, often situated in teknoparks. Examples include the Teknopark of Boğaziçi Üniversitesi and the Acibadem University. Istanbul Technical University's teknopark, ITU Teknokent, houses the most startups. Some notable examples include:

- GlucoT: The Next Generation Glaucoma Treatment Platform combining science and technology
- MD Research Development: Innovative products and methods needed in the field of radiation oncology
- Vagustim: therapeutic products in Vagus Nerve Stimulation
- WeWALK: Enhancing the mobility of visually impaired people through a revolutionary smart cane and smartphone app



**Figure 9.** Active patents and patent application by organizations in Istanbul, categorized based on IPC codes. Only patent applications submitted by World Intellectual Property Organization and European Patent Office between 2013 and 2023 are considered.

### 4.3 Ankara

As the capital of Türkiye, Ankara boasts a robust representation of governmental organizations. Not only are various government entities situated in the second-largest city of Türkiye, but numerous government-funded research centers also call it home. Additionally, large universities play a pivotal role as major contributors to the LSH ecosystem in Ankara.

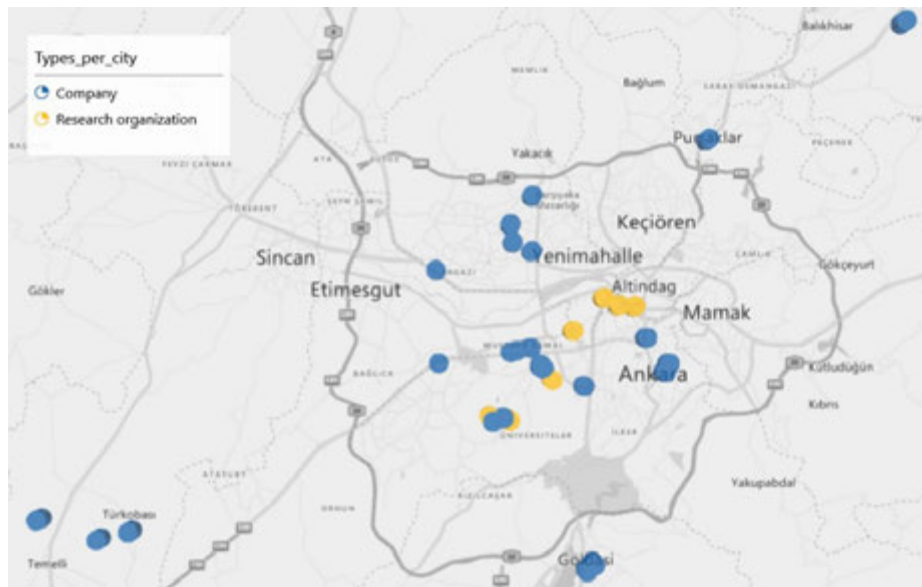


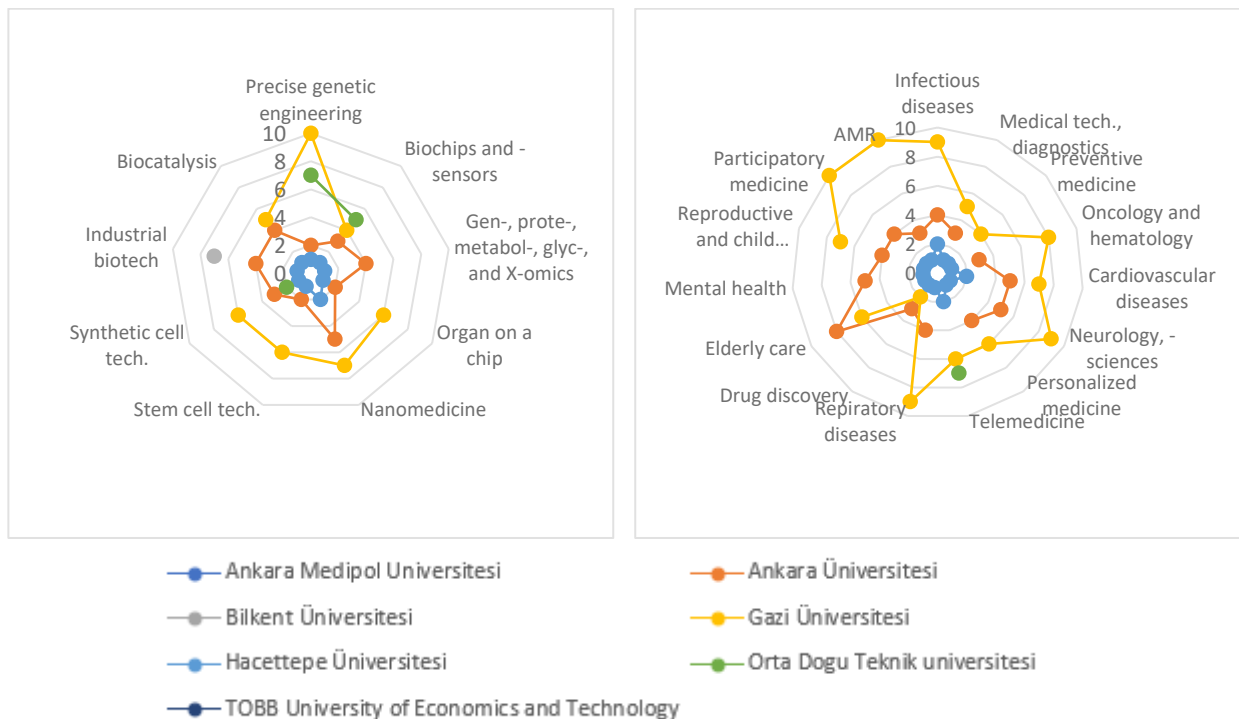
Figure 10. Types of organizations in Ankara

#### Research organizations

In Ankara, five research universities emerge as significant players in patents, academic output, and patent analysis. Hacettepe University, Ankara University, and Gazi University are major contributors to academic output across various fields. METU and Bilkent University specialize in more specific fields, with noteworthy participation in HE calls. METU coordinates prestigious calls on intra-body batteries for neurology and organ-on-a-chip technology, while Bilkent coordinates a call in the field of bioinformatics. Other noteworthy research organizations and centers include:

