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Medical deserts in high-income countries – A study on contributing factors and mitigating approaches with an in-depth qualitative focus into the perspective of German health professionals

Master thesis

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List of Abbreviations

DKG	German Hospital Federation
G-BA	Federal joint committee (Gemeinsamer Bundesausschuss)
GKV	Statutory health insurance
GP	General practitioners
HWF	Healthcare workforce
HCW	Healthcare worker
HIF	Statututory health insurance funds
KBV	National Association of Statutory Health Insurance Physicians
KZBV	National Dental Association
KV	Association of Statutory Health Insurance Physicians
MD	Medical desert
SCR	Scoping Review

Abstract

Introduction

Providing universal health coverage for all citizens is a top priority for many European and other high-income countries. However, many of them face significant challenges to do so. Medical deserts therefore still constitute a growing concern that needs to be addressed. As contributing factors to medical areas can vary across different countries, a national perspective when addressing the issue of it is elementary. This work provides insight into factors and approaches relevant to medical deserts in Germany.

Methods

A qualitative design was used, conducting 4 expert interviews. Experts on medical deserts in Germany were selected via purposive sampling. Data analysis was carried out using qualitative content analysis.

Results

Identified contributing factors were categorized into three main categories: Lack of new ambulant clinics and services, the closure of healthcare providing services and the lack of attending capacity are a direct cause auf medical desert. Factors causing these are the healthcare workforce (HWF) shortage, the saturation of services, a non-adequate use of resources and legislation and financial aspects. Most identified approaches are summarized under regional focussed & patient orientated approaches. Further approaches consist in: professional support & infrastructure, planning & monitoring of the HWFs and populations needs and rural undergraduate training.

Conclusion

The healthcare supply situation is shaped by the German history, its governmental structure, and the healthcare system. Medical deserts result from a complex interplay of factors, which need to be carefully analysed when wanting to effectively address them. A regional focus, the increase of health literacy in the population and the consideration of societal changes are essential here.

Einleitung

Die Bereitstellung einer umfassenden Gesundheitsversorgung für alle Bürger hat für viele europäische- und andere Industrieländer oberste Priorität. Viele dieser Länder stehen jedoch vor großen Herausforderungen, um dies zu erreichen. Medizinisch unterversorgte Regionen (medical deserts) stellen daher nach wie vor ein wachsendes Problem dar. Da Faktoren, die zur Entstehung medizinischer Versorgungslücken beitragen, von Land zu Land unterschiedlich sein können, ist eine nationale Perspektive bei der Bewältigung elementar. Diese Arbeit gibt einen Einblick in Faktoren und Ansätze, die für medical deserts in Deutschland relevant sind.

Methoden

Ein qualitatives Design wurde verwendet und 4 Experteninterviews durchgeführt. Die Auswahl der Experten für medical deserts in Deutschland folgte der purposiven Auswahltechnik. Die Datenanalyse erfolgte mittels qualitativer Inhaltsanalyse.

Ergebnisse

Die identifizierten Einflussfaktoren wurden in drei Hauptkategorien eingeteilt: Der Mangel an neuen ambulanten Kliniken und Diensten, die Schließung von Gesundheitsdiensten und der Mangel an Betreuungskapazitäten. Diese sind eine direkte Ursache für medical deserts. Grund für die Entstehung sind der Mangel an Gesundheitspersonal, die Überlastung der Dienste, eine Fehl-Nutzung der Ressourcen sowie gesetzliche und finanzielle Aspekte. Die Mehrheit der Lösungsansätze wurde unter regional fokussierten und patientenorientierten Ansätzen zusammengefasst. Weitere Ansätze bestehen in: professioneller Unterstützung und Infrastruktur, Planung des Bedarfs an Gesundheitspersonal und Bedürfnissen der Bevölkerung sowie in der Ausbildung in ländlichen Gebieten.

Schlussfolgerung

Die Gesundheitsversorgungssituation ist geprägt von der Geschichte Deutschlands, der Regierungsstruktur und dem Gesundheitssystem. Medical deserts sind das Ergebnis eines komplexen Zusammenspiels von Faktoren, welche sorgfältig analysiert werden müssen, um das Problem wirksam anzugehen. Ein regionaler Fokus, die Steigerung der Gesundheitskompetenz in der Bevölkerung und die Berücksichtigung gesellschaftlicher Veränderungen sind hierbei unerlässlich.

1 Introduction

Providing universal health coverage for all citizens is a top priority for many European and other high-income countries (World Health Organization, 2016). However, many high-income countries face significant challenges in delivering adequate healthcare to their societies. Numerous previous studies have reported on some commonly recognized challenges across these countries. These are an aging population (OECD, 2020a), socioeconomic disparities (McMaughan et al., 2020), fiscal pressure not allowing to increase allocated resources to the health sector (OECD, 2020a), and a shortage and maldistribution of healthcare professionals (Ono et al., 2014; van den Bussche, 2019; World Health Organization, 2016). These challenges have been further exacerbated by the COVID-19 pandemic that started spreading around the world in 2019 (Abrams et al., 2022; OECD, 2019). If these challenges are not properly addressed, they can lead to an undersupply of healthcare, creating what is known as a "medical desert." This phenomenon is still a growing concern as it reduces the effectiveness of healthcare systems (Wong, 2000) and contributes to poorer health outcomes in populations. The growing population of older adults is particularly affected by the lack of access to healthcare, as the risk of non-communicable diseases increases with age (McMaughan et al., 2020). This should be paid special attention to because, in the EU, over 54% of the population aged 65 and older is affected by at least one chronic disease (OECD, 2019). Moreover, patients with long-term conditions also depend on timely access to good-quality healthcare which if not available, severely affects their health outcomes (European Patients Forum, 2016). Many countries try to apply various approaches to mitigate these challenges and address the issue of medical deserts (MDs), but often without a strong rationale underlying their choice of policies and measures (Ono et al., 2014). While research on MDs, specifically on the issue of how to improve the healthcare workforce (HWF) shortage, has primarily focused on geographically large countries like Australia, New Zealand, and North America, there are also studies on this issue in European countries, albeit fewer in number. This shows the importance of the issue of MDs in such geographically large countries (Flinterman et al., 2023).

However, also geographically smaller countries are affected by MDs. Taking Germany as an example, a current issue is the geographic distribution of medical doctors which varies across federal states. Especially with a lower doctor density in rural areas compared to the European average. Various approaches have been implemented to improve access to medical care, such as increasing the number of doctors in rural areas, incentivizing medical students to commit to working in rural areas after graduation, and implementing needs-based planning (Blümel et al., 2020). Additionally, mobile healthcare offices like patients' buses (Schreiber, 2018) and

local healthcare centres have been established to address the issue (OptiMedis AG, 2022).
A key aspect to understand the phenomenon of MDs and to tackle the issues that it brings, is a clear definition of those. However, there exist no uniform or ultimate definition of m MDs. But they are known by a multitude of names that can refer to a lack of adequate healthcare in general or in a specific field. Depending on the applied context, it can refer to different types of MDs, describing different characteristics of them and showing different factors contributing to their occurrence. The contexts for application could be a country, a healthcare profession, a type of healthcare service or a specific disease. Further, the applied context is automatically coming with a smaller or wider focus of the definition (Chevillard et al., 2018). Having a more holistic perspective as given by the definition of the World Health Organization, MDs are defined as underserved areas where populations have limited access to qualified health-care providers and quality health-care services (WHO, 2010). This definition takes into account the geographical aspect of the problem and highlights the lack of access to essential healthcare resources. When narrowing the perspective to a specific field, for example medical doctors, the term "medical desert" can refer to a scarcity of general practitioners (GPs) in a particular territory, the difficulties of retaining doctors or attracting new ones, or finding replacement for the ones retiring. It can also refer to long waiting times and/or long distances to access healthcare services (Chevillard et al., 2018). Even within Germany, different definitions of MDs exist, provided by various governmental organizations or federal states. This variation highlights the complexity of the issue and the need for a comprehensive understanding of healthcare disparities in different regions.
In this work, the term medical desert refers to the disparity in healthcare demand and supply, both in rural and urban areas. This definition is based on the taxonomy provided by (ROUTE-HWF Team, 2023), which will be further described in the background chapter 2.1. It encompasses not only doctors but also all healthcare professionals who contribute to the overall population health. Besides, the focus is not on a specific type of healthcare service, if not the availability of services in general. By adopting this more general definition, a comprehensive assessment of healthcare disparities can be achieved, ensuring that no important factors are accidentally missed. Moreover, the specific focus on Germany in the expert interviews, gives the definition a context.

