CHERRIES
RESPONSIBLE HEALTHCARE ECOSYSTEMS

TERRITORIAL MAPPING REPORT MURCIA

Authors: Sonia Mena Jara, Tim Willemse, Ingeborg Meijer, Gaston Heimeriks. Centre for Science and Technology Studies, Leiden University.

Constructing Healthcare Environments Through Responsible Research Innovation and Entrepreneurship Strategies, CHERRIES project will support Responsible, Research and Innovation (RRI) policy experiments in the healthcare sector in three European territories: Murcia (ES), Örebro (SE) and the Republic of Cyprus (CY).

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EXECUTIVE SUMMARY

CHERRIES engages ecosystems in South-West Europe (**Murcia ES**), Northern Europe (**Örebro SE**), and South-East Europe (**Republic of Cyprus CY**). The territorial preconditions and development paths are varying. While the size and population of the territories are similar, the administrative, economic, and innovation systems have major differences. What is the influence of these differences on the capacity of the regions to develop demand-driven health innovations; what are drivers and barriers, and what is the policy mix that supports territorial responsible research and innovation in healthcare?

Based on the mapping guidelines (D2.1), the three territorial ecosystems have been mapped. The mappings scrutinised the central **actors** in the territorial healthcare systems, their innovation behaviour and **capabilities, priorities, needs and observable trends**. Further, the policy instruments determining the innovation policy mix, were analysed. The methodology builds upon a mixed-method ranging from desk research, expert interviews to bibliometrics indicators and networks. The European Commission (EC) describes its policy for **responsible research and innovation (RRI)** as diverse sets of societal actors (researchers, citizens, policymakers, business, third sector organizations, etc.) that "*work together during the whole research and innovation process to better align both the process and its outcomes with the values, needs, and expectations of society*". The major mechanism for bringing actors together is public engagement, one of the EC's six RRI 'keys' along with ethics, gender equality, governance, open science, and science education. The capacity to support territorial health innovations in an engaging and responsible way is central to the experimentation phase in CHERRIES.

The executive summary brings together the main findings from mapping the actors and stakeholders (section 1), the policy context (section 2), and mapping of context and content in relation to smart specialisation (section 3). The extended mapping results are available in these sections; the methodology is provided in each section and referring to further documentation for details. The report comprises an understanding of the specificities of a territory, including the peculiarities of its economic structure, the idiosyncrasies of its institutions, the character of its political culture and policy-mix and its relational connections as well as the status for RRI implementation. These territorial development paths serve a baseline for further interventions (WP3 and WP4) into these systems, and subsequent monitoring (WP6).

Innovation from a responsible territorial perspective

'Smart Specialisation' is an innovation policy concept intended to promote the efficient and effective use of public investment in research. Its goal is to boost regional (territorial) science and innovation in order to achieve economic growth and prosperity, by enabling regions to focus on their strengths. This approach understands that spreading investment too thinly across several frontier fields risks limiting the impact in any one area.

The complementarities between both Responsible Research and Innovation (RRI) and Smart Specialisation (RIS3) approaches rely on some of the characteristics that differ between them. The RIS3 policy is primarily oriented towards regional competitiveness and therefore does not fully incorporate local institutions and notions of social value or choice. On the other hand, neither the theory, policy nor practice of RRI pays attention to the spatial dimension of innovation processes, which is central in RIS3 approaches. In that sense, RRI ignores the various ways in which regional context affects not only the development of innovation

but also the perception of what is responsible and socially desirable, understanding that knowledge and resources which are necessary for innovation - labor mobility, R&D collaboration- are all regional. Thus, from the innovation studies literature, we know that innovation processes are socially and spatially embedded, as the regional context creates conditions for knowledge acquisition and learning. Overall, these two approaches share their origins as a policy concept rather than a theoretically motivated framework that argues for broad stakeholder involvement in the development of research and innovation policy and the need for R&I to be oriented towards solving grand societal challenges SGC.

Actors and stakeholders supporting healthcare & innovation

In **Spain**, the health sector is mainly public since private insurances only exist on a marginal level. Since early 2000s, the competences for healthcare and subsequent budgets have been transferred to the territories, leaving the national ministry with a coordinating role. Spain has the highest life expectancy in the EU and social inequalities in health are less pronounced than in many other countries. However, many years of life in old age are lived with some chronic diseases and disabilities, increasing demands on health and long-term care systems. Health spending per capita in Spain is more than 15 % lower than the EU average. While most health spending is publicly funded, direct out-of-pocket spending by households accounts for a greater share than the EU average. The Spanish health system relies on a strong primary care system, but growing demands arising from the increasing burden of chronic diseases may require more and more efficient use of resources (European Commission, 2019).

Generally, Murcia is regarded as a **moderate innovator** in the European landscape, which is supported by the numbers on regional R&D spending. These indications suggest that Murcia should not be looking to realise very advanced high-tech innovations since there is not much experience with this type of activities. At National level, FECYT, the Spanish Foundation for Science and Technology, supports the system in the monitoring and measurement of indicators through the Spanish R&D&I Observatory (ICONO). In turn, two national funding organisms attached to the Ministry of Science, Innovation and Universities are; The Spanish State Research Agency, AEI- (Agencia Estatal de Investigación) and the Centre for Industrial Technological Development -CDTI (Centro para el Desarrollo Tecnológico Industrial) in charge of the promotion of innovation in the country. In the region of Murcia, the innovation support system is headed by the Regional Development Agency (INFO) and includes incubators that support innovation projects. In recent years, the health innovation sector in Murcia established a successful health ICT ecosystem in collaboration between the business sector and the public health sector, which is driven by the TBM cluster and the Murcian Health Service (SMS).

As a result of the stakeholders'mapping exercise, the most prominent actors in Murcia are the Civil Society Organizations (51) and Public Administration organizations (15) both with a large number of Institutions acting at the regional level. Only two CSOs perform at the National scale, together with two companies; Problete Pharma and Medical Canada. There are much less private sector organisations (Firms, SME's and start-ups) identified by the region (9). According to the 4P model there are 10 healthcare **providers** (2 hospitals and 8 companies). It is worth noting that the "*Union Murciana de Hospitales*", groups together 100% of the private hospitals in the Region, also the main clinics without hospitalization, care centres, diagnostics and laboratories became part of the association. **Patients** are formed by 20 Patient-oriented CSO's and 1 public organisations. The **Policymakers** category is made up of 14 regional and 4 national Public Administration institutions. The key stakeholders are distributed across all the organizations' typologies, albeit that there is a strong overrepresentation of CSO's. With regard with the level of

involvement of the regional actors, the coordination team from Murcia is formed by two policymaker institutions "**Instituto de Fomento de la Región de Murcia**" (Institute for the promotion of the Murcia Region) and "**Fundación para la Formación e Investigación Sanitarias**" (Foundation for Health Training and Research) and two organization from the private sector (**CEEIM & TicBioMed**). The Working team is represented by one Public Administration Institution "**Comunidad Autónoma de Murcia"** (Autonomous Community Region of Murcia) and the "**Servicio Murciano de Salud**" (Murcian health service).

Policies and RRI

There is no overarching RRI-policy in Spain, or in the Murcia region. In 2020 the Spanish Strategy for Science, Technology and Innovation 2021-2027 (EECTI 2021-2027) was launched. The ECCTI 2021-2027 is specifically designed to facilitate the articulation of the R & D & I policy with the instruments of the European Union, taking into account the approved or ongoing regulations. The EECTI includes activities specifically aimed at solving the problems caused by COVID-19 pandemic, and to consolidate and promote science and innovation as a tool for the social, economic and industrial reconstruction of the country (Ministry of Science and Innovation, 2020).
Excellent and open science constitutes one of the pillars of Goal 4 (Generation of scientific knowledge and leadership) of the EECTI. The promotion of Open Science is expected to favor the generation of high quality and impact knowledge, as well as its transmission to society. In addition, axis 14 from the EECTI proposes to promote the critical spirit and commitment of Spanish society to R & D & I, promoting gender balance in research and innovation, scientific culture, reflection and decision, based on scientific evidence, the promotion of science and innovation, and implementing all of them openly and inclusively. Ethics is also incorporated in the strategy; the development of the instruments and bodies established will be facilitated, such as the Spanish Ethics Committee in the Investigation. Altogether these elements reflect implicitly RRI dimensions.

Smart specialization

In the smart specialization strategy, three variables are being considered for defining a specialized regional economic sector or field of activity: regional capacity in science and technology, regional employment that concentrates each sector or area of activity, and the specialization of the regional business structure compared to the Spanish one. In the Murcia region, organisations are primarily economically specialized in agricultural inputs and services.

The priorities for the Region of Murcia, defined in the previous Smart specialisation Strategy (2016), are structured around those activities in which there is clear leadership, such as the **agri-food value chain**, including agriculture (livestock, fishing and the food industry), the **water cycle** (its treatment, purification and management), the **environment** and, logistics and transport. On the other hand, the Region of Murcia focuses on **quality of life**, since that contributes to the well-being of its inhabitants'. This broader topic includes tourism, **health,** and habitat**.** In the **Health and Well-being sector**, there are important scientific-technological capacities that offer great specialization opportunities for the Region of Murcia.

In order to specify a place-based approach to smart specialisation in times of Grand societal challenges, locally and historically situated discourses and practices need to be taken into account for aligning research and society. The mapping of the regional capacity in science and technology shows that:

- Based on the publication data (2018), Murcia has shown **Medium Scientific diversity** and **High Scientific Complexity indicators** values. Diversity matters because regions are more likely to expand and diversify into new topics and fields that are closely related to their existing activities. Complexity of knowledge matters because it allows regions to produce idiosyncratic knowledge that few other regions can make.
- Publication data further indicate **Active Ageing,** which relates to the WHO priority connected to "Assistive health / rehabilitation" as the most occurring category in relation to knowledge production. As an example, this includes **food habits and nutrition in Nursing homes** as a topic being studied by research Institutions. The Catholic University of Murcia, University of Murcia, and University Hospital San Juan are the dominant publishing institutions.
- The **relatedness indicator** measures the main strength and capabilities already present in the region from the scientific perspective, as shown by the **Revealed comparative advantage (RCA).** Murcia has an all-round representation of scientific subfields, however, fields in relation to Environmental Science and Agriculture are most dense, confirming the regional priority in the agri-food chain. Fields in the *Biomedical and Health Science* with a high RCA compared to European partners are: **Food Science and Technology** – in connection to Life and Earth Science main Field-, **Ophthalmology**, **Dentistry**, **Oral Surgery and Medicine**, **Cardiac and Cardiovascular system**, **Urology and Nephrology, Hematology, Immunology**. At the interface of Health and Social Science, we found **Rehabilitation, Sport Science, Nursing and Psychology / Psychoanalysis.**
- A further breakdown in microfields reveals that in the top 10 the following fields stand out: **Food chemistry, Dietetics and Nutrition.** Also a high level of specialization relates to **Critical Care medicine** concerning respiratory non-invasive ventilation**, Sport Science** related to physiology and performance**, Cardiac and Cardiovascular Systems** (Thrombosis and haemostasis) and **Dentistry, Oral surgery & Medicine** associated to oral and maxillofacial implants**.**
- **Patent analysis** in Murcia revealed 458 patents between 1981 and 2019 across technological fields, where the three categories related to the Health sector are within the top 10 with the majority of patents; Medical Technology (35 patents), Pharmaceuticals (21 patents), and Biotechnology (19 patents). From the Pharmaceuticals sector several patents are dedicated to the process of preparing products comprising pomegranate (*punica granatum*) extracts as nutritional products, or for preventing diseases or physiopathological conditions. Notable is the connection of the priorities identified from the analysis of the regional knowledge production based on publication data and the patent's creation, where we observed the **ophthalmological sector** and **Functional Foods** emerging from both sources of analysis.
- Priorities informed by the regional actors indicate another range of demand-driven priorities: these are covid-19, chronic illness, telemonitoring, and empowerment. The results of the scientometric analysis focussed on the regional scientific production on Chronic diseases. A text-search analysis of scientific articles showed as the most researched chronic illnesses (number of publications), **Diabetes**, **colorectal cancer**, **Alzheimer**, **chronic kidney disease**, and **Chronic obstructive pulmonary disease (COPD).** The co-ocurrence network analysis map portrayed as relevant **chronic low back pain**, **chronic lymphocytic leukemia,** and **chronic heart failure** as well.
- In regards to the selection of **EU projects (CORDIS database)** connected to the regional priorities from Murcia, four of them deal with Chronic diseases such as **diabetes mellitus, hypertension care, cardiovascular accidents** and the impact of second-hand tobacco smoke on respiratory health. One project addresses **telemedicine and mobile health** for personalized healthcare, and there is one initiative referring to the **improvement of eyesight** (Ophthalmology), determined as one of the strong

research areas in the region. The participant organizations belong to the public and private sector, with one Higher Education Institution (HEI), the Universidad Politécnica de Cartagena.

Our approach may assist policymakers in designing and implementing RIS3 strategies that not only promote smart (i.e. competitive) but also inclusive and sustainable regional economic development. By combining information on the relative strength of regional knowledge production activities (e.g. science and technology that is linked to global developments) with information about regional stakeholders, local needs and policies, we can thus specify priorities that can help to maximise the regional development potentials.
It further shows that scientific capacities that could be useful for regional development, do not necessarily align with the demand-driven regional needs. Demand driven reseach priortiy setting for funding schemes is very much in sync with RRI, but the Smart specialisation paradigm doesn't seem to include regional needs.

