



D4.3 Final version of definition and taxonomy on medical deserts

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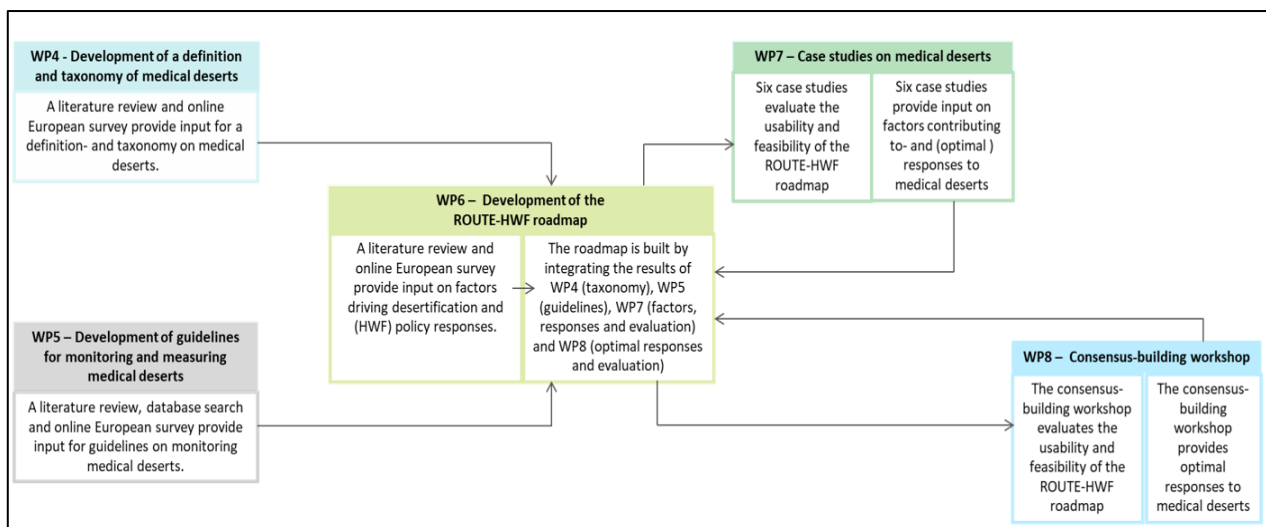
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1. Introduction

The aim of this third deliverable D4.3 of Work Package 4 is to provide the final version of a definition and taxonomy on medical deserts as the conceptual base of the ROUTE-HWF project. The definition and taxonomy are designed to help national and regional authorities, stakeholders, and health professionals to gain a better understanding of (1) the origin and development of medical deserts, (2) how to measure and monitor them, and (3) how to investigate and evaluate the effects of health workforce (HWF) policy measures to mitigate or eliminate medical deserts.

Together with the measuring and monitoring guidelines (as developed in Work Package 5), the definition and taxonomy feeds into the creation of the ‘Roadmap out of medical deserts’ that is created in Work Package 6. The interplay between the definition and taxonomy, measuring and monitoring guidelines and the ROUTE-HWF roadmap is presented in Figure 1 below, along with the corresponding WPs and methods of data collection and stakeholder engagement.

Figure 1. The interplay between the ROUTE Work Packages on the definition and taxonomy, measuring and monitoring guidelines, that feed the ROUTE-HWF roadmap on medical deserts



This deliverable D4.3 will describe the third and final version of the definition and taxonomy, based on six country case studies (see deliverable D7.1) and the ROUTE-HWF experts workshop organized in Zagreb on November 30 and December 2023 (see deliverable D8.1).

By connecting the definition and taxonomy of medical deserts with the measuring and monitoring guidelines (provided in deliverables D5.1 and D5.2), the project is paving the way towards creating the ROUTE-HWF roadmap out of medical deserts (see deliverables D6.1 and D6.2). The ROUTE-HWF roadmap will support EU Member States *in a tailored manner*, i.e. supporting them to design and implement specific policies related to *specific types of medical deserts*. It will provide a rationale for public authorities and health professionals at national and subnational levels to apply an *optimal mix* of HWF policies to their particular medical deserts, while taking the context-sensitivity of these policies and medical deserts into account. The final goal is to mitigate the effects of medical deserts and dissolving these – and hence to improve access to healthcare as well as quality of healthcare for citizens living in these areas, now and in the future.