1.1 My role and perspective

During the third semester of the master studies *Health Science,* I did a six-month internship at the Avedis Donabedian research institute in Barcelona (Fundación Avedis Donabedian, 2016). Afterwards, I kept working for one year in the same institute. The main project in which I was working in for these one and a half years was called “A **R**oadmap **OUT** of m**E**dical deserts into

supportive **H**ealth **W**ork**f**orce initiatives and policies (ROUTE-HWF)" (ROUTE-HWF Team, 2023). It is an international project, co-funded by the Health Programme of the European Union with five different partners from five different countries working together. It aims to help EU Member States to improve timely access to high-quality healthcare across all EU regions, thus reducing disparities in population health. One part of the project and my main task during the internship was to conduct a scoping review (SCR) on the topic of medical underserved areas, so called MDs. The purpose of the SCR was to systematically map the research done in this area and provide an overview of the different definitions and characteristics of MDs as well as to identify any existing contributing factors and approaches to mitigate or eliminate them. The results of the SCR on MDs lead to the question if the identified factors and approaches differ across countries and occupations. Such a comparison was done by me based on the database of the SCR (Seils et al., 2023). Additionally, to the SCR a qualitative study in 33 European countries on the same topic as the SCR was conducted. The gained information served to develop a taxonomy for MDs. Further activities during my work were five national stakeholder workshops to discuss and evaluate the developed taxonomy and six in-depth case studies to further assess the applicability and usability of the taxonomy. All these activities provided me with deep knowledge and expertise in the area of MDs. Besides, during the monthly meetings with the project-team we had intense talks about the current project results, impacted by different countries perspectives. All this helped me to understand the complex topic of MDs as a concept itself but also made me see the need for having a national focus when wanting to effectively address the issue of MDs in a country. However, the whole project has an international focus. Results of the SCR showed that there is little research done on MDs in European countries, and that the recognition of MDs as a problem is relatively new in Europe, compared to geographically larger areas (e.g. United states, Canada and Australia) (Flinterman et al., 2023). Further, my personal impression is, that MDs are often associated with rural areas and mainly the HWF shortage which is especially present in rural areas. Besides, the focus of the ROUTE project was the HWF shortage in general and how to address it, anyhow, during the work of the project it become apparent to me that the HWF shortage is not the only cause for the existence of MDs. And that the phenomenon of MDs is way more complex. I am convinced that the HWF shortage of certainly has a significant impact on the occurrence of MDs in Germany, if only through the demographic change increasing the demand for healthcare services, putting additional strain on an already limited workforce. And clearly, Germany also has rural areas but also many metropolitan areas, which makes me assume that there must be a difference in the characteristics of MDs in rural regions and urban regions which might also come with different types of factors contributing to the occurrence of them. Additionally, I assume that work-related factors, such as a high workload and a low

salary for example are unattractive, and therewith essentially contributing to MDs not only in general but also in Germany. This obviously comes from the work I've done previously, but also from the impression I have got during my studies of physiotherapy in 2016-2020. My impression is that in Germany there is still the persistent traditional view of doctors as having a "calling" and nurses as merely "little helpers". This outdated image fails to acknowledge the diverse skills and valuable contributions of healthcare professionals and keeps alive a hierarchical system. This might discourage potential candidates from undergoing careers in healthcare. Moreover, I think the healthcare system itself lags on adapting to societal changes, as it struggles to adapt quickly enough to evolving needs and demands. In my opinion the system's slow response to societal shifts can contribute to the persistence of MDs, as it fails to adequately address the healthcare disparities in different regions. As I made the experience that county specific perspectives and contexts such as the healthcare system, demographics of society, socioeconomic conditions and geography can provoke differences in specific contributing factors, some specific characteristics of Germany that could be relevant to MDs, came to my mind. In the case of Germany, I think the federalist structure of Germany, also represented in the structure of the healthcare system, could be an interesting fact because it theoretically forces Germany to always have a regional focus when it comes to implement approaches. Also, the previous division of Germany in east and west, might have provoked differences in healthcare supply structures which now impacts the healthcare supply in Germany. Besides, when looking at current movements of the world, the high rate of migration also towards Germany (Statistisches Bundesamt (Destatis), 2022), provokes changes in society that can affecting the demographics of society. Therefore, I decided to do an own scientific study, asking experts about their opinion on why MDs occur especially in Germany and what they think how they could be addressed in the context of Germany.

1.2 Justification and Research Question

The problem of MDs still constitutes a growing concern as they reduce the effectiveness of healthcare systems (Wong, 2000) and leading to poorer health outcomes in populations (McMaughan et al., 2020). Thus, the WHO made a call to action worldwide to address issue of medical underserved areas (World Health Organization, 2016). As factors can vary across countries, it is essential to analyse the country specific influencing factors for adequately addressing the issue of MDs (Flinterman et al., 2023). Furthermore, because only a little amount of research available for European countries (Flinterman et al., 2023), an even higher percentage than the EU average of people older than 65 being affected by at least one chronical disease in Germany (58%) (OECD, 2019), and the by the National Association of Statutory Health Insurance Physicians (KBV) prognosed increasing undersupply due to a

shortage of HWF in Germany (Kassenärztliche Bundesvereinigung, 2023), expert interviews providing an in-depth inside into the perspective of German health professionals will be conducted, addressing the following questions:

a) Which factors contributing to the occurrence of MDs apply specifically for Germany and
b) What type of approaches to address medical underserved areas are adequate in the context of Germany?

The Expert interviews are informed by the results of the SCR (Flinterman et al., 2023) and will not only focus on the factors influencing the HWF shortage as a cause for MDs, but allow having a wider perspective, to get the most realistic idea of factors and approaches relevant for Germany.

2 Background

From the introduction it has become clear that MDs are an issue that urgently need to be addressed. For a better understanding of the thematic, in the following the definition of MDs will be explained more detailed. After that a comparison of contributing factors and approaches across different western high-income countries and different healthcare professions will be described to get a general idea of differences in contributing factors and approaches to mitigate MDs. Since an in-depth inside into the situation of Germany will be provided it is also important to have a general understanding of the definition of MDs in Germany, the organisational structure, and the German healthcare system. These contents will be explained in this chapter. Subsequently, the methodology of conducting the interviews and its results will be described. Finally, the results will be discussed in the context of the Germany.

2.1 The concept of medical deserts

Besides the multitude of available definitions for MDs, such definitions vary by country (Bärnighausen & Bloom, 2009). The absence of a clear definition and categorization hampers the understanding the characteristics of MDs (Flinterman et al., 2023). To address this problem the ROUTE project develops a taxonomy to identify and define MDs across countries (ROUTE-HWF Team, 2023). To the best of my knowledge, it is the first attend to develop a taxonomy that can generally be applied across European countries to identify and define MDs. According to the current development state of the taxonomy, MDs can be defined and classified by four dimensions. With two of them being classified as **population and healthcare demand objects**: (i) percentage population aged 65 and over and (ii) economic resources of the population, and other two being classified as **area and healthcare supply objects**: (iii) travel

time to public health facilities by public transport and (iv) population provider ratio. Conforming to the taxonomy, MDs are defined by at least one of the objects on both, the demand and supply side. Additionally, as the key to all existing medical desert definitions is the underservice of regions (Bes et al., 2023), object (iv) population provider ratio should always be present when defining types of MDs. This leaves six different combination possibilities, each describing one type of MDs (see figure 1). Thus, matching workforce supply and demand is considered as a core function of any healthcare system (Gorman, 2018).

