


# Medical deserts in Spain—Insights from an international project

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## Abstract

**Introduction:** Medical deserts are a growing phenomenon across many European countries. They are usually defined as (i) rural areas, (ii) underserved areas or (iii) by applying a measure of distance/time to a facility or a combination of the three characteristics. The objective was to define medical deserts in Spain as well as map their driving factors and approaches to mitigate them.

**Methods:** A mixed methods approach was applied following the project "A Roadmap out of medical deserts into supportive health workforce initiatives and policies" work plan. It included the following elements: (i) a scoping literature review; (ii) a questionnaire survey; (iii) national stakeholders' workshop; (iv) a descriptive case study on medical deserts in Spain.

**Results:** Medical deserts in Spain exist in the form of mostly rural areas with limited access to health care. The main challenge in their identification and monitoring is local data

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availability. Diversity of both factors contributing to medical deserts and solutions applied to eliminate or mitigate them can be identified in Spain. They can be related to demand for or supply of health care services. More national data, analyses and/or initiatives seem to be focused on the health care supply dimension.

**Conclusions:** Addressing medical deserts in Spain requires a comprehensive and multidimensional approach. Effective policies are needed to address both the medical staff education and planning system, working conditions, as well as more intersectoral approach to the population health management.

#### KEYWORDS

health care demand, health care supply, health planning, health workforce, medical desert, medically underserved area

#### Highlights

- Existence of medical deserts have been a growing concern among many European countries.
- In Spain they are mostly identified as rural, often isolated and/or depopulated areas.
- Health care demand and supply characteristics define and influence medical deserts.
- Mitigating medical deserts in Spain requires a comprehensive and multisectoral approach.

## 1 | INTRODUCTION

The unequal distribution of health professionals in Europe has been investigated for many years now.<sup>1,2</sup> The term “medical deserts” has become popular to describe the lack of primary care physicians in rural areas.<sup>3-5</sup> However, there is no uniform definition of “medical deserts”. In a recent literature review they are defined as (i) rural areas, (ii) underserved areas or (iii) by applying a measure of distance or time to a health facility, or a combination of these characteristics.<sup>6</sup>

In Spain, the issue of progressing depopulation of mostly interior, rural provinces, called ‘Empty Spain’ (*España Vacía*) has been on the national policy agenda for many years now.<sup>7</sup> Due to the high concentration of people in urban areas, many vast and unpopulated regions lack access to essential local services like health clinics, schools, and supermarkets. According to a study by the Bank of Spain, citizens residing in rural provinces have to travel longer distances to reach these services compared to those in other European Union nations.<sup>8</sup> The migration of young people to urban areas in search of employment and education opportunities contributes to the decline of rural populations. These strongly impact the health workforce distribution.

Although, no direct deficit of medical professionals exists in Spain (the number of medical doctors per 1000 inhabitants is higher than in the majority of other European countries<sup>9</sup>), there is unequal distribution across the

country regions (Autonomous Communities) as well as within the regions.<sup>10</sup> As of June 2021, there were an average of 3.0 practicing physicians per 1000 inhabitants in the Spanish National Health System (NHS). The number varied by region, with Andalusia having the lowest at 2.3 and Asturias having the highest at 3.8. Interestingly, 63% of active doctors were in just five out of the 17 Autonomous Communities.<sup>11</sup> The issue of physicians' unequal distribution is especially visible within primary health care, where the number of family physicians and pediatricians per 1000 inhabitants varies from 0.6 in Balearic Islands to 1.1 in Castilla y León.<sup>12</sup>

The objective of this study was to define medical deserts in Spain as well as map their driving factors and approaches to eliminate or mitigate medical deserts in the Spanish context. The study is part of multinational research work conducted within the project: A Roadmap out of medical deserts into supportive Health Workforce initiatives and policies (ROUTE-HWF) co-funded by the European Union's Health Programme (grant agreement no. 101018379).<sup>13</sup>

## 2 | METHODS

A mixed methods approach was applied following the ROUTE-HWF project's work plan.<sup>13</sup> The activities included: (i) a literature review, (ii) an online survey, (iii) a workshop with national stakeholders, and (iv) a descriptive case study on medical deserts in Spain, involving consultations with key informants. A scoping review of an international literature was conducted to identify and map the empirical research on medical desert characteristics, contributing factors and approaches to mitigate them.<sup>6</sup> The results of the review were used to develop a questionnaire to be distributed among health workforce experts from European countries to gain more insight into the national context of medical deserts. The questionnaire covered three main parts (all focused on a given country and/or region): (i) characteristics of medical deserts and criteria for their definition, (ii) reasons and causes of medical deserts, (iii) approaches to eliminate or mitigate medical deserts. Results of both the review and survey were then used to conduct stakeholders' workshops with health workforce experts in five European countries (partner countries of the ROUTE-HWF project: Spain, The Netherlands, Finland, Croatia and Poland). During the workshops, the participants were i.a. asked to evaluate a list of criteria that can be used to define medical deserts in their country, comment on the medical deserts driving factors, and discuss possible solutions. A purposive sampling was used for choosing both the survey respondents and the workshop participants.