Reflection process on RRI implementation

Based on the initial mapping results, a discussion with territorial stakeholders about benefits, barriers and strategies for the implementation of RRI based measures started. The reflection process began during the last quarter of the year 2020 (Q4) and also in connection to CHERRIES WP3. Training activities were performed based on Task T3.2 "Training key stakeholder and need identification processes" in the three regions involved in Cherries experimentations, whose general aim was to establish the territorial experimentation process, prepare the stakeholders' system (territorial multipliers and key stakeholders) for the RRI based demand articulation, facilitating bottom-up RRI and need articulation processes, experimentation and to the co-creation process.
The training supported a learning process aimed at helping healthcare and R&I stakeholders to reflect about how to identify potential for RRI principles and approaches within the institutions that aim at increasing the service delivery quality for patients as well as to identify innovation needs and how to articulate them within and between organisations for the territorial network. This process served as an entry point for the embeddedness of RRI at the institutional level and for triggering a more open and reflexive behaviour in a broad set of relevant territorial actors. The implementation of these activities resulted in one training workshop in each of the three regions involved in the CHERRIES experimentations and through the delivering of online resources.
Besides the training workshops, the preparation stage was developed based upon bilateral meetings. The training activities were supported by K&I and conducted in coordination with the establishment of the territorial experimentation process and the finalisation of the experiment design (T3.3) and with the preparation and the publication of the Call for needs (T4.1). Task T3.2 builds on the Stakeholders Mapping exercise started in the first stage of the project (WP2) and on the development of the CHERRIES Toolbox (T3.1).

The outcomes of these activities produced relevant up-to-date information about RRI oriented actors engaged in projects, in keys areas or initiatives identified during informal meetings and through the training workshops. The reports of these activities are at this time in local language and a further translation of the content will be integrated into the Synthesis report (task 2.2 & 2.4). However, the final round of consultation with the territorial teams to update any further information concerning to actors or initiative RRI-related identified during the preparation stage and the dissemination of the Call for needs and call for solution in the territory will be addressed during the reflection workshop to be conducted in March 2021, where an interregional and regional discussion will take place.

1. MAPPING STAKEHOLDERS IN THE HEALTH AND INNOVATION SECTOR – Murcia region

The European Commission (EC) conception of RRI emerged from its science with and for society (SwafS) policies and R&D work programmes. The EC describes RRI as diverse sets of societal actors (researchers, citizens, policymakers, business, third sector organizations, etc.) that "*work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs, and expectations of society*". The major mechanism for bringing actors together is public engagement, one of the EC's six RRI 'keys' along with ethics, gender equality, governance, open science, and science education. In that regard, CHERRIES project considers the bottom-up involvement of all kind of citizens, irrespective of their age, gender, ethnicity, and socio-economic background as one of its pillars (European Commission, 2018[1]).

The development of the Territorial mapping activities for CHERRIES project encompassed the mapping of relevant actors in the Health and Innovation landscape as one of the central activities during the first year of the project (2020). The engagement process has been also developed considering the adverse circumstances of the current pandemic of Covid-19. The regional partners have faced difficulties due to the physical distance restrictions that do not allow gatherings and events dedicated to the involvement process. In addition, one of the most important actors such as Hospitals and Health-related institutions (Providers), need to attend issues of higher priority for public health during the pandemic contention. That means the engagement process has been delayed and disrupted by this unexpected scenario. However, and despite the obstacles, the regional partners have conducted a substantial effort to follow the mapping exercise.

1.1 Identification and assessment of territorial actors

The following results are framed in task 2.2, "*Mapping Health and Innovation sector in the pilot territories",* and were steered by the territorial actors supported by Leiden University. This Work Package is conducted in collaboration with WP6 responsible for the Monitoring, evaluation and impact assessment to secure the projects' overall impact.

The mapping exercise follows the methodological approach recommended in the document "GUIDELINE FOR TERRITORIAL MAPPING WP2 - Deliverable 2.1", part of WP2. The process involved the following 4 steps: 1) *Identification of stakeholders from current regional network* 2) *Addition of potential new partners from datasets* 3) *Selection criteria for stakeholders* 4) *Categorize stakeholders regarding their degree of involvement in the project.*
The results of steps 1 and 2 provide an overview of the distribution and representation of the different types of organizations identified by the region. Figure 1 displays the number of Institutions classified by each category and the geographical scope or territorial scale in which the institutions develop their activities.

These are some of the criteria considered by the region of Murcia to select the stakeholders:

- The activity level of the entity in recent years as a measure of relevance in the real scenario
- Number of associated people

[1] European Commission (2018) Science with and for Society. Work Programme 2018-2020.

- The relevance of the represented group
- The number of connections with other groups (for example, Federations as the sum of associations).
- Degree of innovation/risk aversion culture

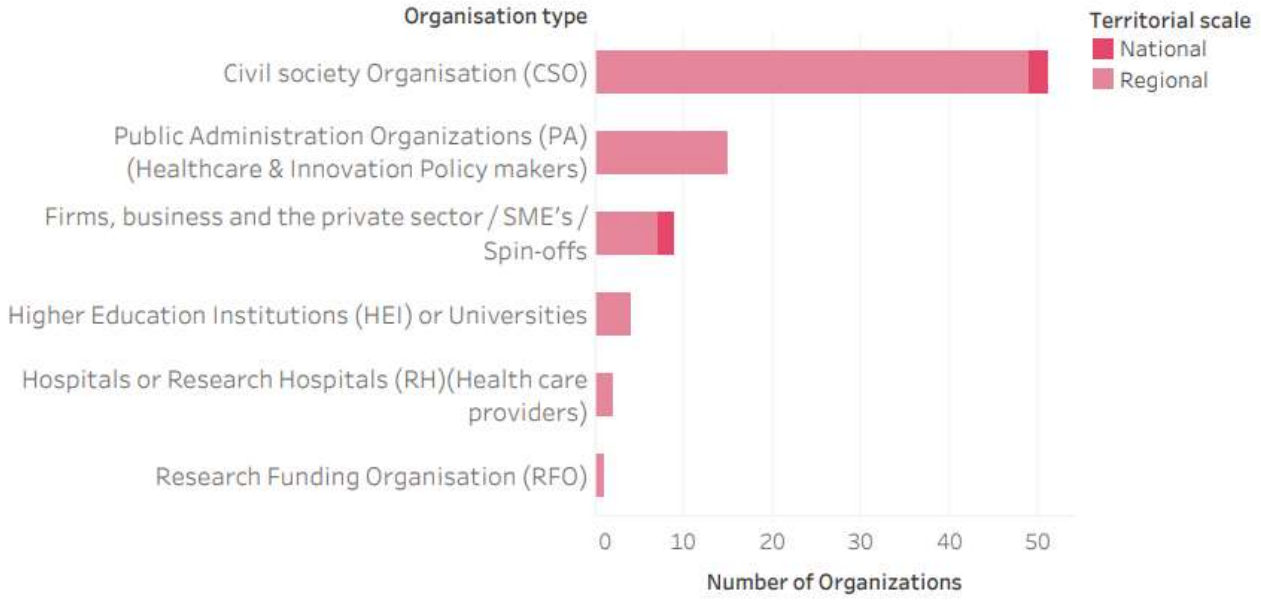
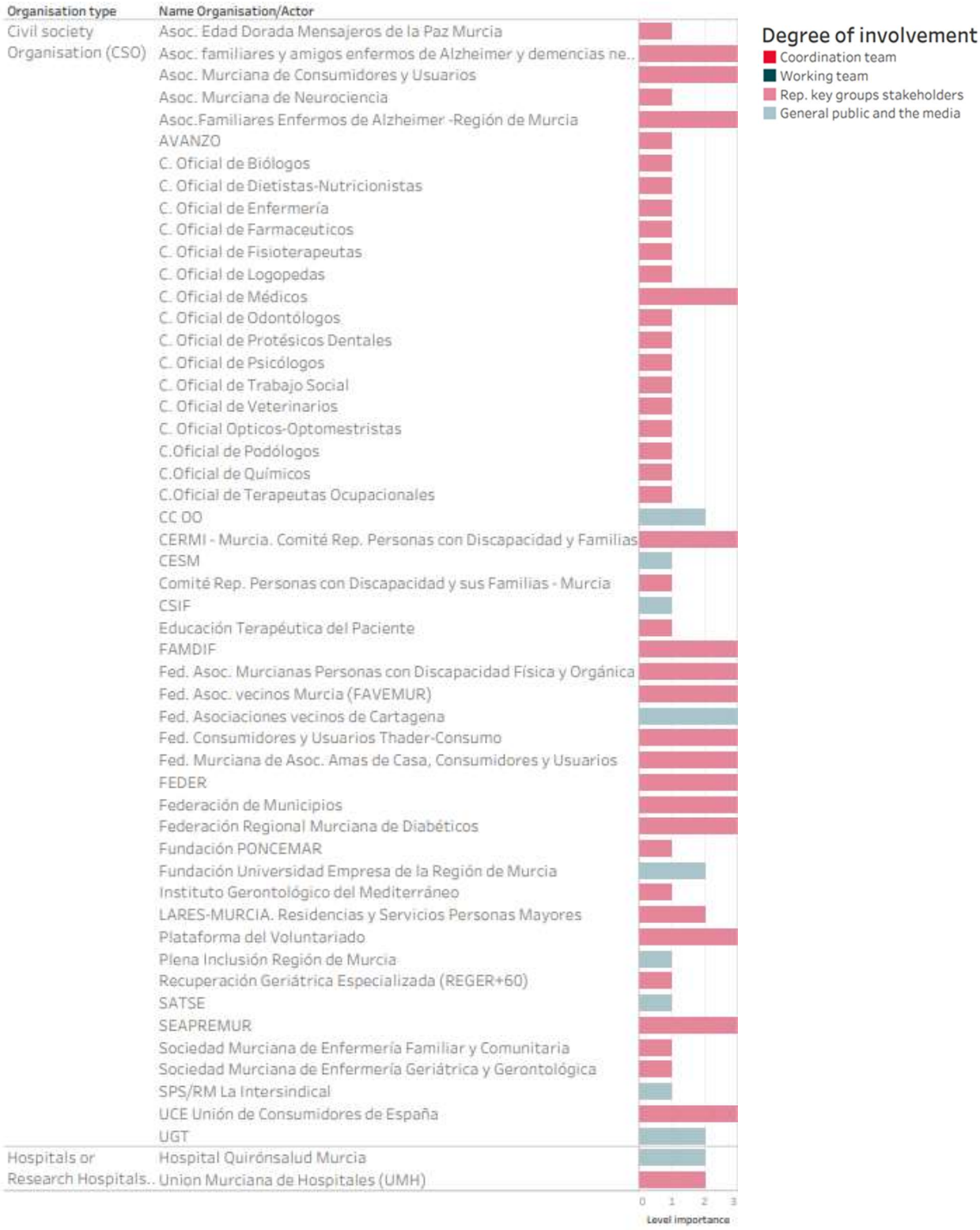


Figure 1. Number of institutions per each organization type and the territorial scale they perform.

From Figure 1 we notice that Civil Society Organizations and Public Administration organizations are the ones with the larger number of Institutions recognized from the regional ecosystem. It stands out the higher number of organizations from the private sector (Firms, SME's and start-ups) identified by the region. This, acknowledging the difficulties mentioned by the three regions to identify partners from the private sector. Regarding the territorial scale, the majority of the organizations act at the regional level. Only two CSOs perform at the national scale, together with two companies; Problete Pharma and Medical Canada.

The following Figure displays the results of all the regional actors recognized in the local ecosystem by implementing the aforementioned steps 1 to 4. It covers information regarding the categorization of the groups of actors and stakeholders concerning their level of importance. The values range from 1-3, where 1 = Less relevant; 2 = Important and 3 = Extremely important. As a result of the assessment, and applying the regional perspective each one of the actors was classified by their (potential) degree of involvement in the project, creating operative groups of stakeholders according to their interest and role in the project.


Organisation type
Name Organisation/Actor
Civil society Organisation (CSO)
Asoc. Edad Dorada Mensajeros de la Paz Murcia
Asoc. familiares y amigos enfermos de Alzheimer y demencias ne..
Asoc. Murciana de Consumidores y Usuarios
Asoc. Murciana de Neurociencia
Asoc.Familiares Enfermos de Alzheimer -Región de Murcia
AVANZO
C. Oficial de Biólogos
C. Oficial de Dietistas-Nutricionistas
C. Oficial de Enfermería
C. Oficial de Farmaceuticos
C. Oficial de Fisioterapeutas
C. Oficial de Logopedas
C. Oficial de Médicos
C. Oficial de Odontólogos
C. Oficial de Protésicos Dentales
C. Oficial de Psicólogos
C. Oficial de Trabajo Social
C. Oficial de Veterinarios
C. Oficial Opticos-Optomestristas
C.Oficial de Podólogos
C.Oficial de Químicos
C.Oficial de Terapeutas Ocupacionales
CC OO
CERMI - Murcia. Comité Rep. Personas con Discapacidad y Familias
CESM
Comité Rep. Personas con Discapacidad y sus Familias - Murcia
CSIF
Educación Terapéutica del Paciente
FAMDIF
Fed. Asoc. Murcianas Personas con Discapacidad Física y Orgánica
Fed. Asoc. vecinos Murcia (FAVEMUR)
Fed. Asociaciones vecinos de Cartagena
Fed. Consumidores y Usuarios Thader-Consumo
Fed. Murciana de Asoc. Amas de Casa, Consumidores y Usuarios
FEDER
Federación de Municipios
Federación Regional Murciana de Diabéticos
Fundación PONCEMAR
Fundación Universidad Empresa de la Región de Murcia
Instituto Gerontológico del Mediterráneo
LARES-MURCIA. Residencias y Servicios Personas Mayores
Plataforma del Voluntariado
Plena Inclusión Región de Murcia
Recuperación Geriátrica Especializada (REGER+60)
SATSE
SEAPREMUR
Sociedad Murciana de Enfermería Familiar y Comunitaria
Sociedad Murciana de Enfermería Geriátrica y Gerontológica
SPS/RM La Intersindical
UCE Unión de Consumidores de España
UGT
Hospitals or Research Hospitals..
Hospital Quirónsalud Murcia
Union Murciana de Hospitales (UMH)
0
1
2
3
Level importance
Degree of involvement
Coordination team
Working team
Rep. key groups stakeholders
General public and the media

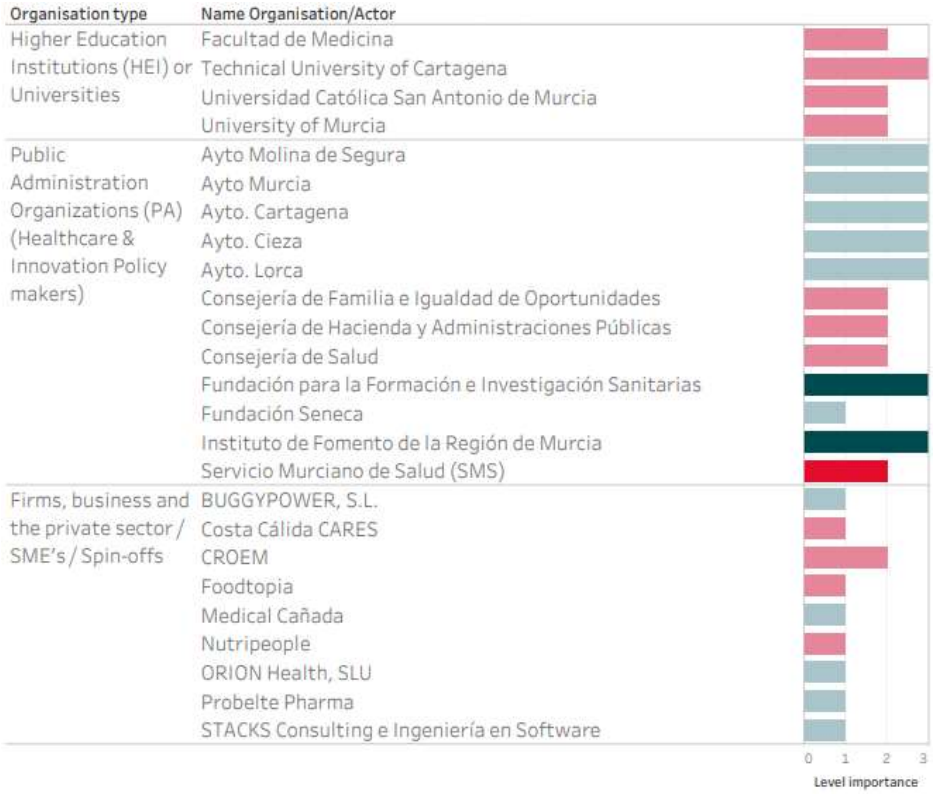


Figure 2. Identification of stakeholders in Murcia, classified by their type of organization, the Level of importance and their Degree of Involvement.