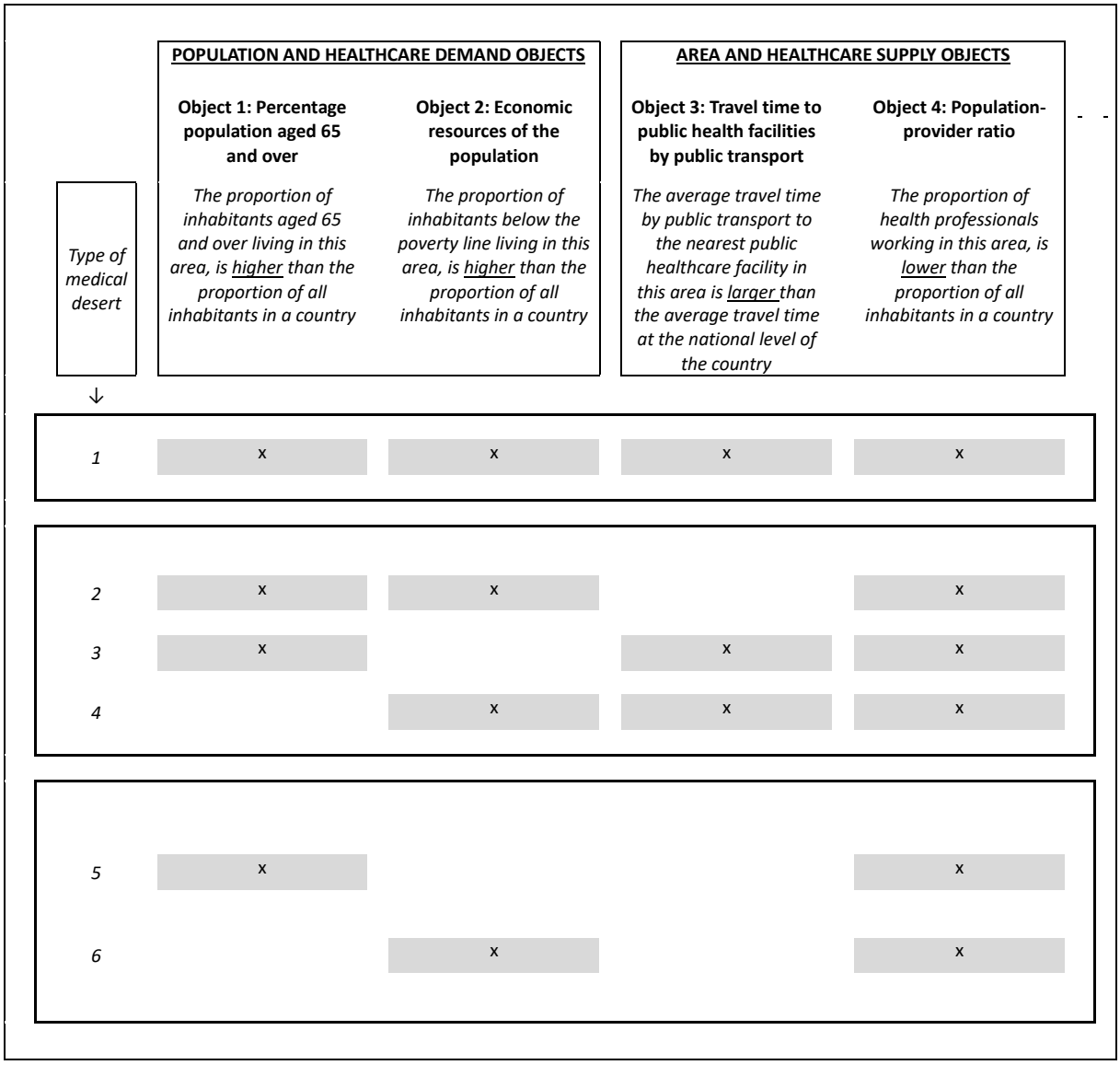

Figure 1: Second reduced version of a taxonomy to define and classify 6 different types of MDs by four objects/dimensions (ROUTE-HWF Team, 2023)

2.2 Factors contributing to medical deserts and approaches to mitigate them across western-high-income countries and different healthcare professions

Different contributing factors and approaches to mitigate MDs have been identified for different

healthcare professions and geographical regions in previous research. It's described that identified contributing factors can be grouped into four main categories: i) Work-related factors, ii) lifestyle-related factors, iii) socio-demographics or other HWF characteristics and iv) migration. For approaches, a total of five main categories is reported: i) Undergraduate training, ii) postgraduate training, iii) innovative models of care, iv) planning & monitoring HWF distribution and v) support & infrastructure (Flinterman et al., 2023). Comparing these will help to facilitate country or occupation adapted policy recommendations since a lot of actions were taken, without a strong rationale underlying the choice of policies and other measures (Ono et al., 2014). A manuscript, still in preparation, including n=195 studies from the United States, Canada, Australia, New-Zealand, and European countries conducted such a comparison of contributing factors to and approaches for mitigating MDs across countries and different healthcare professions (Seils et al., 2023). In the following an insight into the comparison will be given.

2.2.1 Contributing factors and mitigation approaches across different geographical regions

In the following comparison only the main categories of factors and approaches as described above are considered, with n=x referring to the number of studies found for each category. The specific contributing factors and approaches for European countries, summarized under each main category can be found with the related references in the tables a1 and a2 in the appendix 1. Specific contributing factors and approaches for other high-income countries can be found as supplementary material on the digital submitted version.

Factors: To Australia relevant contributing factors that were identified in the literature, are mostly characteristics of the HWF (n=47), followed by working conditions (n=26) and life-style conditions (n=17). The same order of factors applies for the USA with n=2 studies found for characteristics of the HWF, followed by working conditions (n=18) and lifestyle conditions (n=5). As well for Canada, most frequently factors of characteristics of the HWF (n=14), followed by working conditions (n=4) and life-style conditions (n=4) were identified as relevant in the literature. In Europe the most frequently identified contributing factors are the working conditions (n=7) followed life-style conditions (n=4) and characteristics of the HWF (n=3). In New Zealand most studies identified characteristics of the HWF (n=4) as a contributing factor, as well as life-style conditions (n=1) and working conditions (n=1).

Approaches: Approaches most frequently identified in literature for Australia is the undergraduate training (n=28), postgraduate training (n=6), improvement of support and infrastructure (n=4), the planning and monitoring of the HWF distribution (n=2) and innovative models of care (n=2). For the USA also most frequently identified approaches are the undergraduate (n=15) and postgraduate training (n=7), followed innovative models of care

(n=4), improvement of the support and infrastructure (n=2) and the planning and monitoring of the HWF distribution (n=1). Also, for Canada, the undergraduate (n=5) and postgraduate training (n=4) were the most frequently identified approaches. Moreover, one study reported on the improvement of support and infrastructure. In Europe, only undergraduate training (n=3) and improvement of support and infrastructure (n=5) were identified as existing approaches to mitigate MDs. For New Zealand solely undergraduate training was identified in the literature as an applied approach (n=4).

With n=90 studies identified concerning characteristics of the HWF and n=57 for the category of working conditions, these are the most frequently identified contributing factors across geographical regions. For approaches across countries the undergraduate training but also methods of postgraduate training have been studied a lot, except for New Zealand and Europe. Studies conducted in New Zealand, only report on approaches using undergraduate training. In Europe, the most frequently reported approaches were support and improvement of the infrastructure.

2.2.2 Contributing factors and mitigation approaches across different healthcare professions

Here again, only the main categories of factors are considered. For the specific contributing factors and approaches across different professions, see the digital submitted version.

Factors: Most studies regarding contributing factors are concentrated on students (n=61) followed by physicians (n=29), GPs (n=20) and allied HWF (n=10) and Nurses (n=5). Within the population of students, HWF characteristics are the most prominent factor contributing to the workplace decision, identified in the studies (n=58), followed by working conditions (n=9) and life-style conditions (n=5). According to the literature, the factors that contribute the most to physicians' decision of their working place are the HWF characteristics, followed by working conditions (n=13) and life-style conditions (n=10) and migration to other geographical regions (n=1). For GPs the most often identified contributing factors are the working conditions (n=19), followed by life-style conditions (n=9) and HWF characteristics (n=7). In the population group of the allied HWF, the most frequently identified contributing factors are the working conditions (n=9), followed by lifestyle conditions (n=4) and the HWF characteristics (n=2). Most frequently found contributing factors for nurses are the working conditions (n=5), followed by life-style conditions and HWF characteristics with each two studies found under this category.

Approaches: most studies concerning approaches are found within the population of students (n=45), followed by physicians (n=25), GPs (n=10), allied HWF (n=6), institute or practice (n=6) and nurses (n=4). Identified approaches in the target group students are mainly focused on undergraduate training (n=44) and only one single study was identified for the approach of postgraduate training. To recruit and retain physicians in medical underserved areas,

approaches regarding undergraduate training (n=9), postgraduate training (n=7), support and infrastructure (n=5), innovative models of care (n=3) and planning and monitoring of the HWF distribution (n=1) were identified in the literature. In the population group of GPs approaches regarding postgraduate training (n=4), support and infrastructure (n=3), planning and monitoring of the HWF distribution (n=2), and undergraduate training (n=1) are available. For the allied HWF approaches in the area of postgraduate training (n=3), undergraduate training (n=2) and support and infrastructure (n=1) were identified. According to the literature, institutes and practices applied approaches such as innovative models of care (n=3), postgraduate training (n=1), undergraduate training(n=1) and models of support and infrastructure (n=1) to recruit and retain the HWF into underserved areas. Approaches identified to retain and recruit nurses are postgraduate training (n=3) and support and infrastructure improvements (n=1).
Overall, across professions, characteristics of the HWF (n=87) but also working conditions (n=55) are the most identified contributing factors. For approaches, besides the undergraduate training (n=56), postgraduate training was also shown as highly relevant (n=19).

2.2.3 What does the comparison tell?

From the comparison it becomes clear that there are general factors across western-high income countries, influencing the HWF shortage and therewith contribute to MDs. Further, these general factors might lead to common challenges, that apply in general across countries and professions (OECD, 2020a). However, factors and approaches are kept quite general in the comparison. Even the more specific factors described in the tables, refer to a sub-category of factors, ignoring their individual reflection within the country. Financial issues for example are reported for almost every country and profession. However, this doesn’t provide any information about how they manifest themselves and what their cause is. This is because they are caused by the country specific characteristics. In the manuscript in preparation by Seils et al. it is also reported that the factors can vary across different profession due to individual characteristics of each profession. These could amongst others be the education and training requirements, reimbursement and insurance coverage and infrastructure and resources (Seils et al., 2023). It therefore makes clear that when effectively wanting to address the issue of MDs in a certain area the specific factors for this area and/or healthcare profession need to be identified to adequately develop approaches.
Information from this comparison on contributing factors as presented in the tables a1 an a2 (see appendix 1) has been used to inform the expert interview. Characteristics of the most dominant references are shown in table 1.