The above activities led to the development of the ROUTE-HWF project's taxonomy to define and measure medical deserts across European countries (Table 1). The taxonomy is based on a set of four objects: two of which address the level of health care demand and two that address health care supply in a given area. These four indications are measured in terms of the relative value for a NUTS-2 (Nomenclature of Territorial Units for Statistics level two) region, being either above or below the country average. Combining the four dichotomous variables, the matrix indicates five types of medical deserts, where at least three of the four objects apply. The taxonomy was applied and tested in descriptive case studies on medical deserts in chosen European countries (including Spain) which were then consulted with country informants.

In the case of Spain, a total number of eight experts filled in the questionnaire between December 2021 and February 2022, while 19 experts participated in the national workshop organised as online event in February 2022. Both the survey respondents and workshop participants represented different backgrounds, including academia, active medical professions and local health authorities. The consultations of the case study on medical desert in Spain took place between April and May 2023. Three country experts received the invitations to participate in consultation, of which two agreed. The country experts were purposively chosen based on their expertise in health workforce issues. They received the case study draft text via email and participated in consecutive online consultations with the case study leading author (KDJ) and the Spanish ROUTE-HWF project representative (AIG). During the meeting, the national experts were asked to comment on the appropriateness of the data presented in the case study text as well as provide any relevant additional information.

TABLE 1 The ROUTHE-HWF project taxonomy, defining five types of medical deserts.

Type of medical desert	POPULATION AND HEALTHCARE DEMAND OBJECTS		AREA AND HEALTHCARE SUPPLY OBJECTS	
	Object 1: Percentage population aged 65 and over	Object 2: Economic resources of the population	Object 3: Travel time to health facilities	Object 4: Population-provider ratio
	<i>The proportion of inhabitants aged 65 and over living in this area, is <b>higher</b> than the proportion of all inhabitants in a country living in this area</i>	<i>The proportion of inhabitants below the poverty line living in this area, is <b>higher</b> than the proportion of all inhabitants in a country living in this area</i>	<i>The percentage of the population that lives within 15 minutes by car from a hospital in this area is <b>smaller</b> than the average percentage at the national level of the country</i>	<i>The proportion of health professionals working in this area, is <b>lower</b> than the proportion of all inhabitants in a country living in this area</i>
↓				
1	X	X	X	X
2	X	X	X	
3	X	X		X
4	X		X	X
5		X	X	X

Source: Deliverable 4.2. Second version of a definition and taxonomy on medical deserts. <https://route-hwf.eu/results-and-publications/>.

### 3 | RESULTS

#### 3.1 | Defining medical deserts in Spain

In Spain, the term “medical desert” has no official definition, but the national experts identified it mainly as rural areas with restricted access to health care. These areas are typically located in sparsely populated and isolated regions. The experts suggested that definitions used in other countries, like France and the United States, can be applied in Spanish circumstances. In these countries, medical deserts are often linked to the uneven distribution of health care providers across regions and a shortage of family doctors, particularly in rural areas.

To define medical deserts in Spain, it is considered appropriate to use a complex set of factors rather than relying on a single indicator. The national experts established the following order of relevance: (i) distance to a health facility; (ii) characteristics of the area; (iii) characteristics of the population; (iv) characteristics of the health workers; (v) size of the population. Distance to a health facility may be related to remote or rural areas, especially if it exceeds 50 km to the nearest hospital. Geographical accessibility, such as in mountainous regions or islands, is also important. Low socioeconomic status may affect the demand for health services and the presence of medical deserts.

When applying the ROUTE-HWF project's taxonomy six autonomous communities met the definition of medical deserts: Extremadura, Valencia, Castilla y León, Castilla-la Mancha, Andalucía and Canarias (Table 2).

## 3.2 | Contributing factors and solutions to medical deserts

Diversity of both factors contributing to medical deserts and solutions applied to eliminate or mitigate them can be identified in Spain. They can be related to demand for or supply of health care services (Table 3).