From Figure 2 we note that the type of Organizations assessed with a High level of importance are diverse. Among them, we found Civil Society Organizations, Public Administration (PA), Private Sector and Hospitals as being considered "Important" or "Extremely important". The representation of the 4P model depicts the distribution of the different actors in each one of the categories. We observe that the Patients' are formed by twenty Civil Society Organizations (CSOs) and one Public Administration organization. It is worth noting that the "*Union Murciana de Hospitales"*, groups together 100% of the private hospitals in the Region, also the main clinics without hospitalization, care centres, diagnostics, and laboratories became part of the association.

To visualize the composition of the Coordination and Working Team, Figure 3 depicts the main organizations representing these groups.

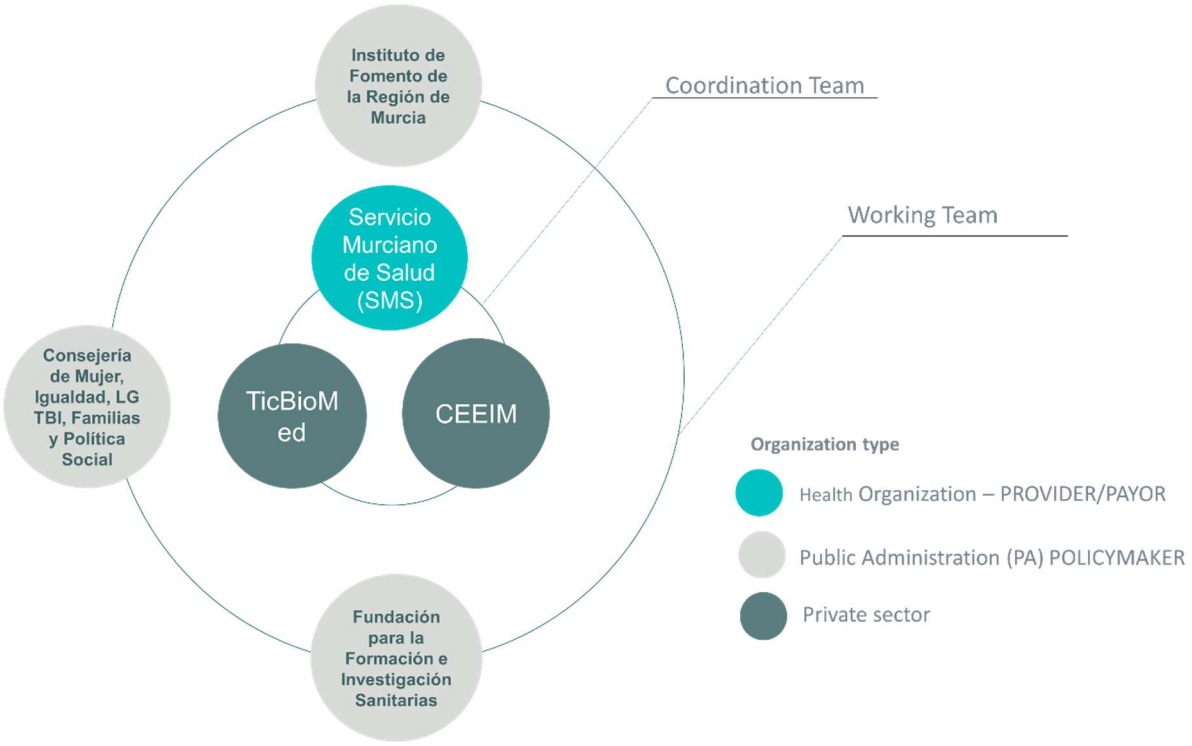


Figure 3. Diagram representing the results of the "Degree of Involvement" of the regional actors from the Health and Innovation sector in Murcia.

Figure 3 illustrates the core coordination team from Murcia, which is formed by two organization from the private sector (CEEIM & TicBioMed) and one Health Organisation represented by SMS (Servicio Murciano de Salud). The Working team is represented by three Public Administration Institutions.

The "Instituto de Fomento of the Murcia Region" (Institute for the promotion of the Region of Murcia) is the economic development agency of the Autonomous Community of the Region of Murcia that is entrusted with the promotion and development of the business fabric, stimulating the competitiveness, innovation and productivity of regional companies, especially SMEs, to generate quality and stable employment. On the other side the "Fundación para la Formación e Investigación Sanitarias (Foundation for Health Training and Research) is an organization for Health Training and Research of the Region of Murcia, responsible for the management and promotion of training activities for professionals related to Health Sciences and in the Health Administration and Management sector. The "Consejería de Mujer, Igualdad, LGTBI, Familias y Política Social" (Council for Women, Equality, LGTBI, Families and Social Policy) belongs to the Autonomous community of Murcia.

We acknowledge that in the successive stages of the project, the current list of stakeholders may experience changes due to the engagement process being currently developed in the reflection phase part of CHERRIES project. These activities entail the implementation of workshops, meetings, and interviews that can show potential new partners to be involved in the project, and on the other hand, the operational groups categorization will adjust following the interest and participation shown during the engagement activities.

2. POLICY MAPPING ON TERRITORIAL R&I HEALTHCARE ECOSYSTEMS

2.1 International policy instruments

The analysis of the policy instruments at international level enabled us to comprehend the connection between international-umbrella policies and guidelines, and their National or regional policies adapted to the local context. Most of the documents are elaborated by the World Health Organization and the European Commission. This task addressed 4 policy domains; Responsible Research and Innovation, Smart Specialization Strategies, Healthcare & Innovation, and its results are presented below, where main documents are highlighted.

2.1.1 Responsible Research and Innovation

For almost a decade, the RRI approach to research and innovation policy has gathered traction and it is now a cross-cutting issue in the **European Union's Framework Programme for Research and Innovation in the European Research Area** (Horizon 2020) as well as a part of **Science with and for Society Work Programme** (SWAFS). RRI and its approach seek to focus on research and the products of innovation to achieve benefits in the social and environmental realms.

The **SWAFS (Science with and for Society) Work Programme 2018-2020 (WP18-20)** from latest Horizon 2020 has been developed to reflect and support the evolution of science and society and the increased emphasis on their interplay at national and EU levels. There is recognition that co-design with citizens, stakeholders and end-users needs to be promoted in all policy instruments, including in Horizon 2020.

From this Funding programme several initiatives have been developed towards the incorporation of RRI in the European and International arena. The projects funded by Horizon 2020 have widely created tools to put the RRI concept in practice. These tools consider the development of training materials, strategies, guidelines, methodologies, and databases to enable the discussion at different territorial levels (European Commission, 2014).

2.1.2 RIS3 - Research and Innovation Strategies for Smart Specialisation

Europe 2020 is the EU's growth strategy for the coming decade. The EU aims to become a smart, sustainable and inclusive economy. These three mutually reinforcing priorities should help the EU and the Member States deliver high levels of employment, productivity and social cohesion. Concretely, the Union has set five ambitious objectives – on employment, **innovation**, education, social inclusion and climate/energy – to be reached by 2020. Each Member State has adopted its own national targets in each of these areas. Concrete actions at EU and national levels underpin the strategy. National and regional authorities across Europe shall design smart specialisation strategies in entrepreneurial discovery process, so that the European Structural Investment Funds (ESIF) can be used more efficiently and synergies between different EU, national and regional policies, as well as public and private investments can be increased.

The **Regulation (EU) 1301/2013 of the European Parliament and of the Council of 17 December 2013** is a legal base which defines 'smart specialisation strategy'. The existence of a national or regional smart specialisation strategy in line with the National Reform Program, to leverage private research and innovation expenditure, which complies with the features of well-performing national or regional R&I systems is a

prerequisite for the effective and efficient achievement of a specific objective for all investment priorities under thematic objective no 1: Strengthening research, technological development and innovation. More specific guidance for regions and Member States on how to develop and implement regional innovation strategies for smart specialisation is available in the form of a methodological and practical guide. (European Commission, 2014a).

2.1.3 Healthcare policies

World Health Organisation

WHO has a long track record developing normative work and high-level international policy frameworks. The organisation identifies achieving universal coverage as a strategic priority, with the goal of 1 billion more people benefitting from universal health coverage by 2023. This work is supported by normative guidance and agreements; data, research and innovation; and leadership in the realms of diplomacy, advocacy, gender equality, health equity and human rights, multisectoral action, and finance. WHO's work is aligned with SDG target 3.8, which focuses on achieving universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all. The essence of Universal health coverage (UHC) is the access to a strong and resilient people-centred health system with primary care as its foundation. Community-based services, health promotion and disease prevention are key components as well as immunization, which constitutes a strong platform for primary care upon which UHC needs to be built. One of the core documents in this regard is the *Global strategy on human resources for health: Workforce 2030.* The main priorities established by WHO for the Universal health coverage and key policy instruments are detailed as followed

a) **Prevention:** In the European Region, preventable diseases continue to impose a high burden of premature mortality, and unfortunately, simple and cost-effective preventive and curative interventions are underused. WHO/Europe aims to strengthen public health programmes to prevent communicable and noncommunicable diseases, and address risk factors. The organisation has implemented a complete set of policy instruments in topics such as Alcohol use, Antimicrobial resistance, Food safety, Illicit drugs, Nutrition, Oral health, Physical activity, Tobacco, Vaccines and immunization, Violence and injuries. A key document at European level is the *European strategic action plan on antibiotic resistance (2011-2020)*

b) **Health promotion** is the process of empowering people to increase control over their health and its determinants through health literacy efforts and multisectoral action to increase healthy behaviours (e.g. lifestyle advise). In this context a relevant international instruments is: *Promoting health: guide to national implementation of the Shanghai Declaration (2018).* There is also a series of Resolutions that contribute to reducing health inequities.

c) **Therapeutic or palliative care** is related to the treatment of disease or disorders by remedial agents or methods for cure having a beneficial effect on the body or mind (e.g. treatments, products, technologies or services). Palliative care is recognized in key global mandates and strategies on universal health coverage, non-communicable diseases, and people-centred and integrated health services. Some of the fundamental instruments link to this priority are: *Integrating palliative care and symptom relief into primary health care: a WHO guide for planners, implementers and managers (2018), and Strengthening of palliative care as a component of comprehensive care throughout the life course (2014).* Additionally, a set of documents on integrating palliative care and symptom relief into paediatrics and into responses to humanitarian

emergencies and crises are among the Guidelines presented by WHO. At the European level, we highlight the document: *Palliative care for older people: better practices* (2011).

d) **Rehabilitation or assistive care** enables and promotes inclusion and participation, especially of persons with disability, ageing populations, and people with non-communicable diseases, e.g. through hearing aids, wheelchairs, prostheses, and devices. A key document in this topic is Rehabilitation in health systems *(2017).* Other relevant documents provide guidelines on community-based rehabilitation (CBR), the provision of manual wheelchairs in less-resourced settings, and for training personnel in developing countries for prosthetics and orthotics services

European Commission

The European Commission's Directorate for Health and Food Safety (DG SANTE) is the Commission department responsible for EU policy on food safety and health, and for monitoring the implementation of related laws. **The Strategic plan 2016-2020 – Health and Food Safety** sets out the department's vision for a five-year period, up until 2020. EU action in the public health area is mainly linked to incentives and cooperation measures and the actions focus on the following challenges:

- Achieving greater cost-effectiveness
- Competitiveness together with safety
- Tackling emerging global threats such as antimicrobial resistance
- Evidence-based policymaking
- Addressing the risk factors of non-communicable diseases
- Promoting vaccination.

The EU can adopt health legislation under the **Treaty on the Functioning of the European Union: Article 168** (protection of public health)**, Article 114** (approximation of laws), and **Article 153** (social policy). Areas where the EU has adopted legislation include Patients' rights in cross-border healthcare, Pharmaceuticals and medical devices (pharmacovigilance, falsified medicines, clinical trials), Serious cross border health threats, Tobacco, Organs, blood, tissues, and cells.
The Council of the EU can also address recommendations[2] on public health to EU countries. These recommendations address topics concerning the Prevention of drinking of alcohol and drug dependence, Cancer screening, prevention of injury, and the promotion of patient safety, including the prevention and control of healthcare-associated infections. It also covers actions in the field of rare diseases, Smoke-free environments, and Seasonal influenza vaccination.
The main funding schemes or instruments for co-financing are the **Third Health Programme (2014-2020) –** where the Regulation (EU) 282/2014 is the legal basis for the current Health Programme and provides funding to projects on health promotion, health security, and health information. Also, **The Horizon 2020 research programme** supports projects in areas such as biotechnology and medical technologies. EU cohesion policy supports investments in health in EU countries and regions. The European Fund for Strategic Investments.