2. Approach and methods

As presented in deliverables D4.1 and D4.2, the theoretical base of our ROUTE-HWF taxonomy development is the iterative method as proposed by Nickerson et al. (Nickerson, Varshney, & Muntermann, 2013). According to Nickerson et al., a taxonomy should comply the following four basic rules:

- It should be concise. It should contain a limited number of dimensions or a limited number of characteristics in each dimension, because an extensive classification scheme with many dimensions and many characteristics would be difficult to comprehend and difficult to apply.
- It should be sufficiently inclusive. It should contain enough dimensions and characteristics to be of interest. For example, a taxonomy with only one dimension and two characteristics within that dimension would not be very interesting. This attribute can conflict with the conciseness attribute.
- It should be comprehensive. It should provide for classification of all current objects within the domain under consideration.
- It should be extendible. It should allow for additional dimensions and new characteristics within a dimension when new types of objects appear.

To achieve this, Nickerson et al. formulated eight steps that are embedded in three consecutive phases:

Phase 1: The empirical deductive approach

1. Examine subset of objects.
2. Identify general distinguishing characteristics of objects.
3. Group characteristics into dimensions to create first taxonomy.

Phase 2: The deductive empirical approach

4. Conceptualize new characteristics and dimensions.
5. Examine objects for new characteristics and dimensions.
6. Revise taxonomy to create next version.

Phase 3: The use of the taxonomy

7. Identify missing objects in taxonomy.
8. Design new objects

The result of the first phase (steps 1-3) are reported in the first version of the definition and taxonomy (deliverable D4.1), while the executing of second phase (i.e. steps 4-6) are reported in deliverable D4.2. Here, the execution of steps seven and eight (phase 3) will be reported in this report as deliverable D4.3.

Below we will subsequently describe the execution of step 7 and 8 following Nickerson's et al. method. We build upon the first and second version of the ROUTE-HWF taxonomy conceptually and empirically. While the first two versions were based on literature reviews, a cross-national survey and six national stakeholder workshops, this third and final taxonomy is based on (1) the six country case studies (see deliverable D7.1) and the ROUTE-HWF expert workshop (see deliverable D8.1).

3. Towards the third and final definition and taxonomy on medical deserts

Executing step 7: Identify missing objects in taxonomy

To prepare this step, we first recall the construction of our first and second version of the ROUTE-HWF taxonomy that were developed by the first six steps of the Nickerson's et al. method (see the previous chapter). Versions one and two were based on 4 key characteristics and factors that basically drive the process of desertification that were derived from literature reviews combined with expert consultations (see the D4.1 and D4.2 report). The 4 characteristics/factors are defined as Objects of our taxonomy, divided in:

- Two Objects that drive the demand for health services in European regions:
 1. One addressing the existing volumes of healthcare demand in a region (with aging as a key driver or indicator).
 2. One addressing the existing levels of healthcare demand (with poor economic resources of the population as a key driver or indicator).
- Two other Objects that drive the supply for health services in European regions:
 3. One addressing the existing volumes of healthcare supply (with shortages of healthcare workers as a key driver or indicator).
 4. One addressing the existing levels of healthcare supply (with limited accessibility or proximity of health services as a key driver or indicator).

In the ROUTE-HWF taxonomy we first assume that the two Objects defined at both the demand and supply side ('volume' and 'level') are interconnected, and at both sides can be seen as a 'multiplier' relationship that drive the process of desertification in regions. Secondly, we assume that the two demand-side and supply-side drivers are cross-connected as well. Therefore, all four Objects need to be considered *in conjunction*, to subsequently identify and understand the *different types* of medical desert regions in European countries because of *different combinations* of desertification processes.

Based on these assumptions, every region within a country can be characterized all four, three, two, one or none of the 4 Objects – indicated by their relative scores compared to the national average. For instance: a region can deal with (a) aging and (b) shortages of healthcare workers, another region can deal with (a) aging, (b) poor economic resources and (c) shortages of healthcare workers, while a third region does not deal with any of the four factors of desertification. In theory, combining the four Objects in terms of 'apply'/'not apply' (or: 'true'/'false') leads to 16 unique combinations by which a region can be characterized. This classification of regions was the base of the first version of the ROUTE-HWF taxonomy (see D4.1).