### 3.2.1 | Factors contributing to medical deserts

In the case of contributing factors, issues related to population ageing, changing health need's structure and lack of social support are intertwined with health system regulatory issues (i.e., inadequate workforce planning and insufficient funding) as well as health workforce's difficult working conditions, especially in rural areas. Population ageing is a global phenomenon. In 2021, the median age of the population in Spain was 44.7 years, which was slightly above the EU-27 average of 44.1 years. In the same year, the share of the population aged 65 years, and more was 19.8% (the ratio value has increased by approx. 3% within the last 10 years).<sup>9</sup> It strongly impacts demand for health services in terms of both the volume of care needed as well as its structure. As one of the national experts pointed out - many primary care consultations for older patients are more related to social care needs (loneliness, dependency, etc.) than to health problems.

The unequal distribution of health workers is partly related to different levels of regulation.<sup>14</sup> The distribution of doctors and nurses is influenced by the planning and redistributive policies of regional health authorities. Since there is a high degree of autonomy among Autonomous Communities' health systems, differences in regional approaches can also be significant. Health workforce planning is based on health maps, which define the "basic health zones" in each Autonomous Community and are used as a basic geographical unit for the organization of the work of primary care teams.<sup>15</sup> However, these maps are not regularly updated, which means that in many cases they do not reflect the true distribution of the workforce or the accessibility to primary care. According to the national Primary Care Information System (SIAP), there are currently 30,301 family physicians in Spain, the vast majority of whom cover population groups of 1000–2000 inhabitants (Table 4). At the country level, only 5.7% family doctors cover population below 500 inhabitants. However, there are regions, in which a much higher share of family doctors has less than 500 patients (28.2% and 18.2% in Castilla y and Aragón respectively).<sup>16</sup>

The distribution of pharmacists depends on public and corporate regulation, while the distribution of dentists is mainly influenced by market forces, leading to even greater variation in their distribution between Autonomous Communities.<sup>14</sup> In 2020, the number of dentists per 1000 population ranged from 0.4 in Ceuta to 1.3 in Madrid.<sup>17</sup>

Budget reduction policies affected the migration of health workers during the financial crisis. There was an increased out-migration of doctors and nurses seeking employment abroad, while the inflow of doctors from other countries, especially Latin America, decreased.<sup>14</sup> In general, the demand for doctors in the Spanish health system is closely linked to the current economic and political situation.<sup>18</sup> Although the number of doctors and nurses has increased over the last decade, temporary contracts have grown, with high workloads and lower salaries than permanent positions, contributing to the growing dissatisfaction among health workers. Economic incentives also play a crucial role in the distribution of the health workforce across the country. For example, Catalonia Region experienced a decrease in registered doctors between 1997 and 2017, as approx. 30% of all doctors trained in Catalonia chose to work in Valencia and the Balearic Islands.<sup>19</sup>

The difficult working conditions for health workers in remote, rural areas (e.g., long hours, large patient lists, solitude, and lack of peers' support) are intertwined with the location choices of the health workforce and strongly contribute to medical desertification in Spain. Family and Community Medicine is often perceived by young

TABLE 2 Application of the ROUTE-HWF project taxonomy in Spanish context.

Region	Demand for health care		Health care supply		
	Proportion of the population aged $\geq 65$	Percentage of population at risk of poverty or social exclusion	Percentage of population within 15 min of a hospital	Doctors per 100,000 inhabitants	Compliance with medical desert criteria
Spain	19.8%	27.8%	71.0%	458.0	Not applicable
Spanish regions					
Andalusia	17.7%	38.7% <sup>a</sup>	70.6% <sup>a</sup>	368.0 <sup>a</sup>	Yes
Aragon	21.8% <sup>a</sup>	20.0%	64.8% <sup>a</sup>	576.3	No
Principality of Asturias	26.5% <sup>a</sup>	26.3%	84.6%	418.1 <sup>a</sup>	No
Balearic Islands	16.2%	22.4%	79.2%	490.0	No
Canary Islands	17.0%	37.8% <sup>a</sup>	61.5% <sup>a</sup>	447.0 <sup>a</sup>	Yes
Cantabria	22.7% <sup>a</sup>	21.4%	76.1%	595.3	No
Castilla y León	25.7% <sup>a</sup>	23.1%	61.6% <sup>a</sup>	438.6 <sup>a</sup>	Yes
Castilla-la Mancha	19.0%	32.5%*	58.9% <sup>a</sup>	277.0 <sup>a</sup>	Yes
Catalonia	19.3%	22.3%	84.4%	468.7	No
Extremadura	21.1% <sup>a</sup>	38.7% <sup>a</sup>	54.6% <sup>a</sup>	370.4 <sup>a</sup>	Yes
Galicia	25.7% <sup>a</sup>	25.2%	60.7% <sup>a</sup>	463.7	No
La Rioja	21.4% <sup>a</sup>	21.3%	84.8%	327.0 <sup>a</sup>	No
Comunidad de Madrid	18.1%	21.6%	96.9%	569.6	No
Region of Murcia	16.1%	33.8% <sup>a</sup>	81.4%	423.1 <sup>a</sup>	No
Autonomous community of Navarre	20.1% <sup>a</sup>	14.7%	81.8%	640.7	No
Basque Country	23.1% <sup>a</sup>	16.0%	90.6%	560.4	No
Valencian Community	19.9% <sup>a</sup>	30.6% <sup>a</sup>	83.7%	450.7 <sup>a</sup>	Yes
City of Ceuta	12.8%	43.0% <sup>a</sup>	94.2%	871.7/	No
City of Melilla	11.3%	35.2% <sup>a</sup>	99.7%	Not applicable	No