Table 1: Most relevant studies to inform expert interview

Authors	Year	Country	Design	Aim	Main results
(Flinterman et al., 2023)	2023	Diverse	Scoping Review	To systematically map the research done in the area of medical deserts and provide an overview of the different definitions and characteristics of them as well as to identify any existing contributing factors and approaches to mitigate them	Main categories of identified contributing factors consisted in sociodemographic/characteristics of the HWF, work-related factors and lifestyle conditions. Approaches focused on training adapted to the scope of rural practice, HWF distribution, support and infrastructure and innovative models of care.
(KBV, 2019)	2019	Germany	Report		Reports on wishes and preferences of new doctors when opening their own ambulant clinic. Especially important is a good work-life balance and reconciliation of work and family life. A worrying issue is the high financial risk.
(Kuhn et al., 2017)	2017	Germany	observational, quantitative	To better understand perspectives on and attitudes towards different supplementary models, attitudes among local politicians in the German federal state of Lower Saxony towards the suitability of supplementary care models were examined.	Mayors and county administrators supported the use of trained medical assistants, patients' busses, mobile physicians' offices, and telemedicine. The use of trained medical assistants was related with relieving the physician's work. In contrast the approach of telemedicine was seen with scepticism.
(Natanzon et al., 2010)	2010	Germany	observational, qualitative	To explore the 'pros and	The attractiveness of working as GP rural areas can be

				cons' of GPs' work in rural areas and to identify from GPs' perspective possible measures for counteractin g future GP shortages.	attributed to factors such as lower competition and a diverse range of work. Negative aspects are primarily observed at the regional and structural levels, including lower earnings and limited leisure facilities. Efforts to address the shortage of GPs in rural areas have focused on promoting group practices to enhance the attractivity of working as GP in these regions, as well as exploring initiatives to recruit students from rural backgrounds.
(Steinhaeus er et al., 2011)	2011	Germany	observational, quantitative	To explore if working time, number of treated patients per week or proportion of privately insured patients vary between rural and urban areas in Germany.	Primary care physicians in rural areas who work in single practices have significant higher workload compared to their urban counterparts. The number of working hours is significantly influenced by the number of patients treated per week and the type of medical practice. Applying the self-rated classification of rurality: there were no significant disparities found in the proportion of privately insured patients or the number of patients seen per week between rural and urban areas.
(Wilhelmi et al., 2018)	2018	Germany	observational, qualitative	To explore determinants influencing this subjective perception of rurality and to develop further strategies to resolve the physician shortage in rural areas.	It is necessary to devise strategies that increase awareness and establish a personal connection with rural areas throughout undergraduate and postgraduate medical training. Special emphasis should be placed on promoting family-friendly aspects such as childcare facilities and schools, enhancing the attractivity of working conditions, and addressing shortcomings in local infrastructure, including internet access and transportation connections.

2.3 Germany in Focus

In the following the phenomenon of MDs will be considered in the context of Germany. All country specific aspects to understand the relevant contributing factors and approaches have been attempted to describe.

2.3.1 Actors in the German healthcare system

Responsibilities for the administration of the health system in Germany are complex and divided into three levels (Bundesministerium für Gesundheit, 2022)Click or tap here to enter text.:

1. Government, federal states, and municipalities according to the federalist structure of Germany, setting the framework through government regulations.
2. Design and organisation of health care through self-administration by the self-governing bodies (institutions and associations).
3. Concrete care provided by statutory health insurance funds (HIF), the health care professions, hospitals, and pharmacies, which each have their interests represented by associations.

The first level - the legal framework: Within the governmental frame the federal ministry of health is the leading organ for the health sector and is responsible for policymaking at the national level, i.e. for drafting laws and administrative guidelines. It also carries out the legal supervision over the self-governing bodies of the health care system at federal state level. Further the Bundesrat, constituting the institution of federal states, provides them with the chance to discuss health policy concerns. The federal states have their own competences for law-making. This is due to the federalist structure of Germany in general. It manifests itself in the government setting the frameworks for regulations, but with the federal states regulating in detail for their territory which authorities act on this and how the regulations are implemented. The pursued aim of this is politics being as close as possible to the people. More specifically, this means that each federal state is responsible for the implementation of federal laws as well as for hospital planning and the financing of hospital investments. Furthermore, they have the technical and service supervision of the municipal public health service. Municipalities, as smallest political regulatory framework, are responsible for the local healthcare supply (Bundesministerium für Gesundheit, 2022).

The second level - Self-governance: An important element of the German healthcare system is the existence of self-governing bodies in it, primarily operating within their respective federal state boundaries. This means that the self-governing bodies themselves decide which medical services are to be provided and financed by the service providers at the expense of the HIF. One principle for orientation here is that services must be sufficient,

appropriate and be economical. For services above and beyond patients have to pay themselves. The federal joint committee (G-BA) is the highest decision-making body within the self-governing health care system. The G-BA is responsible for translating the objectives set out in the laws into concrete regulations. It provides guidelines for service providers, payers, patients, and manufacturers, for example on the scope of services covered by the HIF and their quality (OECD, 2019).

In the G-BA different actors come together: the National Association of Statutory Health Insurance Funds, the KBV and the National Dental Association (KZBV) and the German Hospital Federation (DKG) and patient representatives. The National Association of Statutory Health Insurance Funds comprises the individual health insurances and concludes contracts with medical associations, hospitals, and pharmacies. KBV and KZBV are responsible for ensuring ambulant medical or psychotherapeutic and dental care for people with statutory health insurance (GKV). Besides, they represent the interest of the included actors participating in contractual medical care, also called statutory health insured accredited medical care. At the federal state level, the hospitals are organised in regional hospital associations. The regional associations are in turn united in the DKG. The DKG assumes statutory tasks within the framework of self-administration in the health care system (Bundesministerium für Gesundheit, 2022).

Third level - Single actors and their representative bodies: The actual treatment of patients happens in the third level through medical doctors, therapists and other healthcare professions in hospitals, ambulant clinics, or rehabilitation centres. To ensure, that these actors involved in direct patient care are also heard politically, they are organised in professional organisations and professional and business associations(Bundesministerium für Gesundheit, 2022). Furthermore,

2.3.2 Health insurance and sectors of care

Germany is a welfare state based on a solidary thought. This means that the legislator in the German federal republic is also responsible for social justice and social security of the citizens. A central element of social legislation is, amongst others, the social insurance to protect the population against existential threats. This includes besides the statutory pension, unemployment, and long-term care insurance also the GKV (Deutscher Bundestag, 2023). 90% of the Germany population is publicly health insured.

The health care system is predominantly financed by the GKV. Contributions to the GKV are paid jointly by employers and employees paying a fixed percentage of their income, while the Federal Government contributes a subsidy to the GKV from tax revenues. The federal states participate in the financing of hospital care by providing, for example, investment cost subsidies or investment support programmes. All these financial resources

form the health fund, which provides the GKV with the financial resources they need to finance the services for their citizens. Besides the GKV, there is also a private insurance (PKV) with 10% of the population being privately insured. Here insured are self-employed persons and employees with a gross annual income of more than 64350 € having the option of choosing between GKV or PKV. People insured in the GKV system can take out private supplementary insurance. However, private health insurers do not participate in the health fund. The contribution level to the PKV depends on own risk characteristics (such as age and pre-existing conditions) and the scope of the insurance cover (Bundesministerium für Gesundheit, 2023). Moreover, privately insured persons must lay out the money first but are reimbursed later. Unlike as for GKV patients, the spend money directly goes to the healthcare provider and not to the health fund. PKVs usually reimburse higher rates for medical services than GKVs, which means that practices with private patients can generate higher revenues. Besides, privately insured patients are often entitled to additional services that are not covered by the GKV. These may include, for example, extended diagnostics, alternative treatment methods or shorter waiting times. Doctors can charge higher fees for such services, resulting in higher revenues (Panea, 2018).

Furthermore, the healthcare system is divided into two sectors: ambulant care sector and the hospital sector. Ambulant care includes GPs, specialists, dentists, psychotherapist, and allied health professionals such as physiotherapists, speech therapists and ergo therapists amongst others (Deutscher Bundestag, 2023). Most of these ambulant practitioners participate in contractual care, which refers to statutory health insurance accredited services (Vertragärztliche Verorgung) and are traditionally self-employed (Busse & Blümel, 2014). They are part of the association of Statutory Health Insurance Physicians (KV) and are allowed to treat statutory insured patients and get paid by the GKV for the provided treatment. It further means that the accreditation is bounded to the ambulant clinic's location and the KV region and its needs-based planning. However, patients can choose clinic of their choice (Deutscher Bundestag, 2023). Besides, contractual care doctors are subject to the law on statutory health insurance physicians. It comprises many laws and guidelines that regulate the relationship between contracted doctors, HIF, and patients. It defines the framework conditions for medical care within the statutory health insurance system and regulates aspects such as fee accounting, quality assurance, the licensing of contracted doctors, cooperation between doctors and much more (Berner, 2014).

The second sector is the inpatient care i.e. Hospitals. Normally, here citizens with GKV and PKV are treated. Patients can choose the hospital of their choice. The GKV is paying the cost if the hospital is allowed to treat GKV patients. Accredited hospitals are such: they are integrated into the hospitals plan of the federal state, have a care contract with GKV or PKV or are certified as university clinic (Deutscher Bundestag, 2023).