In developing the second version of the ROUTE-HWF taxonomy (see D4.2), we additionally applied the proposition that *at least three of the four Objects* needs to apply, to focus our taxonomy on the most relevant types of medical deserts. This proposition was based on two common notions that were derived from the national stakeholder workshops that were held in six countries of the ROUTE-HWF consortium (i.e. The Netherlands, Croatia, Poland, Spain, and Finland):

1. Policy actions and priorities regarding desertification are merely at stake in regions that are underserved due to a *cumulation* of desertification drivers, where demand *and* supply drivers interact.
2. The urgency of finding tailored solutions and comparing European regions as medical deserts is particularly felt when focusing on areas that are (and will be) *specifically at risk*.

As a result, with the second version of the ROUTE-HWF taxonomy each medical desert type is defined by at least one Object regarding the demand *and* supply side, of the (regional) health system. This complies best

with the acknowledgment of the inseparable interplay between the demand and supply drivers of desertification (a key finding from the national stakeholder workshops held in all countries of the consortium partners). The five types of medical deserts that are consequently defined by the second version of the ROUTE-WHF taxonomy are shown in figure 2.

Figure 2. Second version of the ROUTE-HWF taxonomy to define and classify 5 ‘main’ different types medical deserts by four objects/dimensions (‘x’ in the cells indicate that the object is ‘true’ or applicable for the specific type of medical desert area/region)

	DEMAND FOR HEALTH SERVICES – POPULATION AND HEALTHCARE DEMAND OBJECTS		SUPPLY OF HEALTH SERVICES – AREA AND HEALTHCARE SUPPLY OBJECTS	
	Object 1: Aging of the population	Object 2: poor economic resources of the population	Object 3: Shortages of health workers	Object 4: limited accessibility and proximity of health services
Type of medical desert	<i>The proportion of inhabitants aged 65 and over living in this area, is <u>higher</u> than this proportion at the country level</i>	<i>The proportion of inhabitants below the poverty line living in this area, is <u>higher</u> than this proportion at the country level</i>	<i>The health professional-to-population ratio in this area, is <u>lower</u> than this ratio at the country level</i>	<i>The average travel time by public transport to the nearest public healthcare facility in this area is <u>longer</u> than the average travel time at the country level</i>
↓				
1	x	x	X	x
2	x	x	x	
3	x	x		x
4	x		x	x
5		x	x	x

To execute the next step 7 of Nickerson’s et al. method – to identify missing Objects in taxonomy – we build upon the results of two actions:

- the six case studies conducted in this ROUTE-HWF project (see D7.1), that explored the similarities and differences of the five medical desert types for six countries (being Poland, Croatia, the Netherlands, Spain, Germany, and Ireland)
- the ROUTE-HWF expert workshop held in November/December 2023 in Zagreb (see D8.1), where 96 participants from 20 different European countries discussed the ROUTE-HWF project, focussing on the potential policy solutions to mitigate the key problems of medical desert areas in Europe.

From both sets of results, it first became clear that the 4 Objects of our taxonomy are both specific and concise to identify areas as medical deserts – given that their combination cannot result into different types of medical desert areas, confirming the logic of the taxonomy. Hence no Objects are missing in the taxonomy, but another common conclusion was that one Object can be considered as essential and therefore cannot be excluded from any type of medical deserts: the shortages of health workers. Shortages of health workers or professionals (merely measured and monitored by the health professional-to-population ratio in an area; see Figure 2) are acknowledged as the exclusive reason for defining medical deserts mainly an “underserved area”. This also complies with the common definition of medical deserts we found in our literature reviews (Bes et al., 2023; Flinterman et al., 2023; Seils et al., 2023).