- *Bilkent University National Nanotechnology Research Center (UNAM)*: A multidisciplinary organization in cutting-edge nanotechnology research, supported by government legislation (Law No. 6550). Of the eight categories, five are LSH-related: nanobiotechnology, neuroscience, computational nanotechnology, micro&nanofluidics, and MEMS & NEMS.
- *METU MikroElektroMekanik Sistemler – METU MEMS*: Engaged in Micro-Electro-Mechanical Systems (MEMS) technology. The HE OrChESTRA project builds productive links between METU MEMS and three internationally-leading counterparts; TU/e (The Netherlands), IMEC (Belgium), and UFR (Germany), in order to strengthen the scientific and research capacity.
- *Neuroscience and Neurotechnology Excellence Joint Application and Research Center (NOROM)*: Under the coordination of Gazi University, in partnership with Ankara University and Middle East Technical University.

- *METU BIOMATEN*: A center of excellence in biomaterials and tissue engineering since 2010, a collaboration between METU University and several health industry-related organizations.
- *Ankara Innovative Theranostic Development Center (AnkaTheraHub)*: Established to support companies in high-tech healthcare and enhance applied research in cancer and infectious diseases. It offers incubation services, acceleration services, and technical units equipped with high-tech machinery for prototyping. AnkaTheraHub is conducted by Ankara University (A.Ü.) and several national organizations.