2.3.3 Definition of medical deserts in Germany

In Germany there is no uniform definition for MDs, but different definitions exist describing the phenomenon of MDs. Hassenteufel (Hassenteufel et al., 2020) refers to MDs as doctors' shortage. According to Kühl (Kühl, 2012) an undersupply is defined as a physician-population ratio below the predefined ratio of −25% for GPs and −50% for specialists. The G-BA refers to undersupply of GKV accredited medical care which is present when the population/physician ratio falls below a certain level (Gemeinsamer Bundesausschuss, 2022). More specifically, if in certain planning areas panel doctors' position that are provided in the demand plan for needs-based care cannot be filled. Not only temporarily, and this results in an unreasonable impediment to the use of ambulant care services but that can't be remedied even by authorising doctors and facilities managed by doctors. The concept of needs-based planning is later described in the chapter. However, most of the definitions for MDs in Germany refer to the HWF shortage (Kroll et al., 2019) and the current healthcare supply situation is mostly examined under the aspect of physician and specialists' availability (Hassenteufel et al., 2020). Nevertheless, it is important to keep in mind that for the expert interview a wider definition was used, including all medical professions.

2.3.4 Current healthcare supply situation

The issue of MDs in Germany has politically been recognized as an issue since 2004. Already back then, MDs have been seen as a combination of issues. First, the coming physician's shortage foreseen by the institutionalized physician associations. Secondly, the HIF highlighted regional differences in medical healthcare supply and requested well-tailored approaches to address the diverse problems in each region (Hassenteufel et al., 2020). Nevertheless, as reported by the OCED in 2015 the healthcare supply in Germany was still considered as good. But the good healthcare supply and the nationwide availability of physicians is now threatened (OECD, 2015). An overview of the healthcare supply requirements expected for the year 2035 in relation to 2018 shows that the population's need for medical care is increasing. 87.242 contracted care physicians and 59.738 doctors in the hospital sector will reach the statutory retirement age until 2035 and will need to be substituted by a new generation. The differentiated analysis according to the KV makes it clear that almost all federal states have significantly fewer graduates than they will need to maintain health care for their population (Kroll et al., 2019). Especially at risk are areas that are considered as unattractive. These are mainly rural areas or areas with a low socioeconomic status (Gemeinsamer Bundesausschuss, 2022). Besides the HWF shortage a special focus is put on and the differences between urban and rural areas in Germany when talking about MDs. In more rural areas, the availability of family physicians falls short

of meeting 100% of the ratios determined by the Federal Joint Committee's needs-based planning. On the other hand, in certain urban areas, the supply exceeded the demand by as much as 207% in 2018 (Blümel et al., 2020; Gemeinsamer Bundesausschuss, 2022). Particularly three factors serve as enhancers for the discrepancies between urban and rural Germany: Firstly, the societal transformation of doctor's profession. There is an increasing desire for flexibility in working structures and good working conditions with shorter working hours and part-time jobs. This in turn might lead to a decreased operational output on the part of an average physician in relation to the population. To maintain the same level of performance, the younger generation therefore needs a higher number of people (OECD, 2015). Further there is a trend in young physicians towards working as an employee in hospitals or medical service centres in the ambulant sector, away from being self-employed with an own office. These opportunities can mainly be found in urban areas (Kroll et al., 2019; OECD, 2015; Ono et al., 2014). Secondly, the travel time for patient to reach physician tends to be longer in rural areas (OECD, 2015; Ozegowski & Sundmacher, 2014). Additionally, the lack of good access to public transportation leads to challenges in accessing healthcare services when they are depended on public transport. Often public transport in rural regions with small population is limited for economic reasons, increases problem of accessing medical services (Adorno et al., 2018). The figure 2 highlights this by showing the distance to the next GP per federal states, which is especially high in total areas.

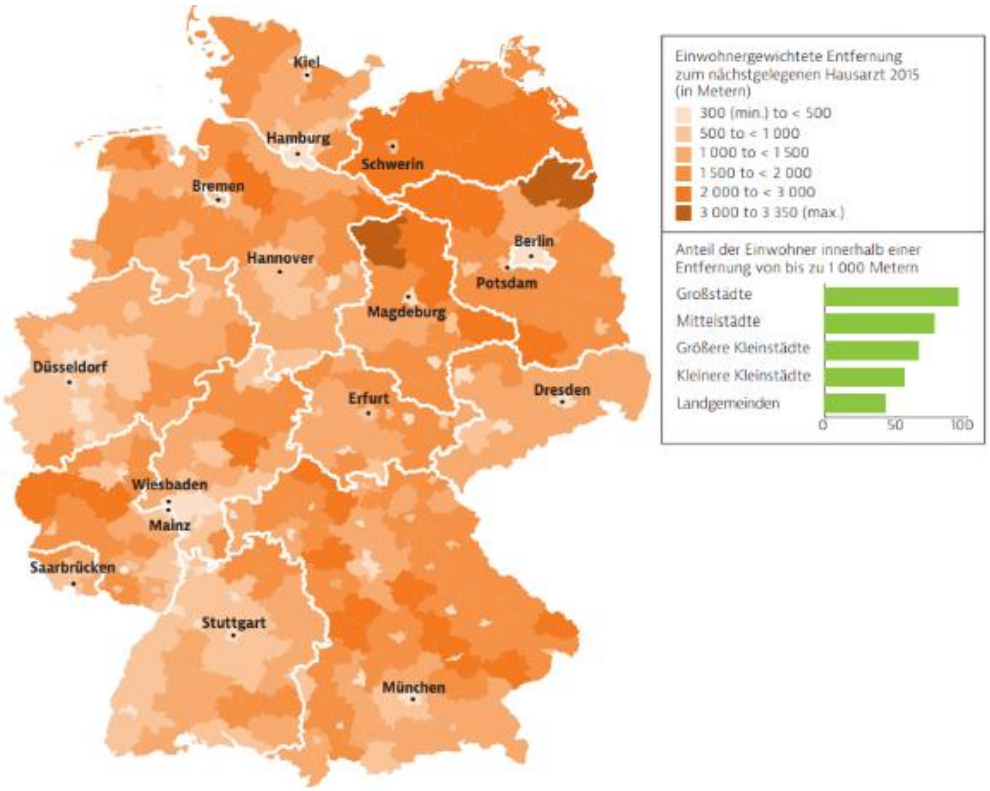

Figure 2: Travel distance to next GP in Germany (OECD, 2019).

And thirdly, society is getting older, particularly with a growing number of older people in rural areas who face mobility issues and health problems, requiring proper access to medical care (OECD, 2015). In a new model calculation, the KBV has determined that the demand for medical care will increase moderately until 2030, but that the supply of physicians will decrease. The group of GPs and so-called specialist primary care physicians will be particularly affected (Kassenärztliche Bundesvereinigung, 2023).

2.3.5 How does Germany try to reach an equal healthcare supply?

Ensuring equitable access to healthcare and addressing disparities in service availability have been key priorities in reform efforts over the past decade. Main measures taken to reach this in ambulant care are amongst others: (i) implementation of the needs-based planning (ii) introducing a voluntary "structure fund" with dedicated financial incentives to encourage physicians to work in underserved areas, along with implementing additional changes to the reimbursement scheme and (iii) controlling the oversupply of physicians by denying licenses for new ambulatory care practitioners (Blümel et al., 2020). The needs-based planning is a method of distributing GPs and specialists across the planning areas. It aims to maintain sufficient healthcare supply by achieving a predefined ration between physicians and the number of people living in a specific planning area. The planning areas in ambulatory care are made by the federal law. They don’t necessarily coincide with the administrative districts, giving self-governing bodies greater possibilities to intervene, nevertheless, the federal states still have a consultation right in the needs-based planning. Guidelines for the distribution of GPs and specialists are made by the G-BA but responsible for the actual distribution is the KV. For calculating needs-based population ratios the level of care was differentiated into four categories: (1) family physician care, (2) specialist care, (3) highly specialized care, and (4) separate specialized care. Further, differences in population ageing, gender, morbidity, and socioeconomic status were considered (Busse & Blümel, 2014)Click or tap here to enter text.. However, it has turned out that this method is less suitable for addressing undersupply since the restrictions on settlements are not forcing doctors to work in rural areas, but they can find attractive job in the hospital sector or cities(Kopetsch, 2010).

To assure available hospital care, the ministries of health (or ministries of science for university hospitals) at the state level are responsible for planning and regulating inpatient treatment facilities. This is done within the framework of the federal Hospital Financing Act. The scope of this planning includes highly specialized "tertiary" care such as neurosurgery, as well as regular secondary inpatient care. Planning units can vary and include institutions, departments, and beds in certain states. However, there are significant differences in the content and methods of the hospital requirement plans among the federal states. The

regulation of capacities is determined based on the principles of need (for specific departments) and performance, but the specific criteria for regulation differ significantly (Busse & Blümel, 2014). More specific approaches are explored in the expert interviews.

3. Method

3.1 Research design

A qualitative design was chosen because this work sought to explore and understand the phenomenon of medical underserved areas in Germany, a geographically relatively small area, with a high population density but nevertheless a partly non-sufficient medical service supply(OECD, 2015). Therefore, the method of choice for data collection were expert interviews. Since the research interest in this case is information orientated, a guideline based expert interview opens access to knowledge about the phenomenon of medical underserved areas. The design was based on the hermeneutic phenomenology. The reason for choosing this interpretive design were twofold.