Moreover, and specifically in relation to Healthcare systems, in 2014 appeared the *Communication from The Commission On effective, accessible, and resilient health systems.* This Communication focuses on

[2] https://ec.europa.eu/health/policies/implementation/recommendations_en

effectiveness, or the health systems' ability to produce positive health to improve the health of the population (European Commission, 2014b).

2.1.4 Health & Innovation policies

Transformation of Health and Care in the Digital Single Market

The European Commission is working to provide its citizens access to safe and top quality digital services in health and care. In line with the Commission's Digital Single Market (DSM) strategy and after analysing the results of an Open Public Consultation, the European Commission published a Staff Working Document and a Communication on Digital Transformation of Health and Care in the Digital Single Market, empowering citizens and building a healthier society. These policy documents give direction to EU activities in this field for the coming years.

As part of its Digital Single Market strategy, the European Commission has proposed political measures for ageing well in the Communication on Health and Care. This, acknowledging that Digital technology can help older people to stay healthy, independent, and active at work or in their community for longer and it helps to improve our quality of life.

Also in line with the Ageing well with ICT framework, European policymakers, civil society, professional organisations and the industry have developed a European blueprint to address the challenges in innovating better health and care provisions for the ageing society. A key document is: Blueprint for a digital transformation of health and care in an ageing society

2.2 Research & innovation system and key actors in Murcia

In 2017 the RIO country report identified some of the challenges for R&I policy-making in Spain. It referred to the improvement of framework conditions for R&I in general and the enhancement of funding and governance of the R&I system, ensuring sufficient investments in the sector. These challenges also include to strengthen the labor market for researchers and stimulating regional R&I potential and performance (Fernández-Zubieta, Ramos-Vielba & Zacharewicz, 2017).

In connection to the Public budget, the initial credits of the PG46 (Expenditure Policy for R & D & I) of 2020 are those carried over from 2018, and correspond to 7,062 million euros. The spending program that receives the higher public funding is the Promotion and Coordination of Scientific and Technical Research (42%), followed by Research and Industrial Technological Development (21%) and Scientific Research (10%). In the breakdown by ministerial departments, it is the Ministry of Science, Innovation and Universities that receive a greater proportion of the initial R & D & I credits (74.6%).

In 2018, R&D spending amounted to 14,945.7 million euros and represents 1.24% of GDP. R&D expenditure is the sum of the expenses of the following sectors: Companies, Higher Education, Public Administration, and Private Non-Profit Institutions (IPSFL). Regarding spending by financing sectors, public administration represents 42% of R&D spending, companies 49.5%, foreign investment 7.9%, and Private Non-Profit Institutions (IPSFL) 0.7% (ICONO, 2020).

Regarding the R&I system structure in Spain, the Act 14/2011 of 1st June on science, technology, and innovation (STI Act) defines the Spanish Science, Technology and Innovation System as a "system of systems" that integrates and coordinates general State policies with those of the Autonomous Regions and

articulates the actions in the public and private (company) spheres via the Science, Technology, and Innovation Policy Council.

The objective of the STI Act is to contribute to sustainable economic development and social welfare by generating, spreading and transferring knowledge and innovation. Spanish R&D&I policy is based around the "Spanish Strategy on Science, Technology, and Innovation, the Spanish National Plan for Scientific and Technical Research and Innovation, and The Annual Action Programme.

Concerning the Spanish System for Science, Technology and Innovation, it is coordinated, assessed and analysed through the following committees and instruments:

- The Council on Scientific and Technological Policy and Innovation
- The Advisory Council for Science, Technology and Innovation
- The Information System on Science, Technology and Innovation

In turn, FECYT, the Spanish Foundation for Science and Technology, supports the system in the monitoring and measurement of indicators through the Spanish R&D&I Observatory (ICONO). ICONO prepares an *Annual Report on Indicators of the Spanish Science, Technology and Innovation* System detailing the System's economic and human resources and the results of Spain's scientific research, development and innovation activities.
The STI Act defines two national funding organisms, both attached to the Ministry of Science, Innovation and Universities; The ***Spanish State Research Agency***, AEI- (Agencia Estatal de Investigación)**,** responsible for fostering the creation of knowledge in all scientific and technical fields, it manages the funding, assessment and verification of scientific and technical activity, and the **Centre for Industrial Technological Development -CDTI** (Centro para el Desarrollo Tecnológico Industrial) in charge of the promotion of innovation in the country.

2.2.1 RRI policies and actors

In reference to policy instruments, this year 2020 was launched The **Spanish Strategy for Science, Technology and Innovation 2021-2027** (EECTI 2021-2027). It is the basic instrument to consolidate and reinforce the Science, Technology and Innovation System (SECTI) in the next seven years. The ECCTI 2021-2027 is specifically designed to facilitate the articulation of the R & D & I policy with the policies of the European Union, taking into account the approved or ongoing regulations.
In this regard, the strategy adds elements that also seek to promote maximum coordination between State and Autonomous planning and programming. The EECTI 2021-2020 includes activities specifically aimed at solving the problems caused by COVID-19 pandemic, and to consolidate and promote science and innovation as a tool for the social, economic and industrial reconstruction of our country (Ministry of Science and Innovation, 2020).
Excellent and open science constitutes one of the pillars of Goal 4 (Generation of scientific knowledge and leadership) of the EECTI. The promotion of an Open Science model will favor the generation of high quality and impact knowledge, as well as its transmission to society. In the same way, The Spanish contribution to the European Open Science Cloud (EOSC), which will act as a data science engine (data-driven science) will also be promoted, as well as the participation in the adaptation of digital repositories.
The axis 14 from the EECTI proposes to promote the critical spirit and commitment of Spanish society to R & D & I, promoting gender balance in research and innovation, scientific culture, reflection and decision,

based on scientific evidence, the promotion of science and innovation, and implementing all of them openly and inclusively.
Ethics is also incorporated in the strategy from the governance perspective. The Strategy will facilitate the development of the instruments and bodies established in the LCTI, such as the Spanish Ethics Committee in the Investigation (Ministry of Science and Innovation, 2020).

2.2.2 Regional policies

At the regional level, the institutions responsible for the R&D in Murcia is the Regional System Council of Universities, Business and Research, and the Autonomous Community of Murcia. In 2011, both organizations publicly presented the edition of the Science and Technology Plan of the Region of Murcia 2011 - 2014
This strategy, for the first time, brought together scientific research, technological development and innovation under the same framework of action, so that all of them, in a coordinated manner, form part of the same value chain. This Plan provided the necessary tools to intensify the policies aimed at promoting greater interaction, relationships and cooperation between companies, universities and technology and research centres (Council of Universities, Business and Research, 2011).

Smart specialization

In the innovation area, the Research and Innovation Strategy for Smart Specialisation for Murcia (RIS3), comprised of integrated agendas for economic transformation of the territory, and is intended to prioritize research and innovation investment and policies from a perspective of knowledge-based economic development.
The Research and Innovation Strategy for Smart Specialisation in the Region of Murcia (RIS3Mur -2014), promotes the evolution towards a new research- and innovation-based growth structure starting with key production sectors and continuing with the promotion of areas in which the Region has considerable potential. RIS3Mur is intended to efficiently concentrate available resources for generation and exploitation of regional knowledge at the service of priorities linked to the Region's competitive advantages and strengths. Thus, research and innovation become increasingly important to increase wealth generation capacity (Autonomous Community of the Region of Murcia, 2014).

2.3 Policy mapping exercise in Murcia

In the CHERRIES project and as pointed out in the Guideline for Territorial mapping report (section 3.2), this step entails the revision of sectoral policies, strategies, and innovation support, based on the theoretical interface of innovation policy, RIS3, RRI, and the healthcare sector and with a focus on mission-oriented policymaking.

The exercise focuses on existing National and regional policy frameworks for territorial innovation, a selection of research and innovation strategies; and health innovation strategies, as well as other policy mixes at the national and regional scale.
The actions conducted through this policy mapping exercise consisted of the collection of policy instruments by each policy domain at the institutional level and the selection of relevant instruments for the region. The type of documents collected corresponds to executive or administrative policies to Technical/operational instruments, and development plans and strategies. The search effort involved the screening of documents from institutional websites and also reaching key stakeholders, requiring feedback on essential policy tools,

particularly regulatory and legal as well as information and suasory instruments. Moreover, the procedure encompassed the “Snowball Research Strategies” method aiming to map networks of relations between policy actors and policy instruments. The approach begins by analysing the documents of a single organization and follows a chain of references from this point. This is based on the assumption that a significant majority of actors in a policy network are known to each other.
As a result of the exercise the regional actors, together with Leiden University gathered the most representative documents from each policy domain. The main results are shown below in figure 4.

Policy Domain 1 ..	Policy domain 2	Organisation
Responsible Research & Innovation	Gender	Autonomous Community Region of Murcia
		CIREM Foundation
		European Parliament
		Ministry for Science and Innovation
		Ministry of health, social services and equality
	Open Science	CRUE Universidades espanolas
		FECYT
	Governance	Autonomous Community Region of Murcia
		Head of state
		Min. Economy, Industry and Competitiveness
	Ethics& Integrity	Universitat de Barcelona
	Public Engagement	Min. Economy, Industry and Competitiveness
	Science literacy and Science Education..	No documents found
Healthcare policies	Health workforce policy	No documents found
	Healthcare -Insurance policies	No documents found
	Hospital policies and procedures	No documents found
	Public Health policies	Autonomous Community Region of Murcia
		Coordination of the Patient Safety Program
		Counseling of health & consumption. Murcia
	Public Health policies - Education	Council Health Council of the Region of Murcia
	Public Health policies (Legal)	Council Health Council of the Region of Murcia
Innovation policies	Innovation policies	Cotec Foundation for Technological Innovation
		Council of Universities, Business and Research
		Gen. Direct. Science, Techn & Information Society
	Regional call - Open innovation	National Association of CEEIs -ANCES
	Science & innovation policies	Gen. Direct. Science, Techn & Information Society
		Ministry for Science and Innovation
	Science & innovation policies (Legal)	Autonomous Community Region of Murcia
Smart specialization	Priorities in science & innovation	Autonomous Community Region of Murcia
	Regional call - RIS3	Direct. Business Innov & Defense Self-Employed ..
Others	Education and Science Policy	Counseling of Educ. & Universities, Murcia
	Entrepreneurship Policy	Institute of Promotion of the Region of Murcia

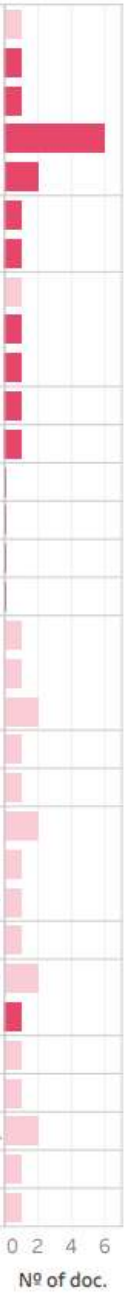


Figure 4. Results of the policy mapping activity showing the representation of the collected documents by their general policy domain (1), the specific domain (2), and the policymaker organization responsible for the elaboration of the policies. The territorial level included the differentiation between National and regional instruments

The results observed from the policy mapping activity are in line with the feedback shared during the CHERRIES General assembly (May 2020) by the region of Murcia. The region noticed relevant points in terms of the availability of documents and the fact that some of them are expired in their time-frame, such as the Health Research and Innovation Plan or the Health Plan for the Region of Murcia. Likewise, they mentioned the difficulty to assess the relevance of policies in real life, and determine whether they start action plans or activities or remain as a mere official publication. They also claimed the lack of coordination among initiatives from innovation and regional development and healthcare issues.

From a regional perspective, the relevance of policy documents is associated with the following aspects:

- the level of governance (regional government, regional ministry, etc.),
- the relation with health or social care,
- if the strategy function as a common framework for other documents and recommendations,
- its relation with science and innovation and the association with innovative funding tools, e.g. including co-creation or open innovation.

From Figure 4 we observe the majority of the documents from Responsible Research and Innovation policies encircle a national scope of governance. For Healthcare and innovation policies, regional policies are well represented in Murcia region, and the Counseling of health & consumption from the Region, appears as a prominent local policymaker institution. There is no overarching RRI policy, and the Science Technology and Innovation policies rely heavily on entrepreneurship and (business) innovation orientation. Focusing on each one of the RRI keys, it seems that for Gender and Open Science there are relevant documents, while for Governance and Public Engagement, Science Education, or Ethics there are no specific documents.
The Gender key is very well covered with 11 different documents, focusing not only on gender equality in research but even include a practical guide to gender in research content. This is mainly based upon national policies. There is one particular Murcia gender policy which is the establishment of the managing body for women's policy.

It should be noted that policy instruments are inherently difficult to track throughout the institutional structure of a nation or at the regional level, and therefore the fact that no documents were found for some of the policy domains or RRI keys, does not mean that they do not exist. Moreover, this task will be continued in Work Package 5 "Co-creation of a responsible innovation policy mix". The aim is to embed learnings in the territorial policy mixes and strategies while giving the territorial stakeholder groups an active role in shaping their environment. The objectives involve to synthesize policy aspects of current WP2, the design of an RRI-compliant territorial innovation policy mix, and to validate demands and provide evidence-base for territorial RRI-compliant development strategies. For complete detail of the policy instruments and regulations compiled in this exercise see Appendix A (excel sheet).

The following table describes the status and level of development of the examined policy domains, highlighting key policy documents, and likewise the current gaps we have for the RRI keys.

Table 1. Description of national policies in Murcia by domain.