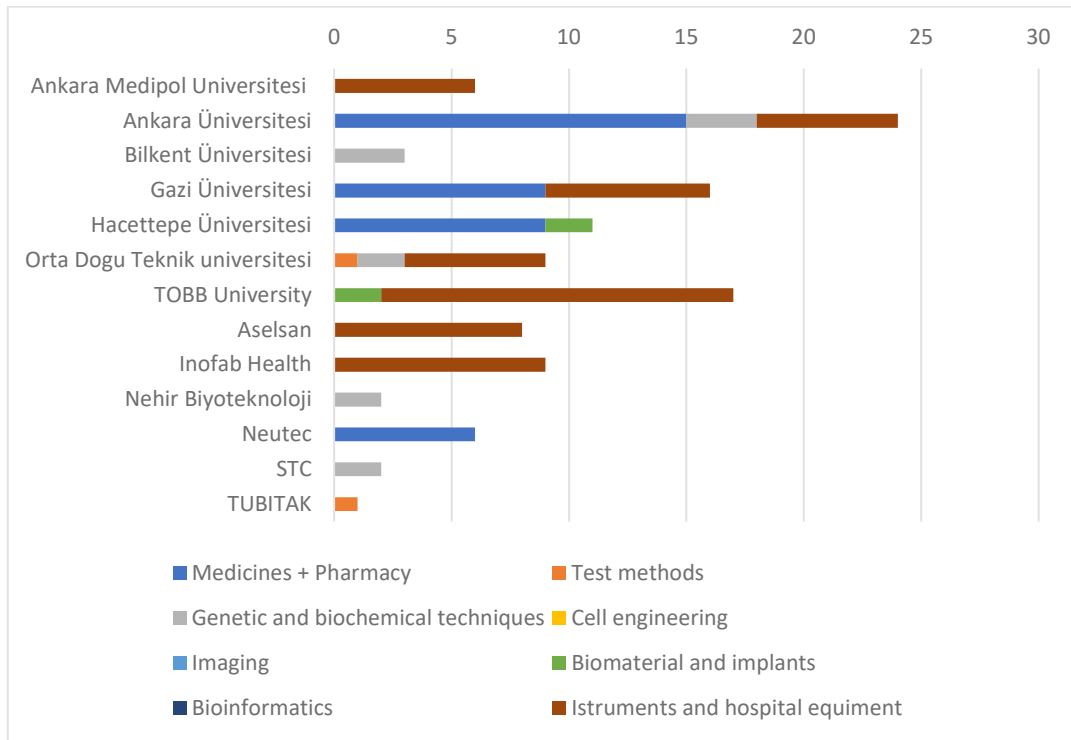


**Figure 11.** Ranking of Ankara universities based on their contribution in specific Life sciences and Health and related key-enabling technology fields.

### Companies

Noteworthy collaborations exist between research organizations and companies, such as SRDC, participating in HE calls for Enhancing Cardiology Data Interoperability, Reusability, and Privacy, and Artificial Intelligence for Personalized Risk Assessment in Chronic Heart Failure. Kardinero participates in a call on Ensuring Secure and Safe CMD Design with Zero Trust Principles. Additionally, Sentebiolab, a synthetic biotechnology company operating in Türkiye since 2011, produces biotechnological products with an R&D laboratory located in Bilkent Cyberpark Teknopark to enhance research and valorization in synthetic biology.

METU Teknoparks hosts an impressive number of LSH-related companies, ranging from biotechnology to medical devices. Furthermore, Bilkent and Ankara University also host several companies in their respective ecosystems.



**Figure 12.** Active patents and patent application by organizations in Ankara, categorized based on IPC codes. Only patent applications submitted by World Intellectual Property Organization and European Patent Office between 2013 and 2023 are considered.