1. An important reference point for the analysis of qualitative data are general deliberations on how to (correctly) understand and interpret texts. In the German-speaking world this is often set equal with the hermeneutical concept, which is the ability to understand by depicting everyday situations and experiences (Plager, 2012; Van Der Zalm & Bergum, 2000).
2. Therewith, the hermeneutic with its complex understanding of the world, provides a framework and methodology to guide interpretive research process for gaining insight into Experts experiences and discover deeper meanings(Plager, 2012)

The qualitative analysis of this work follows the four reference points of the hermeneutical procedure (Kuckartz, 2018):

1. Observance of the creation: Under which conditions evolved the expert interview?
2. Hermeneutic circle: it’s a basic rule of the procedure, to understand the whole of a text from the individual and the individual based on the whole. When starting to read the text foreknowledge and presumptions about the text exists, which will then further develop with every time the text is being read.
3. Hermeneutic difference: refers to the differences that can occur in the interpretation of the text due to linguistic, historical, or rhetorical aspects.
4. Adequacy and accuracy**:** Although using the hermeneutic approach there is no guarantee that the interview is interpreted accurately. The interpretation also always

depends on the reader (the understanding one) and its foreknowledge and presumptions. The interpretation therefore won't be "right" or "false" but more or less accurate.

In this paper, these reference point manifest themselves in the following aspects: It was intended to create a friendly atmosphere during the interview, so that participants feel comfortable sharing their impressions. This already started with the first contact via e-mail or telephone. The existing foreknowledge and presumptions are reflected in the 1 introduction and 2 background section. Further, in the first step of the qualitative analysis the text is worked out as a whole, and difficult text parts understood within the ongoing process of working on the text. During the first read of the interviews it is paid attention what topic relevant themes are mentioned in the interview. These steps are further explained in phase one of the data analysis. Moreover, it's being differentiated between the logic of application, which means to identify themes and categories within the text and the logic of exploration, referring to new and unexpected things that might emerge. Finally, it's being reflecting on hermeneutic differences which in this case are rather small due to no language barrier, nor cultural barrier.

3.2 Setting and sampling

Participants were selected via purposive sampling (Moser & Korstjens, 2018). This method was chosen because the hermeneutic approach requires participants that can provide an in-depth inside and detailed information about the phenomenon under investigation (Kuckartz, 2018). Thus, the four participants were chosen because they had great knowledge about the healthcare service supply in Germany and due to their different profession and geographical working location, they were able to shed light from different perspectives on the same phenomenon.

E-mails (see appendix 2) were sent to potential participants (Medical healthcare workers, Researchers, Healthcare insurance workers). These potential participants were asked for the contact of the person they believed to be the most knowledgeable in the area of medical desters, which could also be themselves. One participant was recruited through a scientific conference on the topic of healthcare supply in Germany. In the next step, potential participants were contacted via phone or e-mail to assure that they fit the required inclusion criteria. Recruitment criteria included that participants should (1) currently be working in a position that is related to political activities in the area of healthcare supply in Germany or (2) as a professional in a medically underserved areas, (3) having knowledge about the recent healthcare service supply situation in Germany whether from a practical or theoretical perspective (4) having a minimum of experience of one year and (5) participants should be from different federal states or having a different professional positions if from the

same federal state.

3.3 Data collection via expert interviews

The semi-structured guideline-based interview is based on the previously conduced SCR about MDs (Flinterman et al., 2023). Result of the SCR showed that here are four main factors contributing to MDs in general. Further, five main types of approaches to MDs are identified. These main contributing factors and main approaches additionally with the results of the paper by Seils et al. (Seils et al., 2023) were taken to inform the first part of the expert interview. The second part of the interview was sought to be more explorative discovering factors specific for Germany or not yet mentioned in the literature.

Semi-structured expert interviews were conducted via zoom and video recorded. The interviews lasted between 30 to 50 minutes. Before the start of the interview participants signed a confirmed consent approving that they agree to be interviewed, that the interview is being recorded, and that the resulting data can be used pseudonymised for further research activities within the master thesis. Further, it was clarified again that the participants can revoke their confirmed consent at any time without having to expect any consequences. This document is attached in the appendix 3. The signed documents are kept save for data protection reasons but can be requested by the author. For transparency of the work and to give an idea of what to expect, as well information material about the topic of interest was sent to the participant beforehand.

At the beginning of the interview participants were informed again that the interview is going to be recorded and were given the opportunity to deny their participation. Besides, to have a uniform starting situation a definition of MDs for the scope of the interview and of this work was given to the participants. In the following, participants were asked broad open-ended question to recount their experience and ideas on (1) contributing factors to MDs that are relevant to Germany and later about (2) approaches to mitigate them. Finally, participants were asked if there are factors that are underestimated or not given enough attention and if they do have a personal idea on how to address the issue of MDs in Germany. Depending on the participants respond, further open-ended questions were asked, or participants were invited to continue with the narrative. For the specific question, see the interview guide attached appendix 4. This structure aligns with the concept of phenomenological hermeneutic data collection which requires the interview to not be a question answer round but a conversation (Crotty, 1996). Field notes, including information about setting, special occurrences, and relevant thoughts on the interview, were taken during and/or after each interview.

3.4 Data analysis

To understand well the process of a structured content analysis it is important to also

understand the terms that form part of the concept of a structured qualitative content analysis. Terms can vary a lot in literature, however, here the terms are used according to the definition of Mayring (Mayring, 2019):

The **recording unit** is the basic unit for the structured content analysis. It describes the text portion confronted with the category system. The **context unit** describes the background for each coding decision. Lastly, the **coding unit** describes the sensibility and refers to the smallest component of material that can be coded. The selection criteria to determine the relevant material from the texts serves as **category definition**. Further, the level of abstraction describes how specific the categories have to be formulated. From the interviews identified **categories** will build the category system. Categories might include **sub-categories**.

All interviews were fully transcribed by the interviewer itself as soon as possible after interviews using the transcription software MAXQDA2022 and according to guidelines of (Dresing & Pehl, 2018) which can be found in the appendix 5. Personal data occurring in the interviews was pseudonymised and kept inaccessible to third parties. After transcription data was checked for accuracy as recommended by reference points of the hermeneutical procedure. The qualitative thematic content structuring analysis itself was conducted using the QDA-software QCAmap (Verein zur Förderung qualitativer Forschung ASQ, 2020) The aim of the analysis was to structure the content of the data by the means of theme categories and sub-categories. Because of the formulation of the question and the explorative idea an inductive approach was used, building categories on the material according to the steps indicated by Mayring (Mayring, 2019). The steps are described in the following:

Step 1: Research question and theoretical background

A clear explorative research question especially for the qualitative content analysis was formulated. It is based in the main research question of this paper. Also, the theoretical background, of contributing factors to medical and approaches was described, based on previous studies.

Step 2: Establishment of a selection criteria, category definition and level of abstraction

Factors that contribute to MDs in Germany and approaches to mitigate MDs relevant in the context of Germany was used as definition of the selection criteria. The level of abstraction was set as case specific. As recording unit all expert interviews are considered. One interview (the whole case material) was set as the context unit. The coding unit was set as a clear meaning component (seme) in the text. All these aspects were formulated before starting the actual analysis.

Step 3: initialising text work and category formulation

The analysis started with initiating text work, reading the material line by line, for the overall understanding of the text keeping in mind the research question. Besides, a formal contemplation of the text was done, noting the lengths of the text and the sentences. Which words are often used words or are complicated words used, what type of language is used, metaphors used by the participant. Important text bodies and central terms are highlighted, and first distinctions noted. According to the hermeneutical approach passages difficult to understand or comprehend were marked, lines of arguments were identified and analysed, and a first impression of material relevant to category definition was gained. After that a short case summary in bullet points for all 4 interviews, keeping in mind the research question (see tables a3-a6, appendix 6).

Then, for formulating categories, the text was read again line by line. After formulating a category, it was checked if the following text passages can be subsumed to the same category or if a new one is required. The level of abstraction was considered while doing so. Categories occurring during analysing process were specified in a coding guide to facilitate the analysis process and to better understand and interpret the results in the end. The coding guide provides definition of category, shows representing text examples for categories and describes coding rules if necessary (see appendix 7). During the whole process of coding the software MIRO (Miro©, 2022) was used for taking notes and illustrating the complex interconnections of categories (see appendix 8 for examples).

Step 4: Revision of categories and rules

After 10% of material the category system and rules were revised to reassure that category system fits the research question. Further the degree of generalization was checked by looking at the number of categories formulated.

Step 5: Final working through material

All Interviews were worked through applying the (further developed) category definition.

Step 6: Building main categories

After the process of coding the Interviews the categories were grouped into main categories if that was useful for answering the research question.

Step 7: Intra-coder agreement check

Interviews were coded all over again by the same researcher and with the coding system previously developed. It was checked for sufficient overlap of marked passages and similar categorisation.