Executing step 8: Design new objects

Based on the arguments presented in the previous chapter, the last step towards the final ROUTE-HWF taxonomy is to limit the five types of medical deserts to four, excluding ‘type 3’ from the second version (see Figure 2 above) because in this type of the Object shortages of health workers (or: a lower health professional-to-population ratio in an area) is not applicable. Figure 3 depicts the third and final ROUTE-HWF taxonomy, defining and classifying the four ‘main’ different types of medical deserts that all include a shortages of health workers as an Object that applies.

Figure 3. The third and final version of the ROUTE-HWF taxonomy, defining and classifying four ‘main’ different types of medical deserts by four objects/dimensions (‘x’ in the cells indicate that the object is ‘true’ or applicable for the specific type of medical desert area/region)

	DEMAND FOR HEALTH SERVICES – POPULATION AND HEALTHCARE DEMAND OBJECTS		SUPPLY OF HEALTH SERVICES – AREA AND HEALTHCARE SUPPLY OBJECTS	
	Object 1: Aging of the population	Object 2: poor economic resources of the population	Object 3: Shortages of health workers	Object 4: limited accessibility and proximity of health services
<i>Type of medical desert</i>	<i>The proportion of inhabitants aged 65 and over living in this area, is <u>higher</u> than this proportion at the country level</i>	<i>The proportion of inhabitants below the poverty line living in this area, is <u>higher</u> than this proportion at the country level</i>	<i>The health professional-to-population ratio in this area, is <u>lower</u> than this ratio at the country level</i>	<i>The average travel time by public transport to the nearest public healthcare facility in this area is <u>longer</u> than the average travel time at the country level</i>
↓				
1	x	x	X	x
2	x	x	x	
3	x		x	x
4		x	x	x

4. Conclusion: The final version of the ROUTE-HWF taxonomy on medical deserts

In this deliverable, the development of the third and final version of the ROUTE-HWF taxonomy is described, by executing the last two steps following the approach of Nickerson et al. First, we recalled the conceptual model behind the first and second version of the taxonomy, its four main Objects and their operationalization. This conceptual model is based by the approach that medical deserts share the common drivers at both the demand and supply side of their (regional) healthcare system, and that their interplay is critical to understand desertification as a process. At the same time, the conceptual model determines to distinct different medical deserts areas that can appear in theory and practice, as not all drivers can or should be in place while defining regions as such. While the first version defined 15 (unique) types of medical deserts by combining the four dichotomous Objects, the second version of the ROUTE-HWF taxonomy was developed as a more concise yet comprehensive and applicable taxonomy defining 5 distinctive types of medical deserts.

The third and final version of the ROUTE-HWF taxonomy further restricts the previous selection of medical desert types from 5 to 4. We remained the approach that each of the four Objects should be considered *as dichotomous variables* resulting in a *limited number of unique combinations* that include at least three of the four Objects. This way, the types of medical deserts in scope are characterized by at least one Object at the supply side, and one Object at the demand side of the regional healthcare system. But, in addition, we argued that one essential (and therefore non-excludable) Object is the shortages of health workers. Shortages of health workers or professionals (that can be measured and monitored by health professional-to-population ratios in an area), was acknowledged as a necessary element for defining medical deserts as ‘underserved areas’ by the experts consulted in the six case studies (see D7.1) and the expert workshop (see D8.1) within the ROUTE-HWF project. Another argument is that the shortages of health workers show to be always present in the common definitions of medical deserts, and all solutions to mitigate these areas at least address policy measures to recruit and retain health professionals to and in underserved areas. Therefore, mitigating or managing the process of desertification implies structural investments in HWF staffing, to meet the specific healthcare needs of the underserved area or type of medical desert.

This final version of the ROUTE-HWF taxonomy directly relates to two other final deliverables of the ROUTE-HWF project, being the third version of the measuring and monitoring guidelines (provided in deliverable D5.3) and the likewise the third version of the ROUTE-HWF Roadmap ‘out of medical deserts’ (see deliverable D6.3). As a ‘package’, the taxonomy, its monitoring and measuring, and the Roadmap, support countries in identifying their specific types of medical deserts and helping them to exchange tailored solutions for the desertification processes in different types of underserved areas. This mutual learning between countries is an essential part of the ROUTE-HWF Roadmap, motivating them to continuously develop specific policy solutions for each type of medical desert.

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