Policy domain	Description of policies
Responsible Research & Innovation	
Gender	11 national policies on this key. It includes guideline documents to incorporate Gender in research. Statistics about Gender and also how to approach "Gender and innovation". One regional policy: law creating the Institute for Women in Murcia
Open Science	One national document on University and Open science. One recommendation for the Implementation to Open Access Dissemination.
Ethics & Integrity	One Declaration on Research Integrity in RRI (from a University).
Public Engagement	One policy document regarding Social perception of science and technology 2016
Governance	One policy document: "State plan for scientific and technical research and innovation 2017- 2020"
Science literacy and Science Education- Citizen sciences	No policies found
Healthcare policies	One "Regional Health program 2010-2015" and an "Action plan for the improvement of patient safety in the Region of Murcia 2012-2016". Both documents are out of date. "Action Program for the Promotion and Improvement of Primary Care in the Region of Murcia 2018-2022"
Innovation policies	At the National scale, the "Spanish Strategy for Science, Technology and Innovation 2021-2027" is a recent policy framework elaborated by the Ministry for Science and Innovation. At regional level the "II Science and Technology Plan 2007-2010" and the "Innovation and Transfer Strategy of Technology of the Region of Murcia" are strategies that despite the relevant content and actions and conditions defined, are out of date documents.

Smart Specialization policies	One Smart Specialization Strategy for the region of Murcia (2015)- (RIS3Mur) and two grant public aid to finance the projects contemplated in the RIS3Mur: "Financing of strategic projects contemplated in the RIS3Mur Strategy" and "Public-private cooperation in the areas of specialization of the RIS3Mur Strategy".

2.3.1 RRI relevant actors

Concerning the Open Science actors at the National level, FECYT (Spanish Foundation for Science and Technology), is a public institution that works in supporting the National Government in the design and implementation of the open access policy. Also involved in some initiatives for Citizen Science and public engagement.
In the regional context, the Autonomous Community of the Region of Murcia has been responsible for elaborating the Law 12/2002, of December 3, that created the Institute for Women in the Region of Murcia and the Smart Specialization Strategy in 2014.

The Ministry for Science and Innovation launched periodically technical reports that support policy-making decisions and boost excellence, gender equality, and efficiency in research and innovation. It is the case for the "Report – women scientists in numbers 2017" and the "WHITE BOOK: Situation of Women in Spanish Science".

3. CONTENT AND CONTEXT SMART SPECIALIZATION STRATEGY

3.1 Introduction

The definition of 'Smart Specialisation' – as an innovation policy concept intended to promote the efficient and effective use of public investment in research. Its goal is to boost regional science and innovation in order to achieve economic growth and prosperity, by enabling regions to focus on their strengths. This approach understands that spreading investment too thinly across several frontier fields risks limiting the impact in any one area.

The complementarities between both Responsible Research and Innovation (RRI) and Smart Specialisation (RIS3) approaches rely on some of the characteristics that differ from them. The RIS3 policy is primarily oriented towards regional competitiveness and therefore does not fully incorporate local institutions and notions of social value or choice. On the other hand, neither the theory, policy nor practice of RRI pays attention to the spatial dimension of innovation processes, which is central in RIS3 approaches. In that line, RRI ignores the various ways in which regional context affects not only the development of innovation but also the perception of what is responsible and socially desirable, understanding that knowledge and resources which are necessary for innovation - labor mobility, R&D collaboration- are all regional. Thus, from the innovation studies literature, we know that innovation processes are socially and spatially embedded, as the regional context creates conditions for knowledge acquisition and learning.

Overall, these two approaches share their origins as a policy concept rather than a theoretically motivated framework that argues for broad stakeholder involvement in the development of research and innovation policy and the need for R&I to be oriented towards solving grand societal challenges SGC.

In that sense, we develop an approach that may assist policymakers in designing and implementing RIS3 strategies that not only promote smart (i.e. competitive) but also inclusive and sustainable regional economic development.

The Territorial mapping exercise enclosed as one of the main steps the definition of the Territorial priorities of the regions. In order to achieve this goal, the methodological approach follows the Research and Innovation Strategies for Smart Specialisation method (RIS3 Guide) from the European Commission (2012). The process entailed the adaptation of the steps and actions considered in the original document, to provide a more specific input required in the context of the CHERRIES project. The actions considered in this approach contemplate: *Step 1) Analysis of the regional context and potential for innovation, Step 2) Governance: Ensuring participation and ownership, Step 3) Elaboration of an overall vision for the future of the region, Step 4) Identification of priorities, Step 5) Definition of coherent policy mix, roadmaps and action plan.* This version of the strategy established a special focus on Healthcare and Innovation sector and uses more recent data and information available, if compared with the previous Regional Smart Specialization Strategies.

3.2 Previous regional smart specialization strategy Murcia

Based on the information collected and the participatory process, three variables have been considered for each sector/field of activity: regional capacity in science and technology, the percentage of regional employment that concentrates each sector or area of activity, and the specialization coefficient of the regional business structure compared to the Spanish one.

The results of the analysis depict the **agri-food** value chain in a relevant position of “R + D + i leadership” due to the outstanding scientific-technological production, the concentration of a significant percentage of employment, and a specialization coefficient higher than unity. Great potential is observed both in **Tourism and in Health and Habitat**. In the case of Tourism, a sector that has a significant number of companies, the challenge is to increase scientific-technological production and its transfer. In the **Health and Well-being sector**, there are important scientific-technological capacities that offer great specialization opportunities for the Region of Murcia.

The priorities for the Region of Murcia are structured around those activities in which there is clear leadership, such as those linked to the chain of **agri-food value**, in which we include, in addition to the **nuclear activities of agriculture (livestock, fishing and the food industry),** those related to the **water cycle** (its treatment, purification and management), the **environment** and, **logistics and transport**. On the other hand, the Region of Murcia bets on the future for a series of potential activities. We refer to **tourism, health, and habitat**, grouped under the heading **quality of life**, since they contribute to the **well-being of its inhabitants**. They are characterized because they will allow, with the intensification of technology, to ensure a future of specialization that generates wealth and employment.

3.3 Territorial context of the region

3.3.1 Economic specialization

We measured this variable using the cluster mapping tool, which shows the analysis of the regional ecosystem scoreboard. The regional eco-system scoreboard for clusters and industrial change illustrates conditions for successful cluster development and industrial change by region in Europe. It displays sectoral, cross-sectoral, and regional indicators of cluster specialisation and size, business performance, regional context and other statistical information. It can be visualised the relative cluster strength and cluster development over time, cluster and regional strength across sectors and emerging industries and linkages between clusters, industrial change, innovation, entrepreneurship, and economic development. The information was extracted using the Mapping tool from the European Observatory for Clusters and Industrial Change (2019).

By using this indicator, we selected the top 10 economic specialization areas for Murcia, displayed in Figure 5. It shows that organisations in the region are primarily specialized in agricultural inputs and services, Furniture and Food Processing and Manufacturing. The categories “Biopharmaceuticals” and “Medical Devices”, both part of the Life Sciences industry are not present among the highest scores.

Figure 5. Chart representing the top 10 sector specialisation in Murcia in 2017.

3.3.2 Innovative behaviour

Generally, Murcia is regarded as a **moderate innovator** in the European landscape ((Innovation score: 59,0) which is supported by the numbers on regional R&D spending. These indications suggest that Murcia should not be looking to realise very advanced high-tech innovations since there is not much experience with this type of activity. Murcia should rather focus on mid-tier innovations with potential for regional gains to ensure high chances of effectiveness for the pilots.

3.3.3 Health care system

Spain has the highest life expectancy in the EU and social inequalities in health are less pronounced than in many other countries. However, many years of life in old age are lived with some chronic diseases and

disabilities, increasing demands on health and long-term care systems. Health spending per capita in Spain is more than 15 % lower than the EU average. While most health spending is publicly funded, direct out-of-pocket spending by households accounts for a greater share than the EU average. The Spanish health system relies on a strong primary care system, but growing demands arising from the increasing burden of chronic diseases may require more and more efficient use of resources (European Commission, 2019).

Health status Life expectancy in Spain increased by more than four years since 2000 to reach 83.4 years in 2017, 2.5 years above the EU average. These gains have been driven mainly by substantial reductions in mortality rates from cardiovascular diseases, but mortality from Alzheimer's disease has increased as a result of the increase in life expectancy. Nearly 60 % of Spaniards aged 65 and over have at least one chronic disease, and more than one in five have some limitations in activities of daily living.

Risk factors While smoking rates have decreased over the past 15 years, more than one in five Spanish adults (22 %) still smoked daily in 2017, a higher rate than the EU average (19 %). Obesity rates have increased in Spain: one in six adults (17 %) was obese in 2017, also above the EU average (15 %). Conversely, alcohol consumption is relatively low, and the proportion of adults reporting heavy alcohol consumption is among the lowest in Europe (9 %).

Health system Health spending per capita in 2017 reached EUR 2 371 (adjusted for purchasing power), more than 15 % below the EU average of EUR 2 884. Following the 2009 economic crisis, health spending remained flat or even decreased in some years, but has started to rise again since 2014. Health spending accounted for 8.9 % of GDP in 2017, below the EU average of 9.8 %.

Accessibility All citizens in Spain are covered by statutory health insurance, but public coverage is lower for pharmaceuticals, and dental care is not covered. As a result, unmet needs for dental care are higher, particularly for people on low incomes. Waiting times for doctor consultations and elective surgery are persisting issues.

Resilience Budgetary pressures to respond to growing needs for health and long-term care will increase in the years ahead owing to population ageing. Some progress has been achieved in promoting greater care coordination for people with chronic conditions, but there is growing recognition by all stakeholders that strengthening primary care should be a key priority.

4. DEFINITION OF TERRITORIAL PRIORITIES AT REGIONAL LEVEL

4.1 knowledge production indicators and scientific production analysis by fields of Science

As part of step 1 from the Smart Specialisation Strategy methodology (*Guideline for Territorial Mapping WP2 - Deliverable 2.1*), and regarding the analysis of the regional context and potential for innovation, this section entails the study of **Scientific and Technological specialisation** of the territory. The following analyses aim to build a profile of the current knowledge production in the regions through bibliometric analysis and using as a source of data, the scientific production in Murcia, patents' creation and the development of european projects.

Some of the requisites filled by the priorities defined in each territory are: 1) priority level should be smaller than whole sectors, but bigger than single activities for maximal effectiveness. 2) Priorities do not have to fit in one particular sector and can be connected to multiple sectors. This is important, because often innovative concepts are formed from a diverse set of capabilities. 3) In respect to the importance of RRI and SDGs in today's society these priorities do not have to carry economic value only 4) Stakeholders can formulate their societal visions for the future and collectively integrate these in their smart specialization priorities.

4.1.1 Scientific production in connection with Societal Grand Challenges (SGC) and World Health Organization (WHO) priorities

The chart below (Figure 6) depicts the average number of publications (normalized by population) of each SGCs category associated to "Health" for the period 2012- 2016. The colours in the chart characterise the relation between Health categories from SGC and the World Health Organization (WHO) priorities. The data was obtained through KNOWMAK, a web-based tool, which provides interactive visualisations and indicators on knowledge co-creation in the European research area[3]. The analyzed period corresponds to publications from 2010 -2016.

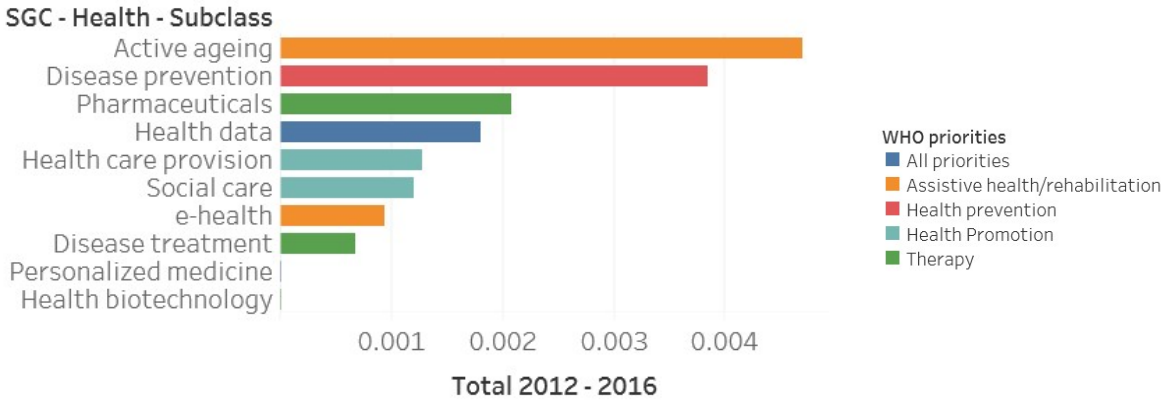


Figure 6. The average number of publications (normalized by population) of each SGCs category associated to "Health" for the period 2012- 2016.

The outcomes from Figure 6 indicates **Active Ageing** positioned as the top category in relation to knowledge production, based on the number of publications produced by the region in the studied period.

The publication content for Murcia under the Active Ageing category, suggests **food habits and nutrition in Nursing homes** as a topic being studied by research Institutions. Among the organizations publishing in this matter, we found the **Catholic University of Murcia**, **University of Murcia** and **University Hospital San Juan.**

[3] https://www.knowmak.eu/

4.1.2 Complexity and diversity indicators

Just as regions differ in size and wealth, they also vary in the diversity and complexity of their knowledge base. Especially large, metropolitan regions are capable of contributing to a wide range of fields (Nomaler et al., 2014). Every region has its own, unique knowledge base. Regions specialize because of the cumulative and path-dependent character of scientific knowledge production (Heimeriks & Boschma, 2014). The opportunities to diversify into new fields are to a large extent dependent on the existing portfolio of related knowledge (i.e. the adjacent possible). From this perspective, it is clear that the **diversity of the knowledge base** can be considered an important indicator for further knowledge developments in regions. Diversity matters because regions are more likely to expand and diversify into new topics and fields that are closely related to their existing activities. Because the diversity of topics indicates a diversity of capabilities, the results confirm the idea that more diverse capabilities are important for producing complex knowledge.

The **complexity measure** looks to explain the knowledge produced in a region combining metrics of the diversity of regions and the **ubiquity** of the fields to create measures of the relative complexity of a region's scientific portfolio. Hausmann and Hidalgo (2009) developed a complexity measure based on the diversity of outputs within territories and the ubiquity (or range) of territories across which individual outputs can be produced. For further details of the methodology applied, please refer to Heimeriks, G., *et al.,* 2019.