Step 8: Final results

The results consist in the list of categories. A frequency analysis of categories was not done because of the qualitative research interest and the small sample size.

3.5 Quality criteria

In qualitative research, there are several quality standards that researchers should strive to meet to ensure the objectivity, reliability, internal- and external validity and overall quality of their findings. However, as these quality criteria originally occurred in quantitative research and are defined accordingly, discussions are going on of how do adapt quality criteria for qualitative research. An intent to adapt these quality criteria to qualitative research happened by distinguishing between internal- and external study quality. Internal study quality refers amongst others to the reliability, dependability, auditability, credibility, and authenticity of the data. External study quality to generalisability (Kuckartz, 2018). In the following it is described how the internal- and external study quality as quality criteria are considered in this work:

Internal study quality:

The internal study quality is not only valid for the qualitative content analysis process itself but also for the whole research project (Kuckartz, 2018). See table 2 for further information.

Table 2: Internal study quality

Quality criteria for data collection and transcription	• Data (interviews) was fixed via videorecording. • Contact with participants was throughout the whole time with the same (and only) researcher of this work, to engage prolonged collaboration. • Uncertainties occurring during the interview about what has been said by the participants were intended to be clarified by asking. • Notes were taken during and after the interview, documenting the interview situation and special occurrences. • Interviews were fully transcribed by the researcher itself, according to the rules of Dresing and Pehl (Dresing & Pehl, 2018)(see appendix 5). • MAXQDA2022 was used as transcription software, allowing a synchronic working with audio recording and transcript. • Data was pseudonymised, however personal reference in form of professional experiences were not eliminated since they are relevant for the justification of the selection of the experts.
Quality data	• It is described why the selected method for analysis is

for the qualitative content analysis process	appropriate. • A hermeneutic approach and a well recommended and often used method by (Mayring, 2014) for qualitative data analysis was used to give a frame to the process. • The analysis was carried out computer-aided with the QCAmap software (Verein zur Förderung qualitativer Forschung ASQ, 2020) also developed by Mayring using all the available material. • Inter-coder reliability is out of scope for this work, but an intra-coder agreement check was conducted (see appendix 9). • For detail and precision, a coding guide and codebook were developed, illustrating, and defining the categories. • Material was read various times before the final coding process. • During the analysis process the software Miro (Miro©, 2022)was used to take notes on the interrelation of factors (see appendix for examples 8) • Original citations were used to clarify the content. Care was taken to ensure that citations from all participants are selected, really representing the said things. However, since the interviews were taken in German, the citations needed to be translated. A document with the original citations and the translation is provided in the appendix 10

External study quality:

External validity would normally be determined by the extent to which research findings can be applied to other settings or populations. This is difficult to fulfil in a pure qualitative study due to a normally relatively small sample size, however the selection of cases can be done carefully to come as close as possible to the concept of the external validity. Besides there are other strategies that are suitable to increase the generalisability. Strategies such as the discussion with experts and member checking, meaning the discussion of results with the participants are out of the scope for this work. A here considered strategy is an extensive stay in the field which can help to avoid premature diagnoses and false conclusions when analysing the material. As further recommended a project diary was written to enhance transferability of the whole project (can be requested by the author is wished so) (Kuckartz, 2018). These quality standards are applied to ensure that qualitative research is conducted in a rigorous, systematic, and ethical manner, and that the findings are reliable, valid, and

useful for informing practice and policy.

4 Results

4.1 The Experts

Four experts of different professions with experience and knowledge in the area of medical service supply and medical underserved areas in Germany were interviewed. Three of them are female and one male.

Participant P1

P1 did the master studies in customer Health Care in Berlin at the Humboldt University. After that P1 started the career with working for a consulting firm, primarily advising hospitals on geomarketing and extrabudgetary revenues for three years. For the following eleven years P1 was with a GKV company and managed the Northern Germany service area. Afterwards and until the date of the interviews P1 was in charge of the hospital investment department at the social welfare authority (individual subsidies, lump-sum subsidies, rent subsidies, Corona compensation payments, hospital structure fund, hospital future fund) in Hamburg. In total P1 has 13 years of experience in MDs, especially knowledge about differences in healthcare supply in territory states and metropolitan areas. P1 is providing a policy maker perspective as Head of Hospital Investment Unit.

Participant P2

P2 started the career with an apprenticeship with the health insurance company AOK Hamburg, followed by business administration studies at the university of Hamburg. Afterwards P2 continued working at AOK in different positions, with the last one as head of marketing and sales division. For the following eight years P2 was deputy regional director. After that until the date of the interviews P2 was regional director of the AOK Rheinland/Hamburg Health insurance. Due to the high experience of 17 years in the position of (deputy) regional director, P2 can be considered as an expert in Client needs/concerns and health care supply in Hamburg. P2 is providing a policy maker perspective as regional director of a health insurance.

Participant P3

P3 was working 12 years in anaesthesia, paediatric anaesthesia, and intensive care. Additionally, for 38 years P3 is working as a paramedic and for 31 years as emergency doctor. P3 collected experiences in the area of MDs during a Malteser international Service

in Congo and by joining Doctors without borders in Sierra Leone. For 20 years now P3 works as GP on the island Amrum, which is a little island in the north of Germany, that can be considered as a geographically special region. For 13 years P3 has an own ambulant clinic on that island. P3 provides the perspective of a medical doctor working in region with special geographical conditions, having very bad infrastructure and knowledge about issues with ambulant clinics.

Participant P4

P4 worked one year as nurse in a hospital in Oldenburg. For the following four years P4 collected different practical experience in occupational health management. For one-year P4 had the position of a health manager for EDEKA supermarket in Hamburg. After that and until the date of the interview P4 was working as project and supply-manager at a company for development and implementation of innovative types of care with the focus on regional health supply concepts in rural areas, and case and care management and development from local health centre concepts. The focus of the work is Hamburg. P4 has one year of experience in the special field of health supply but was recommended as expert by the co-director of the company. P4 provides the professionals perspective due to the education and work as a nurse but also provides the researchers perspective, with the current position as Project- & Healthcare Manager, working on projects improving the healthcare supply services in Hamburg. Besides P4 is the youngest of the interviewed experts, providing a perspective influenced by the preferences of the younger generations.

4.2 Characteristics and location of Medical Deserts in Germany as described by participants

Participants had different opinions on the existence of MDs in Germany. Some reported that whole Germany could be considered as a medical desert, whereas others rated the situation less severe by referring to a lack of services in certain areas or by stating that Germany still has a very good healthcare services supply. A lack of services in general was reported in ophthalmology, neurology, paediatrics, long-term care, and emergency care. Besides a lack of hospitals in Schleswig-Holstein and a lack of ambulant clinics and delivery rooms was reported. Participants mostly located MDs in Germany in the new federal states of eastern-Germany and the peripheral areas of southern Germany (Baden-Württemberg, Black Forest) or the very north (Schleswig- Holstein) and North Frisian Islands. In general, it is reported that territorial states (Flächenländer) have greater healthcare supply problems then city-states (Stadtstaaten). Rural regions are reported to have a low healthcare workers (HCW) density, long travel times for patients to reach the next hospital and an older population. Census metropolitan areas in turn, with a high population density and a wide

range of health services are according to the experts characterized by a higher migration rate and populations with low socioeconomic status influencing the use of healthcare services.

Factors contributing to the occurrence of these areas are described in the following.

4.3 Factors influencing the occurrence of Medical Deserts in Germany

In total 37 individual categories of factors contributing to the occurrence and persistence of medical underserved areas were identified (see appendix 11). They were categorized into three main categories: **main consequences, primary determinants, and secondary determinants**. Secondary determinants can be considered as the actual root of MDs. Following their track, they result in the primary determinants, which are considered as the factors having a direct impact on one or more of the main consequences. The main consequences (of the determinants) in this context, are considered to have a direct influence on the occurrence of medical underserved areas in Germany, according to the used definition for this paper.

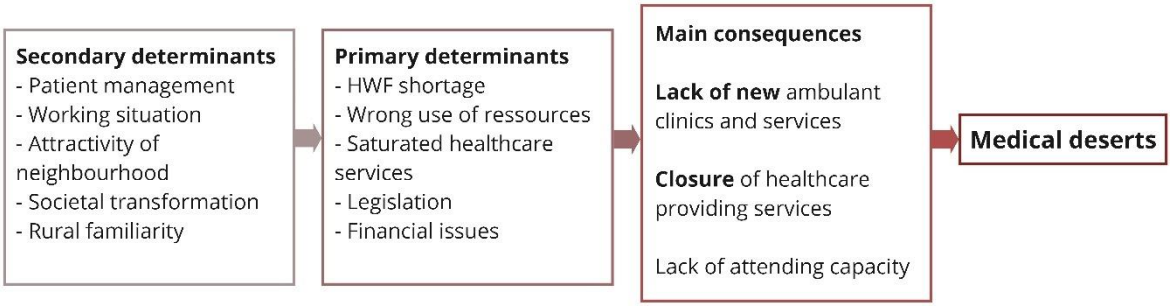

Figure 3: Structure of contributing factor categories

For a better understanding of the whole phenomenon of MDs, the main consequences will be described to get a general idea of the phenomenon. It's followed by the explanation of the secondary determinants for a better understanding of the primary determinants. Finally, the primary determinants and how they result in the main consequences will be explained.