<sup>a</sup>More unfavourable value than the average for the country.

Source: Eurostat 2023/Ministry of Health 2023.

professionals as difficult and unattractive choice of specialisation. In 2018 only 1 out of 10 chose that field. In 2022 approx. 8.5% of post in Family and Community Medicine remained vacant.<sup>20</sup> The lack of adequate planning has led to an imbalance in the specialties, with excess places in some and shortages in others.<sup>21</sup> Young people prefer

TABLE 3 Matrix of contributing factors and solutions to medical deserts in Spain.

	Demand for health care	Supply of health care
Factors contributing to medical deserts	<ul style="list-style-type: none"> <li>• Population ageing</li> <li>• Changing health needs structure</li> <li>• Lack of social/community support</li> <li>• Depopulation</li> </ul>	<ul style="list-style-type: none"> <li>• Inadequate health workforce planning mechanisms</li> <li>• Insufficient funding</li> <li>• Lack of investments in primary care</li> <li>• Difficult working conditions of health professionals</li> <li>• Poor geographical accessibility</li> <li>• Health workforce ageing</li> </ul>
Solutions applied to eliminate or mitigate medical deserts	<ul style="list-style-type: none"> <li>• Innovative models of care focusing on managing patients' demand</li> <li>• Programs focused on integrating social and health care</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing number of training places for medical professionals (at both under- and postgraduate level)</li> <li>• Innovative models of care focussing on improving efficiency and access to care</li> <li>• Policies aimed at encouraging medical professionals to work in rural areas (incl. Infra-structural support)</li> </ul>

Source: authors own compilation.

specialties with better salaries and job prospects in large cities. Between 11,000 and 15,000 doctors work in rural areas, and it is estimated that about 28% of them will retire in 2027.<sup>22</sup> Consequently, in case of many retired doctors, no young professional trained and willing to take their place will be available. A survey revealed that many rural doctors travel more than 50 km a day to work, bearing the costs of transport to and from rural areas.<sup>22</sup> Some Autonomous Communities have implemented a remuneration system based on geographic dispersion, but if they live outside the working area, doctors must pay transport costs. In general, labour characteristics, difficult geographical conditions (isolated mountainous areas) and lack of adequate infrastructure (Internet access or public transport services) contribute to the existence of medical deserts in Spain.

### 3.2.2 | Solutions applied to eliminate or mitigate medical deserts

Diverse policies aimed at improving the health workforce situation have been implemented in Spain at both central and regional levels. Although they were not always directly focused on medical deserts, they have aimed at limiting medical deserts or at least mitigating the factors contributing to their existence. These policies focused on both, managing the demand for health care services as well as improving supply of health care provision, with the latter being more intensified. Some initiatives addressed both dimensions simultaneously (Table 3). The specific policies met different implementation obstacles, thus their success in mitigating medical deserts might also vary.

The Ministry of Health has gradually increased the number of graduate and specialised medical/nursing training places. However, these increases have not been properly adjusted to address the specific specialties deficit nor individual needs of the Autonomous Communities. For example, the priority access to primary care nursing posts for specialists in Family and Community Nursing has not been guaranteed. At the regional level, new models of care have been promoted to improve quality and efficiency, as well as to manage patient demand. These focused on (i) implementing multidisciplinary primary care teams accompanied by skill-mix and task shifting activities; (ii) introducing coordinated/integrated care models, including disease or and case management projects; and (iii) introducing diverse digital health solutions.