The complexity of knowledge matters because it allows regions to produce idiosyncratic knowledge that few other regions can make. In analogy with the production of goods (Hausmann & Hidalgo, 2009; Hidalgo et al., 2007), it can be expected that sophisticated regions are capable of contributing to a large variety of ‘exclusive’ fields that few other regions can develop. The complexity of a region is embodied in the wide range of knowledge or capabilities that are combined to produce outputs: less ubiquitous outputs are more likely to require a greater variety of capabilities. We thus expect that these specialized (e.g. more complex) outputs tend to be produced at relatively few locations and often provide long-run competitive advantage.

Based on the data collected for publications (2018) and the measurement of the aforementioned indicators, Murcia has shown **Medium Scientific diversity** and **High Scientific Complexity indicators** values.

4.1.3 Definition of priorities using scientific relatedness analysis

In this section we aim to communicate the main strength and capabilities already present in the region from the scientific perspective. The **relatedness indicator** measures the **Revealed comparative advantage (RCA)** by analysing the fields in which the region has an above-average concentration of publications. Likewise identify which scientific subfields are often found together in the same region, as a representation of the ability of the territory to diversify into related subfields.

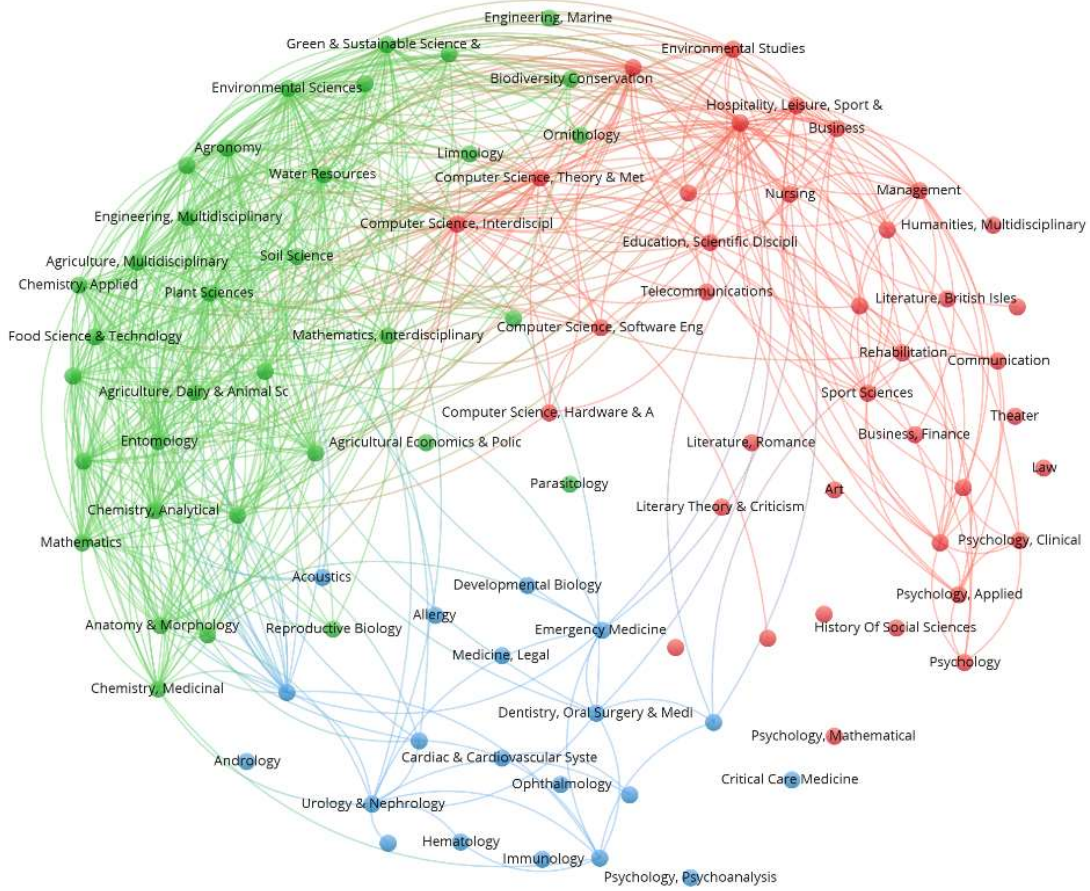


Figure 7. Results of relatedness analysis depicting fields of science with a Revealed Comparative Advantage (RCA).

Murcia has an all-round representation of scientific subfields, however, fields in relation to **Environmental Science** and **Agriculture** shape a dense area (highlighted in green) in the map above. A complete visualization of the prioritized fields can be observed in the image above (Figure 7). Some of the fields related from the *Biomedical and Health Science* field having a Revealed Comparative Advantage (RCA) if compared with the European partners are: Food Science and Technology – in connection to Life and Earth Science main Field-, Ophthalmology, Dentistry, Oral Surgery and Medicine, Cardiac and Cardiovascular system, Urology and Nephrology, Hematology, Immunology. If looking at the Fields connected at the interface of Health and Social Science, we found Rehabilitation, Sport Science, Nursing and Psychology / Psychoanalysis.

4.1.4 Analysis and characterization of priorities at micro-field level

The outcomes from this analysis provide a more detailed characterization of the fields already prioritized in the Relatedness analysis and eventually will reveal new micro-level fields that are relevant in respect to the level of specialization and knowledge production in the territory. The micro-level analysis method considers the use of a computer algorithm, where each publication is assigned to one of the 4013 fields based on a large-scale analysis of hundreds of millions of citation relations between publications. This micro-level fields

are embedded into the five main fields of science, namely: *Social Science and Humanities, Mathematics and Computer Science, Biomedical and Health Science, Physical science and Engineering.* For further details please refer (Waltman & Van Eck, 2012). The tool to represent the results is Vosviewer, a software for constructing and visualizing bibliometric networks.

That being said, the following chart portrays the most relevant micro-level fieds in Murcia. The colours represent the main fields of science and each circle symbolize a micro-level field, where the bigger the circle (node), the higher the number of publications produced in that specific micro-field. As we aim to define how specialized the region is within a specific field, we used the relative number of publications, which takes into account the total number of publications produced in this subfield in the world, based on CWTS internal database, Web of Science's (WoS) produced by Clarivate Analytics. The period of the analysis considers the years 2014 to 2018. A total of 14.433 publications were considered in the analysis including articles, reviews, and conference proceedings.

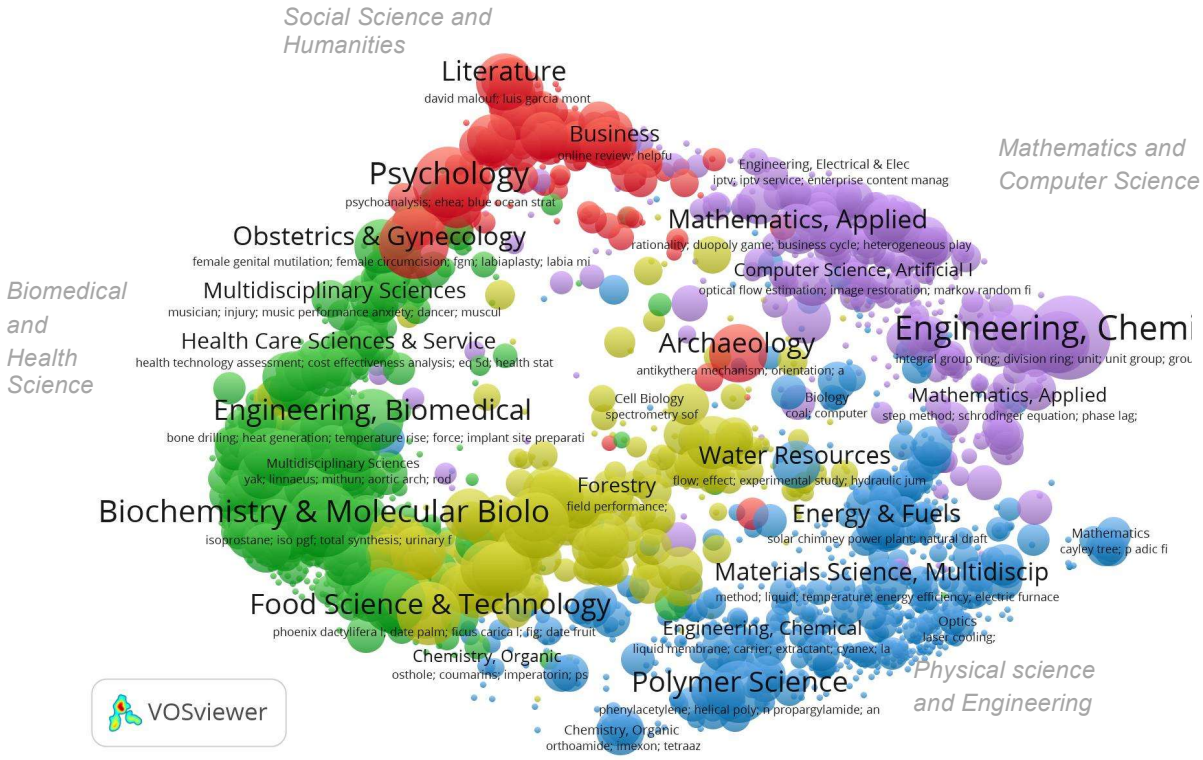


Figure 8. Results of the micro-level scientific field analysis using the relative number of publications for Murcia.

The map above presents an overview of the micro-level fields arising as relevant from each Main field (Social Science, Engineering, Health Science, etc.). As stated in the previous Smart specialization report Murcia region has an extensive development of the Fields related to **Agriculture, Plant Science and Nutrition, and Environmental science**. Similarly, the micro-level field analysis shows a high relative number of publications or level of specialization on these fields, and also in connection to **Biochemistry & Molecular Biology** and **Pharmacology & Pharmacy** fields.

It can be seen that the Fields represented in the previous analysis of Relatedness are in their majority also present in the micro-field level analysis. Among the most representative fields are likewise **Ophthalmology, Oral pathology, Sports Medicine.**

Characterization of the most relevant fields from Biomedical and Health Science

The following image (Figure 9) characterizes the key subjects developed in the Biomedical and Health Science field. The outcomes are based on the previous micro-level field analysis (Figure 8) and aim to obtain an enhanced level of detail of the top 10 fields with higher level of specialisation. This threshold can be extended if the interest of the region is to explore a larger set of scientific areas or fields.

From the chart below, the columns indicating the number of publications show two sets of data. In one side the *Relative number of publications*, to specify the level of specialization in each field and also the absolute number of publications in the field, to depict a full counting of the publications, disregarding the measurement of specialization. It should be noted that a higher degree of specialization should be accompanied by a minimum amount of scientific production. For this reason, we set a minimum threshold of 5 publications per field during the analyzed period (2014-2018). Fields with less than that were not considered in the analysis.

In methodological terms, the description of the fields represented below in Figure 9, considers the name of the most representative Journals where the region publishes, and the content of the publications by using the titles of articles contained in each micro-level field. For the ones having a larger set of publications, we used text mining techniques or term maps (Vosviewer software) to detect the core topics in the abstracts of the publications.

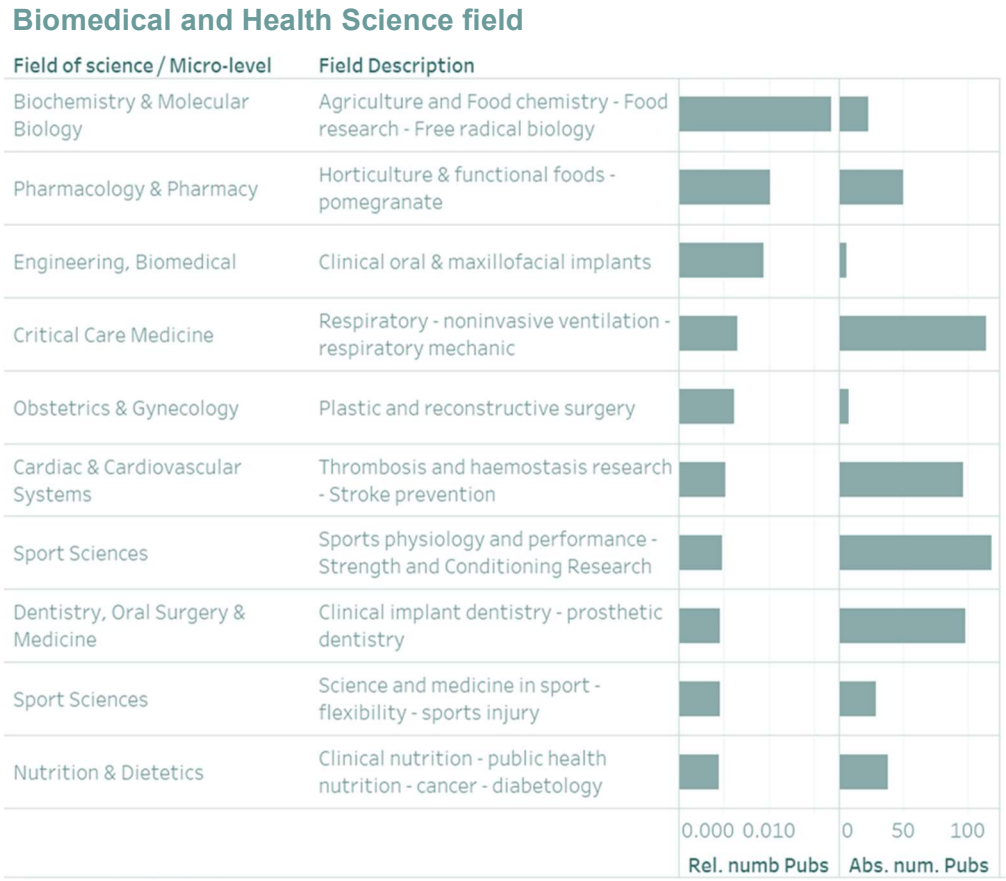


Figure 9. Top 10 micro-level fields within Biomedical and Health Science. Values refer to the relative and the absolute number of publications for Murcia are represented.