## 4.5 Izmir

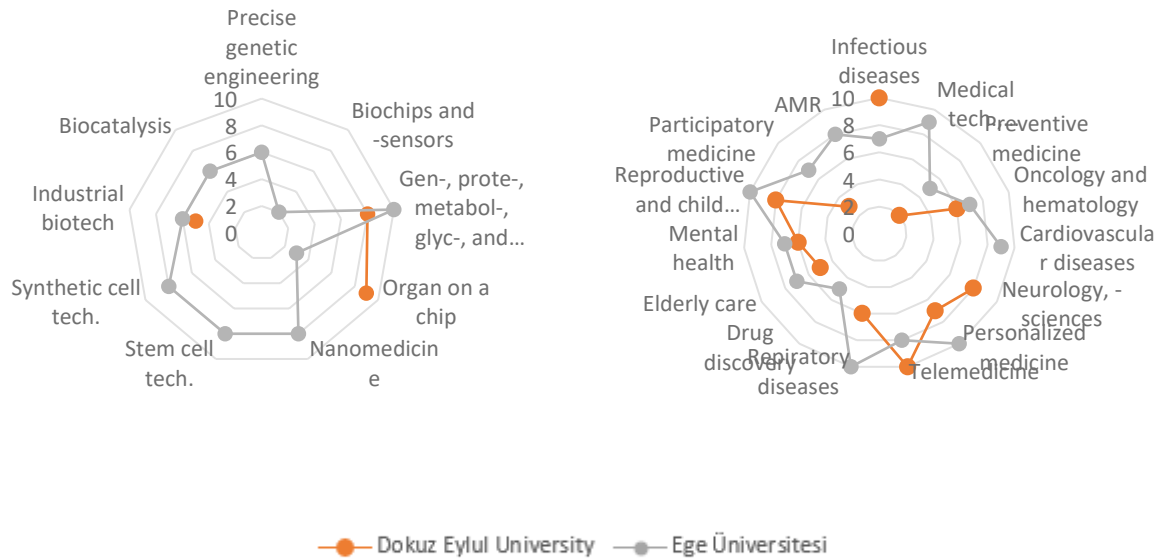
The LSH ecosystem in Izmir is young when compared to Istanbul and Ankara but is gradually emerging as a dynamic and intriguing hub. Notably, its participation in Horizon Calls, when compared to the number of research organizations, is relatively high.



**Figure 13.** Types of organizations in Izmir

### Research Institutes

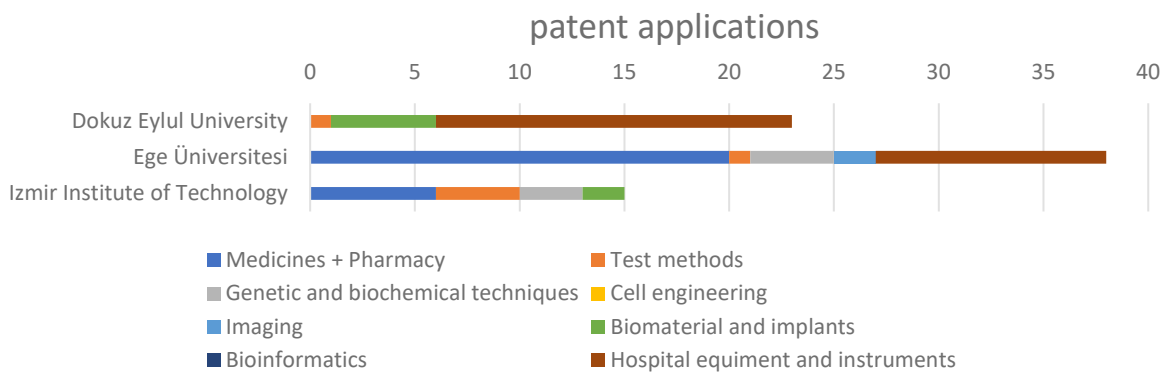
The most relevant universities, namely Dokuz Eylul University, Ege University, and IYTE, share equal standing in the world university index. Dokuz Eylul University and Ege University actively contribute to academic publications and patents, while IYTE is prominently visible in patent contributions. Dokuz Eylul University, in conjunction with its Izmir Biomedicine and Genome Center, plays a crucial role in various fields, including drug development, biobank and biomolecular resources, vivarium units and microscopy facilities. This prominence is reflected in their coordinator role in the HE MSCA call on non-canonical death receptor signaling in cancer and immune cells. Additionally, IYTE demonstrates significant potential in Biotechnology and Bioengineering Application and Research, evident in their BIOMER center and participation in the HE MSCA call on biomedical technologies.



**Figure 14.** Ranking of Izmir universities based on their contribution in specific Life sciences and Health and related key-enabling technology fields.

### Companies

The company landscape in Izmir is relatively limited, featuring two pharmaceutical producers and several companies focused on biotechnology and medical devices. Teknoparks such as Dokuz Eylul Teknopark, IYTE Teknopark, and Ege Teknopark concentrate on LSH-related startups. Although these startups may not be prominently featured in these datasets, their potential value is noteworthy.



**Figure 15.** Active patents and patent application by organizations in Izmir, categorized based on IPC codes. Only patent applications submitted by World Intellectual Property Organization and European Patent Office between 2013 and 2023 are considered.