There are several examples of successful implementation of an advanced nursing model. In Navarra region it was introduced for both low complexity problems and chronic disease management in community settings.<sup>23</sup>

TABLE 4 Share (%) of the number of family doctors per population groups across Autonomous Communities.

Region	Total number	Share of the number of family doctors per population groups				
		<500	501-1000	1001-1500	1501-2000	>2000
Spain	30,301	5.67%	9.44%	49.78%	32.84%	2.27%
Spanish regions						
Andalusia	5121	1.21%	8.59%	45.38%	42.43%	2.38%
Aragon	989	18.20%	14.16%	31.45%	35.89%	0.30%
Asturias	607	3.79%	15.98%	42.17%	38.06%	0.00%
Balearic Islands	596	0.00%	0.50%	10.07%	77.52%	11.91%
Canary Islands	1264	1.74%	3.64%	48.58%	43.75%	2.29%
Cantabria	367	1.63%	6.81%	61.85%	29.70%	0.00%
Castilla y León	2257	28.22%	23.13%	39.70%	8.95%	0.00%
Castilla-la Mancha	1375	13.02%	15.93%	28.15%	42.11%	0.80%
Catalonia	4930	4.52%	7.59%	48.92%	35.76%	3.20%
Extremadura	821	11.08%	27.53%	37.88%	23.39%	0.12%
Galicia	1923	2.29%	13.47%	73.89%	10.35%	0.00%
La Rioja	217	7.37%	12.44%	43.32%	36.87%	0.00%
Comunidad de Madrid	3815	2.41%	2.94%	40.81%	47.08%	6.76%
Region of Murcia	941	0.11%	3.61%	77.26%	19.02%	0.00%
Navarre	431	4.18%	14.39%	53.60%	27.84%	0.00%
Basque Country	1416	1.69%	3.39%	69.49%	23.02%	2.40%
Valencia	3159	3.13%	7.15%	71.73%	17.92%	0.06%
City of Ceuta	72	0.00%	0.00%	8.33%	91.67%	0.00%
City of Melilla						

Source: SIAP 2023.

Advance practice nurses are part of multidisciplinary teams. The model emphasises the importance of empowering patients and promoting self-care. Another example is the model of Acute Demand Nursing Management, which has been progressively developed,<sup>24-26</sup> has an established regulatory framework in Catalonia<sup>27</sup> and has been extended to many Autonomous Communities. Also, intermediate solutions implemented in Madrid, Galicia, and Catalonia, involving advanced nursing practices in remote areas without medical professionals, represent a promising strategy to address medical deserts in Spain.<sup>28-30</sup> These models require strong scientific evidence to support their long-term effectiveness.

Among, diverse examples of digital solutions implementation, the Galician telemonitoring programme for primary care patients have been recognized as best practice on an international scale.<sup>31</sup> The telemonitoring project was piloted in 2017 in Santa Comba, a rural population with a high percentage of elderly residents. The positive outcomes and acceptance led to its expansion throughout all healthcare centres in Galicia by 2020. The system utilises the existing electronic medical record infrastructure and allows healthcare professionals to remotely monitor patients' health status. Patients can enter their health data using their smartphones, ensuring ease of use and accessibility. The system also supports secure communication between patients and healthcare providers, including asynchronous messaging, phone calls, and video consultations. Another example is the tele-dermatology

model, implemented in several Autonomous Regions, including for example, in Castilla y León since 2020.<sup>32</sup> Family doctors can request online consultation with the dermatologist, send photos of dermatological lesions, and the dermatologist decides on the referral or provides diagnostic or therapeutic guidance to the family doctor.

Initiatives focused on strengthening community participation and better integration between health and social care can also be identified in Spain. For example, The Spanish Society of Family and Community Medicine (semFYC) promotes the Programme of Primary Care Community Activities - PACAP.<sup>33</sup> It was launched in 1995 and implemented in several regions (Aragon, Asturias, Catalonia, Navarra, Basque Country and Valencia). The programme promotes a broad spectrum of community activities in the field of primary health care, including those related to communities' social well-being and enhancing the capacity of people and groups to address their problems and needs.

Finally, as the major challenge in Spain is accessibility to medical care in rural areas there are several examples of initiatives focussing on encouraging medical staff to work in rural and other sparsely populated areas. These involve local training for medical students in rural areas; investing in rural health centres infrastructure; building local strategic alliances between neighbouring health centres aimed at sharing limited resources.