As a result of the micro-level field analysis, we can observe that within the top 10 fields related to the level of specialization it stands out topics concerning **Food chemistry, Dietetics, and Nutrition.** Among the fields experiencing a high level of specialization and additionally, a high total number of publications (more than 50 publications between 2014 -2018) are **Critical Care medicine** concerning respiratory non-invasive ventilation**, Sport Science** related to physiology and performance**, Cardiac and Cardiovascular Systems** (Thrombosis and haemostasis) and **Dentistry, Oral Surgery & Medicine** associated to oral and maxillofacial implants**.**

4.1.5 Addressing territorial priorities raised by the regions

During November 2020 the region of Murcia informed the priorities manifested by the stakeholders during the engagement process. Among them were mentioned covid-19, chronic illness and telemonitoring and empowerment. Due to time restrictions, the scientometric analysis related focussed in the analysis of scientific research produced in Murcia on **Chronic diseases**. During the next phase of the project, in 2021 Covid-19 and telemonitoring will be addressed if required by the region.

At present, epidemiological surveillance in Spain remains focused on the communicable diseases included in the list of notifiable diseases. However, there has been a change in the epidemiological pattern that

predominated until the last few decades of the twentieth century. Infectious diseases, which used to be the leading causes of morbidity and mortality, have given way to a predominance of chronic diseases. In this regard, progress has been made in the drafting and adoption of specific legal regulations on public health monitoring (Mayoral Cortes, *et al.* (2016).

In 2012 a report established that the five leading causes of mortality in Spain were malignant tumors, heart diseases, cerebrovascular diseases, chronic lower respiratory diseases, Alzheimer's disease and diabetes mellitus, with more than 61% of deaths (2012). Published in October 2020, The Lancet's special issue on GBD (Global Burden of Disease) included the most up-to-date global health data from 2019 focused on five key themes: demographics, diseases and injuries, risk factors, population forecasting, and universal health coverage. The report determined the top 10 causes of the total number of deaths in 2019 in Spain[4] where the majority corresponded to chronic diseases such as coronary heart disease, Alzheimer or cancer.

Using a set of publications for Murcia region published during 2014-2018, we conducted a text-search analysis based on keywords of these diseases present in titles and abstract of the articles. The figure above represents the knowledge production associated with the most researched diseases mentioned in the report (The Lancet, 2020).

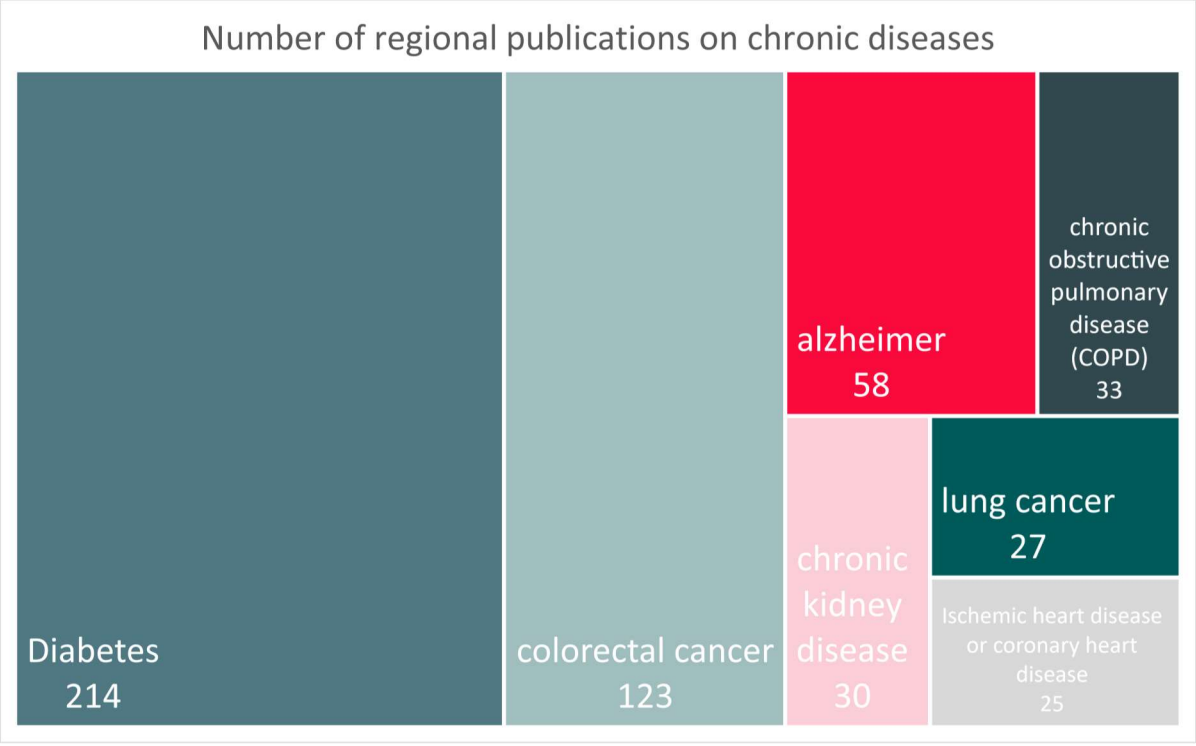


Figure 10. Number of regional publications on chronic diseases for Murcia region (2014 -2018)

In order to expand the perspective of the effects of chronic diseases, we also observed the percentage of the population suffering from them and not only causing the death of the patient. A report in 2017 identified

[4] http://www.healthdata.org/spain

besides arterial hypertension or diabetes, an increase of obesity, musculoskeletal diseases (osteoarthritis, low back pain), and the population with functional limitations and disabilities (Ministry of health, consumption and social welfare, 2018). These results were likewise visible by a term map based on a text-search analysis using as a keyword "chronic" in Titles or abstracts of publications from the Life and Health Science field (VOSViewer). The outcomes are displayed in Figure 11. The green cluster indicated a high occurrence of terms associated to "**chronic low back pain**" while the red cluster showed "**chronic obstructive pulmonary**" and "**chronic heart failure**" as the most recurrent in the analysed set of publications. The cluster depicted by color purple appeared dominated by the term "**Chronic lymphocytic leukemia**". The figure also showed obesity and kidney diseases as important.

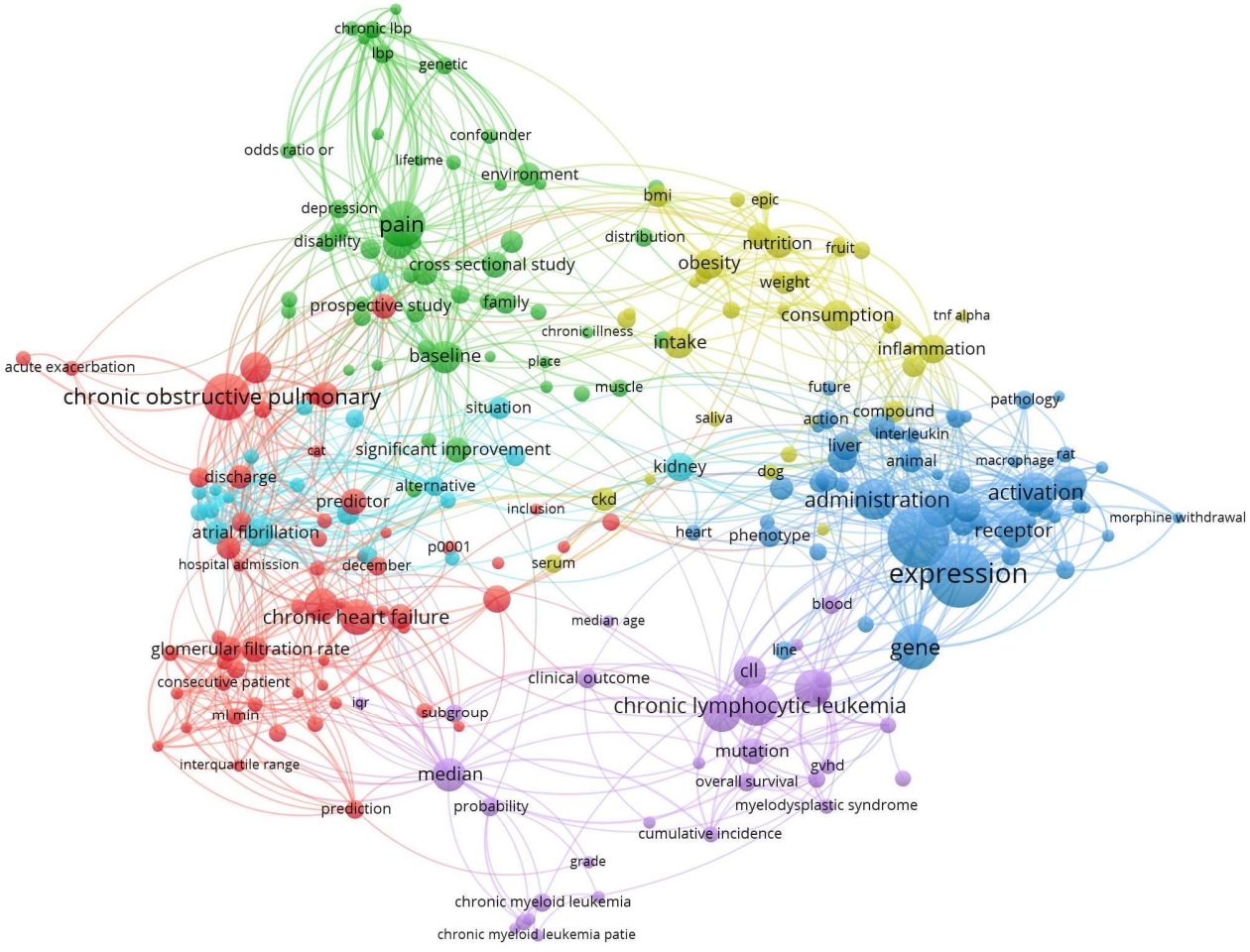


Figure 11. The co-ocurrence network analysis showing terms related to chronic diseases in Murcia.

4.3 Patents analysis by technological field and in the Health sector

It was analyzed the number of patents registered in Murcia region according to the classification of technological fields. The source of information is PATSAT - Worldwide Patent Statistical Database - EPO

database 2020 Autumn edition. Patent statistics and bibliometric analysis are used as indicators of the inventive activity of the regions. This analysis considers only companies registering patents and not individuals, between the years 1981 and 2019 (458 patents).

In the figure below we observe that the three categories related to the Health sector are within the top 10 with the majority of patents: Medical Technology (35 patents), Pharmaceuticals (21 patents), and Biotechnology (19 patents).

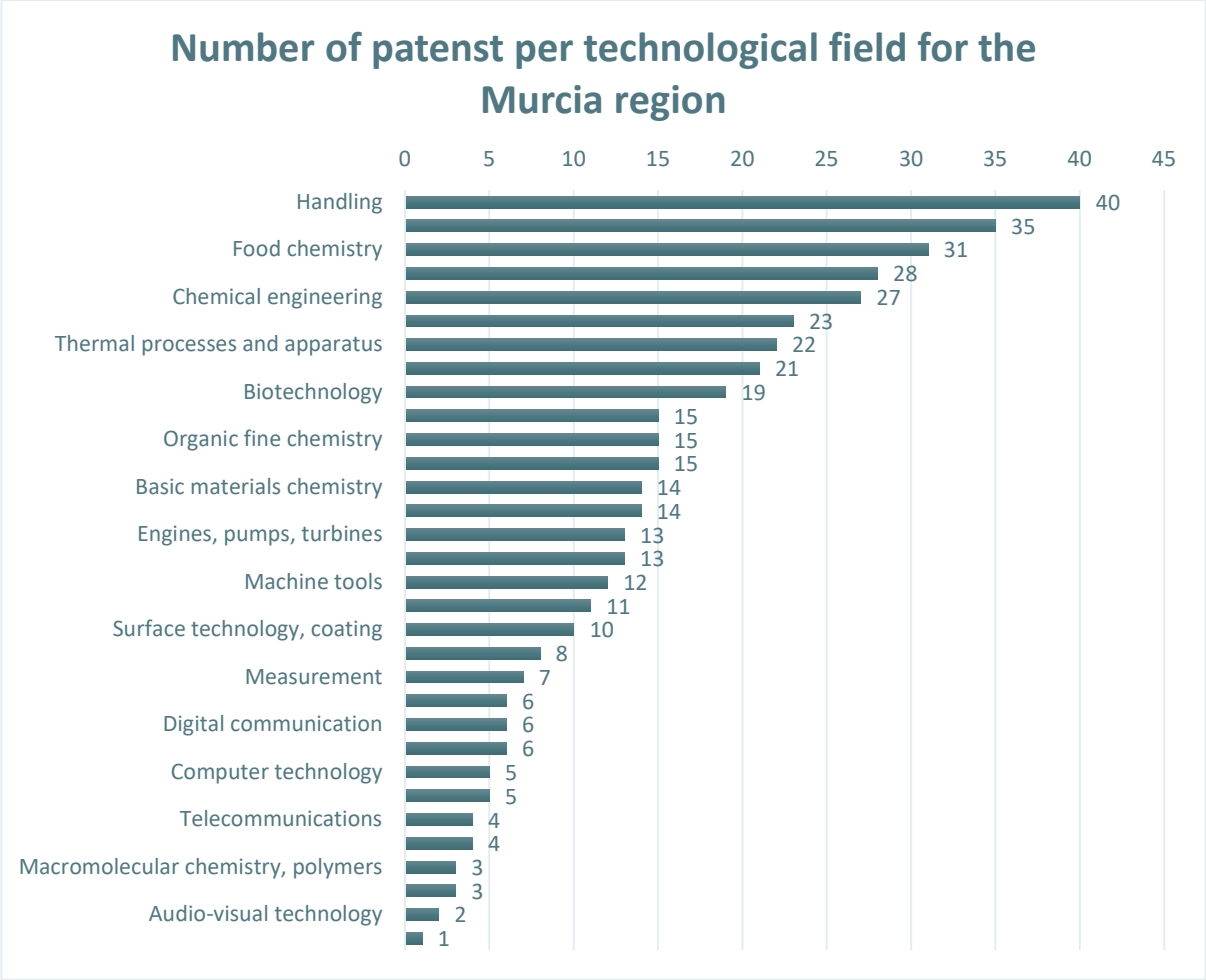


Figure 12. Number of patents per technological field in Murcia between 1981 and 2019.