## 5 Conclusions of report

### **Aim**

This report aims to offer insights into the LSH (LSH) innovation landscape in Türkiye, facilitating the identification of collaboration opportunities with the Dutch LSH system. While the Dutch mission on health and care is broad, this report provides a global overview. It serves as a foundational resource, and for more specific information on topics, a detailed analysis should be conducted.

### **Innovation Landscape**

The innovation landscapes of Türkiye and the Netherlands share similarities and differences driven by distinct priorities and economic objectives. Though both nations prioritize innovation, Türkiye focuses on biopharmaceutical innovation for export and economic gains, contrasting the Netherlands' alignment with the health and care mission. Despite this difference, prioritized areas such as personalized medicine, regenerative medicine, biotechnological developments, neurodegenerative disease treatment, and big data and artificial intelligence applications in healthcare are quite similar. Türkiye has established research centers and projects supporting R&D, coupled with ambitious mindsets and a high number of academically educated individuals. Despite rising academic publications, patent applications, and startup activities, the economic situation may pose challenges for startups. Türkiye recognizes the European market's importance, seeking alignment with European values and fostering collaboration with Dutch institutions.

### **Istanbul, Ankara, and Izmir**

The Turkish LSH ecosystem is concentrated in Istanbul, Ankara, and Izmir. Istanbul, with over 16 million inhabitants, holds the oldest universities and serves as the economic center, hosting a diverse LSH ecosystem. Ankara features relevant governmental organizations, while Izmir boasts a younger ecosystem with robust research institutes. These cities showcase strong ecosystems in various LSH-related fields. Especially in fundamental sciences and biotechnological fields, the ecosystems seem well-developed.

### **Focus Areas**

The report highlights strong ecosystems in biotechnology and fundamental sciences like genetics and biology, emphasizing collaboration between LSH universities, technical universities, state-of-the-art research facilities, and teknoparks offering incubation and acceleration programs. Noteworthy institutes like UNAM and SUNUM, present opportunities for collaboration and enrichment of the Dutch LSH ecosystem. Biomedical research, with centers like the Izmir Biomedical and Genomics Center and BIOMATEN Center in Ankara, signifies well-developed capabilities. Türkiye also demonstrates focus areas in neurosciences, oncology, infectious diseases, and rare diseases

### **Methodology and Limitations**



The report, serving as a snapshot, provides extensive data through an Excel sheet. Utilizing this dataset for specific inquiries, such as major players in specific medicine fields or key-enabling technologies, would be valuable. Acknowledging limitations, including the need for an overarching categorization, and considering individual quality metrics for innovation value, the report suggests expanding dataset selections with Turkish-oriented datasets for a more detailed insight. As an illustration, incorporating patent applications from Turk Patent, academic publications in languages other than Turkish, and insights into national funding projects and their recipients would enhance the overall quality of this dataset.

### **Conclusion**

In conclusion, this report comprehensively outlines the Türkiye LSH innovation ecosystems, emphasizing collaborative opportunities and regional strengths. The insights aim to uncover opportunities for technological innovation collaboration in LSH between Türkiye and the Netherlands.

**Please feel free to reach out with any questions, suggestions, or if you'd like more information based on this report.**

Rory Nuijens, Innovation Attaché Türkiye - [rory.nuijens@minbuza.nl](mailto:rory.nuijens@minbuza.nl)

Necla Günay, NFIA Area director Türkiye and Balkans - [necla@nfia-turkey.com](mailto:necla@nfia-turkey.com)

This is a publication of  
Netherlands Enterprise Agency  
Prinses Beatrixlaan 2  
PO Box 93144 | 2509 AC The Hague  
T +31 (0) 88 042 42 42

Contact  
[www.rvo.nl](http://www.rvo.nl)

This publication was commissioned by the ministry of Economic Affairs and Climate Policy.

© Netherlands Enterprise Agency | March 2024  
Publication number: RVO-058-2024/RP-INT

NL Enterprise Agency is a department of the Dutch ministry of Economic Affairs and Climate Policy that implements government policy for Agricultural, sustainability, innovation, and international business and cooperation. NL Enterprise Agency is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

Netherlands Enterprise Agency is part of the ministry of Economic Affairs and Climate Policy.