## 4 | DISCUSSION

Our study showed that medical deserts in Spain are mostly identified as rural, often isolated and/or depopulated areas with limited access to health care. However, to accurately identify and monitor medical deserts in Spain, availability of reliable and regularly updated local data is crucial. These should include not only the current capacities, but also projection of both future health care needs and health care services supply, considering related demographic, geographical and structural variables. The identified factors contributing to medical deserts and solutions applied to mitigate them can be classified into two broad categories: those related to demand or supply side of health care provision. For both factors and solutions, more national data, analyses and/or initiatives seem to be focused on the health care supply dimension.

The identified solutions were implemented at both national and regional levels. They can be broadly categorized into those focused on education (at both under and post-graduate level), introducing innovative models of care and providing professional and infrastructural support. The Spanish experiences are therefore in line with those from other Western countries, as indicated by Flinterman et al. (2023).<sup>6</sup> Actions focused on attracting and retaining physicians to work in rural and/or remote areas are urgently needed in Spain. A recent analysis, based on European countries experiences comparison showed that these should cover various stages of professional life and aim at improving medical workers' work-life balance and reducing their professional isolation.<sup>34</sup>

Our study indicates, that in the Spanish context, more attention should be given to managing the demand for health services. This could include: implementing a network approach to continuous, people-centered care and improving data management systems. Strengthening strategic multi-sectoral partnerships, especially in the face of an ageing population and changing health needs, is important. Integrated health and social care models have been promoted for many years now as an effective approach to improve access to care and limit unnecessary care (e.g., the need for hospital readmissions), especially for the older population.<sup>35-37</sup>

Due to the general characteristics of the Spanish health care system - existence of separate regional health systems per each Autonomous Community, a strongly recommended action is launching a national knowledge translation platform (KTP) focused on identifying, evaluating and sharing best practices in limiting medical deserts across different regions. Such platforms can take a form of organization or network supporting evidence-informed decision-making - that is making health policy decisions "*informed by the best available evidence from research, as well as other factors such as context, public opinion, equity, feasibility of implementation, affordability, sustainability, and acceptability to stakeholders*"<sup>38</sup> (WHO 2022). Different regions and communities across Spain can learn from each other when the examples of best practices are identified and strongly disseminated. The involvement of major

stakeholders, including local authorities seems especially important in the Spanish context. Without strong and continuous political support, any policy aimed at mitigating medical deserts can face planning and implementation obstacles. Diverse consensus building actions can be taken to involve multiple stakeholders and ensure better applicability and sustainability of health policies.<sup>39</sup>

The main limitation of our work is the is the potential impact of arbitrary and/or subjective factors while gathering the data/opinions from the national stakeholders/key informants. Yet, this was mitigated by involving a diversified group of experts and referring to relevant literature/national data sources whenever available. Also, we were not able to provide a more detailed local data analysis across the six Autonomous Communities indicated as meeting the criteria of medical deserts. That would require availability of updated and comparable micro data. Regardless this limitation, we were able to identify and map factors contributing to medical deserts and solutions applied to mitigate them. Our results provide numerous implications for further research (e.g., on evaluation of specific solutions on access to care and population health outcomes) and policy actions (e.g., on building inter-sectoral collaborations and multi-stakeholders approach, developing local data systems).

## 5 | CONCLUSIONS

The ROUTE-HWF project's taxonomy allows to identify and define medical deserts across different European regions. Yet, the proposed framework of four objects, related to both demand for and supply of health care, can be also applied at lower, local levels to steer policy actions aimed at mitigating factors contributing to medical deserts and supporting adequate solutions. In Spain, medical deserts are mostly rural, often isolated and/or depopulated areas with limited access to health care. They are driven by factors related to both health care demand and supply dimensions. There is no single, individual solution to medical deserts that can be applied and be sustainable. Instead, a comprehensive and multidimensional approach must be applied. Policies are needed to address: the medical staff education (more training in family and community medicine, intensive cooperation between medical schools and rural health centres) and planning system (projections of future needs and capacities), as well as working conditions (better infrastructure, peers support, local strategic alliances, more flexible working arrangements) and more intersectoral approach to the population health management (e.g., community involvement, patients' empowering).

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## CONFLICT OF INTEREST STATEMENT

The authors declared that there is no potential conflict of interest.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in ROUTE-HWF at <https://route-hwf.eu>.

## ETHICS STATEMENT

Not applicable.

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