The next Figure depicts the Medical Technology sector as being the ones with the higher number of patents in the Health sector for Murcia. The total number of patents studied was 75.

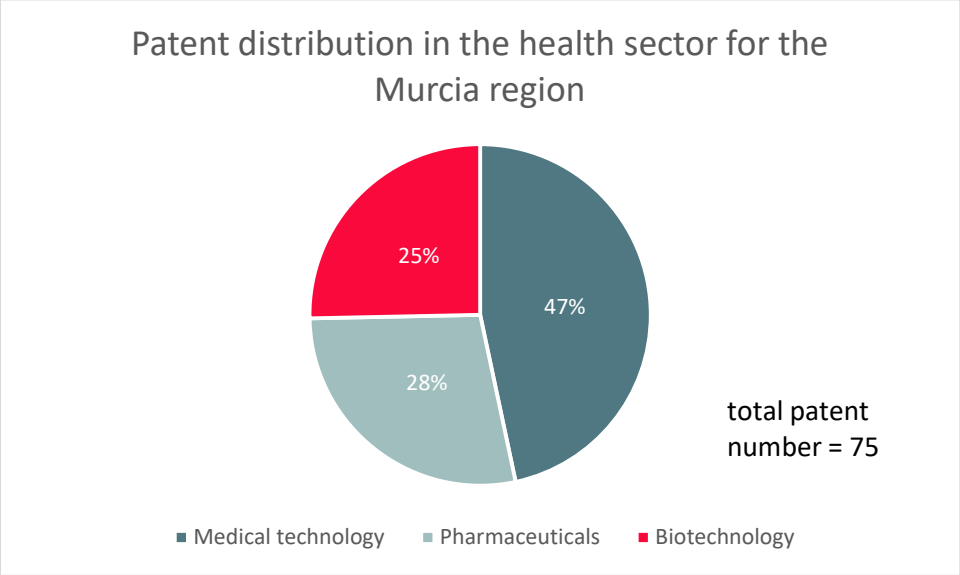


Figure 13. Percentage of patents belonging to the three major groups linked to the Health sector.

When analyzed the content of the patents by their titles, the topics emerging from the "**Medical technology**" classification are connected mostly to ophthalmological procedures and devices, considering the measurement of the eye's wave aberration, production of ophthalmic lenses, intraocular lens or instruments for correcting corneal problems, ocular refraction, or controlling the progression of myopia, among other issues. In the Biotechnological sector, the registered patents aim to develop methods to study plants and their protection against pathogenic agents or stimulate their growth with fertilizers. A couple of patents dealing with human papillomavirus and the production of probiotics for infants were also found.

We noticed from the **Pharmaceutical** sector that several patents are dedicated to the process of preparing or study functional food composition or developing products comprising pomegranate extracts as nutritional products or for preventing diseases or physio pathological conditions. Also, the analysis of products such to treat melanoma and infectious diseases.

Notable is the connection of the priorities identified from the analysis of the regional knowledge production and the patent's creation, where we observe the ophthalmological sector and Functional Foods standing out from both sources of analysis.

It follows a Figure identifying the top-performing institutions in terms of Health-related sectors. The outcomes identify the University of Murcia as the main performing actor.

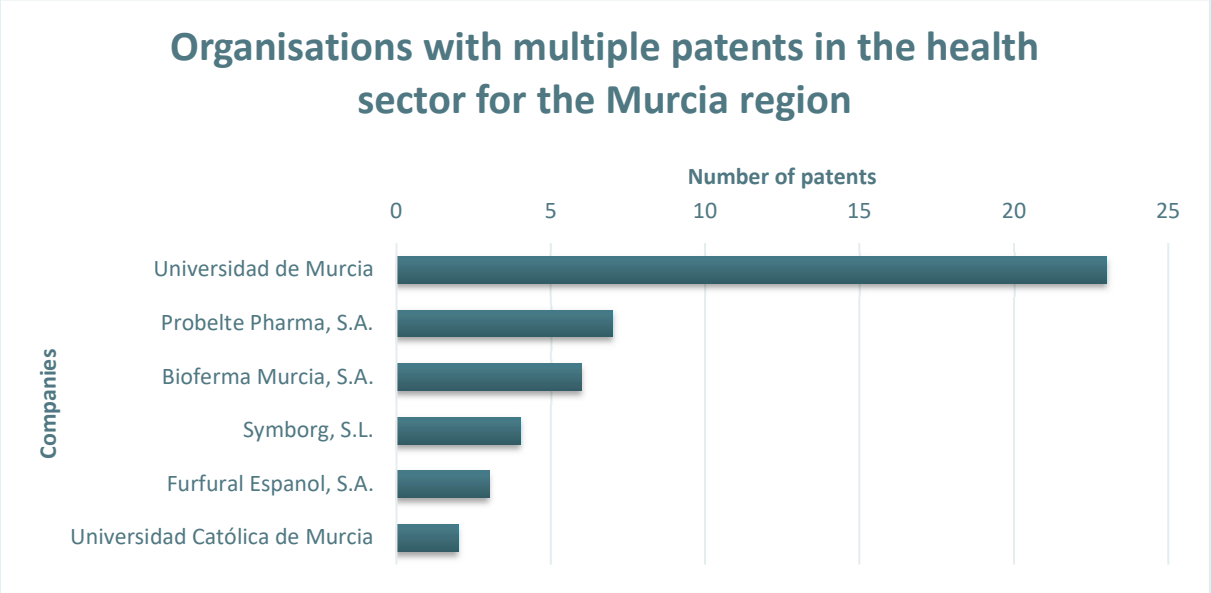


Figure 14. List of companies with inventions registered in the Medical Technology, Pharmaceutical, and Biotechnology sectors.

4.4 European projects and territorial priorities

Using the EU Cordis database from Horizon 2020 funding programme we studied the content of the projects concerning the main priorities stressed by the Murcia region during the reflection and experimentation phase, and as a result of the Smart Specialization analysis. Four of the selected projects deal with Chronic diseases such as diabetes mellitus, hypertension care, cardiovascular accidents and the impact of second-hand tobacco smoke on the respiratory health of vulnerable groups. We identified a project addressing telemedicine and mobile health for personalized healthcare, connected to the priority expressed by the region on Health Telemonitoring. There is one project referring to the improvement of eyesight (Ophthalmology), determined as one of the strong research areas in the region by the Knowledge indicators. The participant organizations belong to the public and private sector, with one Higher Education Institution (HEI), the Universidad Politécnica de Cartagena. Likewise, the selected projects could serve and feed the innovation stories entailed in task 2.3 (Study of innovation biographies of health pilots).

Table 2. List of selected European projects connected to the regional priorities.

Project acronym	Name	Description	Period	Regional Organisation
ProEmpower	Procuring innovative ICT for patient empowerment and self-management for type 2 diabetes mellitus	Public procurers in ProEmpower aim to procure a disease self-management solution to help meet the imminent threat of a diabetes epidemic.	2016 -2020	Servicio murciano de salud / Ticbiomed

TackSHS	Tackling secondhand tobacco smoke and e-cigarette emissions	The project will try to elucidate the comprehensive impact that SHS and e-cigarettes emissions have on the respiratory health of the European population and how health impacts vary according to socio-economic parameters with particular emphasis on specific vulnerable groups (patients suffering from pre-existing chronic lung diseases, heavy smokers, and other disadvantaged groups).	2015 - 2019	Universidad Politecnica de Cartagena
HSMonitor	Pre-commercial Procurement of innovative ICT-enabled monitoring to improve health status and optimize hypertension care	The project will apply the chronic care model to identify support needs for hypertensive patients at all stages. Its integrated ICT enabled hypertension care solution is based on a design.	2019 - 2023	TICBIOMED
BeVision	Better vision after cataract and refractive surgery with photonics technology	VAO will be the only medical device in the world that can measure objectively all eye aberrations of patients and, subsequently, simulate the different optical solutions to correct the patient's eye imperfections during visual testing. Our technology will dramatically improve the outcomes of cataract and laser refractive surgeries.	2017 - 2020	VOPTICA S.L.
COPCAR	Heart monitoring and early assistance in high-risk crisis without patient intervention	Developed COPCAR, an intelligent system that solves the need of prompt intervention in risk crisis to avoid deaths. Likewise the need of monitoring patients at risk to detect early symptoms of cardiovascular accidents.	2016	Control de Pacientes de Alto Riesgo SI

5. IDENTIFICATION OF FINAL PRIORITIES IN THE REGION

Shaping the territorial dimension of future policies for sustainable growth requires understanding the territorial diversity – key challenges and development perspectives – of different places as well as formulating policy approaches and implementation tools that can help to maximise their development potentials. Each region has a unique perspective on global developments. In order to specify a place-based approach to smart specialisation in times of Grand societal challenges, locally and historically situated discourses and practices need to be taken into account for aligning research and society.

Our approach may assist policymakers in designing and implementing RIS3 strategies that not only promote smart (i.e. competitive) but also inclusive and sustainable regional economic development. By combining information on the relative strength of regional knowledge production activities (e.g. science and technology that is linked to global developments) with information about regional stakeholders, local needs and policies, we can thus specify priorities that can help to maximise the regional development potentials. As a result of the analyses conducted, the territorial priorities identified for the region are summarized below.

The outcomes of the analysis connecting the Scientific production in Murcia and the Societal Grand Challenges from the Health class, indicates **Active Ageing** positioned as the top category. This, based on the number of publications produced by the region in the studied period. Likewise, the publication content for Murcia under this category, suggests **food habits and nutrition in Nursing homes** as a topic being studied by research Institutions. Among the organizations publishing in this matter, we found the **Catholic University of Murcia**, **University of Murcia,** and **University Hospital San Juan.**

Concerning the results of the prioritized fields in the regions as an output of the Relatedness analysis, fields in relation to **Environmental Science** and **Agriculture** shape a dense area. As a means to mention some of the fields related from the *Biomedical and Health Science* field having a Revealed Comparative Advantage (RCA) if compared with the European partners are: **Food Science and Technology** – in connection to Life and Earth Science main Field-, **Ophthalmology**, **Dentistry**, **Oral Surgery and Medicine**, **Cardiac and Cardiovascular system**, **Urology and Nephrology**, **Hematology**, **Immunology**. If looking at the Fields connected at the interface of Health and Social Science, we found **Rehabilitation**, **Sport Science**, **Nursing** and **Psychology / Psychoanalysis.** A complete visualization of ALL the prioritized fields can be observed in Figure 7.

The results of the micro-level fields analysis for Murcia region, to identify capabilities in specific topics and fields, revealed as well an extensive development of the Fields related to **Agriculture, Plant Science and Nutrition and the Environmental science**. This is aligned with the previous Smart specialization report. Similarly, the analysis exhibits a high relative number of publications or level of specialization of these fields in connection to **Biochemistry & Molecular Biology** and **Pharmacology & Pharmacy** fields.

As a result of the micro-level field analysis specifically within the Biomedical and Health Science field, we observed that from the top 10 fields with the highest level of specialization it stand out topics concerning **Food chemistry, Dietetics, and Nutrition.** The specific topics studied are Free radical biology, Horticulture & functional foods, especially pomegranate (*Punica granatum*), and Clinical nutrition & public health. Among the fields experiencing high level of specialization and additionally, a high total number of publications (more than 50 publications between 2014 -2018) are **Critical Care medicine** concerning respiratory non-invasive

ventilation**, Sport Science** related to physiology and performance**, Cardiac and Cardiovascular Systems** (Thrombosis and haemostasis) and **Dentistry, Oral Surgery & Medicine** associated to oral and maxillofacial implants**.**

The results of the scientometric analysis aimed at informing knowledge creation based on the **territorial priorities raised by the regions,** focussed on the analysis of scientific research produced on Chronic diseases. The priorities related to Covid-19 and telemonitoring and empowerment, also highlighted by the region, will be addressed at the beginning of 2021. A text-search analysis of scientific publications, based on a list of diseases identified among the main causes of death in Spain, showed the most researched chronic illnesses (number of publications) **Diabetes**, **colorectal cancer**, **Alzheimer**, **chronic kidney disease**, and **Chronic obstructive pulmonary disease (COPD).** The co-ocurrence network analysis map related to chronic diseases portrayed as relevant terms associated with **chronic low back pain**, **chronic lymphocytic leukemia,** and **chronic heart failure** as well.

As a result of the **patents analysis**, we observe that the three categories related to the Health sector are within the top 10 with the majority of patents for Murcia: Medical Technology (35 patents), Pharmaceuticals (21 patents), and Biotechnology (19 patents). The content of the patents indicated the topics emerging from the "Medical technology" classification connected mostly to **ophthalmological procedures and devices**, considering the measurement of the eye's wave aberration, production of ophthalmic lenses, intraocular lens or instruments for correcting corneal problems, ocular refraction, or controlling the progression of myopia, among other issues. We noticed from the Pharmaceuticals sector that several patents are dedicated to the process of **preparing or study functional food composition** or developing products comprising pomegranate extracts as nutritional products or for preventing diseases or physiopathological conditions. Also, the analysis of products such to treat melanoma and infectious diseases.

Notable is the connection of the priorities identified from the analysis of the regional knowledge production and the patent's creation, where we observe the opthalmological sector and Functional Foods standing out from both sources of analysis.

Finally and as a result of the selection of EU project (Cordis database) concerning the main priorities stressed by the Murcia region, or identified as a result of the Smart Specialization analysis. Four of the selected projects deal with Chronic diseases such as **diabetes mellitus, hypertension care, cardiovascular accidents,** and the impact of second-hand tobacco smoke on the **respiratory health** of vulnerable groups. We identified a project addressing **telemedicine and mobile health** for personalized healthcare, connected to the priority expressed by the region on Health Telemonitoring. There is one project referring to the **improvement of eyesight** (Ophthalmology), determined as one of the strong research areas in the region. The participant organizations belong to the public and private sector, with one Higher Education Institution (HEI), the Universidad Politécnica de Cartagena.

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