4.3.1 Main consequences

There are three main consequences leading to the occurrence of MDs in Germany: (1) lack of **new** ambulant clinics or services, (2) **closure** of healthcare providing institutions, and (3) lack of attending capacity.

The lack of new ambulant clinics or services as well as the closure of healthcare providing institutions, is a medical desert induced by an insufficient supply of healthcare services which are not covering the demand of the population.

The lack of new ambulant clinics or services is caused by unattractive conditions for the HWF to open an ambulant clinic or to provide ambulant services. Moreover, the organisational structure of each federal state and an observed trend towards preferences

for a fixed employment instead of being self-employed contribute to the lack of new ambulant clinics.

"…Patients say 'yes, but I can't find anyone in the surrounding area to remove the material or pull out the stitches or anything else and I have to drive 50 km to the hospital', then they just don't have anyone in a 50 km radius who does the material removal and that makes such a medical desert."

P1, Head of Hospital Investment Unit

The closure of healthcare providing institutions describes the closure of i.e. hospitals, single wards, or ambulant clinics.

"…the area coverage of the hospitals is totally collapsing at the moments [...]".

P3, GP on island

It is influenced by the HWF shortage, strict regulations of the G-BA and the available budget for promoting healthcare projects.

The medical desert due to a lack of attending capacity is, unlike the other two main consequences, mainly induced by the demand side due to a higher demand of services and a non-adequate use of available resources. Nevertheless, also the supply side with its HWF shortage has an influence on the lack of the attending capacity. It manifests itself in a lack of appointments and long waiting times for patients.

"...then it is sometimes the case that they say [...] we have a full schedule and they can come in four months."

P2, Regional Director Health insurance

4.3.2 Secondary determinants

In total six categories of secondary determinants have been identified, with five of them containing sub-categories: (i) patient management (ii) educational structure (iii) working situation (iv) attractivity of neighbourhood, (v) societal transformation and (vi) rural familiarity. All of them lead to one or more primary determinant. The following figure gives an overview of the individual influences between main consequences, primary and secondary determinants. A more detailed figure, including every individual factor can be found in the appendix 12.

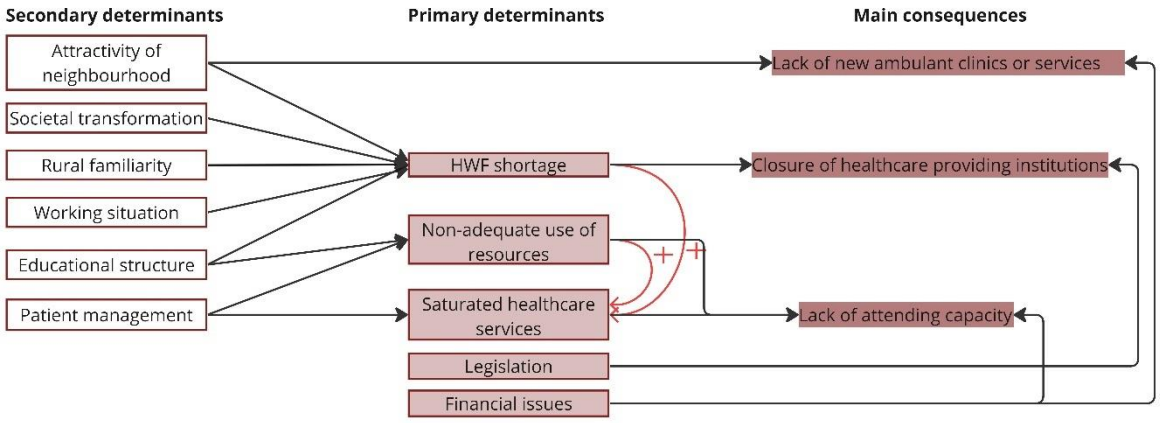

Figure 4: Overview of influences between main consequences and primary and secondary determinants

The category of **patient management** consists of two sub-categories: non-urgency ranking and no holistic patient approach. It describes how different aspects of patient management, provoke a misallocation of resources, and therewith lead to a lack of attending capacity.

The sub-category: non-urgency ranking refers to the issue that clinics don't differentiate sufficiently between patient with routine or preventive concerns and urgent cases and don't allocate their appointment capacity accordingly. Thus, it is reported that prevention checks occupy attending capacity for urgent cases and create a long waiting time.

"…they want to go for skin cancer screening, […] sometimes they can wait a few months for an appointment[,] but they push their way into the queue with all those who have suddenly developed a skin change. But those with the sudden skin change don't get an appointment…"

P1, Head of Hospital Investment Unit

The second sub-category: no holistic patient approach describes the experience that professionals only focus on the patient's specific medical condition, neglecting other aspects influencing the patient's health issue. It is reported that this delays recognizing and solving the actual problem of the patient and implies a long patient journey using resources that aren't justified or could have been avoided when understanding the patient better by looking in a more holistic way.

"And then I think there is a very big misallocation[,] that patients are then channelled through various systems[,] because you don't know exactly what they actually have, so sometimes people look too much subject specific, I think, and not at the whole patient or the person."

P4, Project- & Healthcare Manager

The category **educational structure** contains the two sub-categories of unattractive conditions for further training and the lack of professional skills, especially in the profession of nurses. The first sub-category reports on a too long duration and a faraway location of further training, making it unattractive for the HWF to undergo further training which then relates to a lack of HCW in that field.

"…if you are a specialist nurse for paediatrics after the old training, you need two to three years of professional experience, then two years of further training in neonatology, by which time the family has been founded and you are no longer prepared to change your place of residence for two years because this further training is only offered at a few locations."

P1, Head of Hospital Investment Unit

Further, the second sub-category refer to the event that particularly nurses, are reported to not be provided with enough responsibility to make decisions about patient's health issues from the professional skills and knowledge they have learned during training. They often rely on support from other professionals, which in turn, claims more resources, which then aren't available elsewhere.

"…the nurse in the hospital gives the heparin injection as a matter of routine if the prescription says so. In the ambulant sector, the normal nurse who comes for basic care is not allowed to do it because it may only be a geriatric nurse or a semi-skilled nurse, a registered nurse has to come and if the registered nurse finds out that there is something else [than what was suspected at the beginning] then she is not allowed to do anything else and has to inform the doctor or the ambulance service."

"…if, for example, the nurses were allowed to do a reasonable body check on their own responsibility and could say, according to my own judgement, I can't find anything here, it doesn't necessarily have to go through the obligatory X-ray [...] Then they would save a lot of transports, save a lot of waiting time in emergency rooms, save a lot of radiation exposure, save a lot of doctors' hours."

P1, Head of Hospital Investment Unit

Ongoing, the lack of responsibility provokes little recognition in the public and other professions for the work of nurses. This is a condition which is being criticised by the nurses itself because it creates unattractive working conditions and supports old hierarchy

structures. Consequences of unattractive working conditions will be further explained in the following category: working situation.

“But that is also a bit of responsibility and responsibility also means appreciation and recognition and that is exactly what is now being criticised by care workers … “

P1, Head of Hospital Investment Unit

The category **working situation** of the HWF contains three sub-categories: Low salary, working conditions and patient variety. It describes the working situation as a factor directly influencing the HWF shortage. Factors are reported to be more distinct in rural areas.
Low salary is a reported issue by the participants, making healthcare professions unattractive. It is reported that even after further training (especially for nurses) the salary doesn’t increase as much, as that it would make worth the effort of undergoing extra training.

"And in this respect, we really have to work on increasing the attractiveness on the financial side as well [.]”

P2, Regional Director Health insurance

Another factor, reported by the participants, are working conditions. More specifically it is reported that a high workload and long working hours are considered as negative. Further, a high need of colleague substitution during shift work, especially in the profession of nurses, is reported to be an issue. Apart from that a general dislike towards shift work and a lack of part-time jobs contributes to a negative perception of the working conditions. All these conditions are reported to negatively influence the attractivity of healthcare professions and therewith contribute to the HWF shortage.

"... 21 on-call services a month and 30 or 31 emergency doctor services 24 hours a day, seven days a week - not everyone wants that and I think that's one reason why it's so difficult to get people ...".

P3, GP on island

The patient variety refers to the multitude of different health issues that professionals would encounter in patients, mainly in underserved regions with little density of health professionals. Here, it is reported to be a factor increasing the attractivity to work in such areas, which consequently would reduce the lack of HWF.

"... that makes the work exciting. I would NEVER have become a general practitioner

anywhere else because I imagine it to be very, very boring...".
P3, GP on island

The **attractivity of the neighbourhood** for the HWF is considered to have an influence on the HWF shortage (primary determinant) but also directly on the lack of new ambulant clinics and services (main consequence). It can be seen as a secondary determinant influencing the attractivity of the working and living situation for HCW in an underserved area and therewith contributing to the HWF shortage. However, it can also be considered as a primary determinant in the sense that the attractivity of the neighbourhood directly impacts the availability of new ambulant clinics. However, both cases are further explained below.
The attractivity of the neighbourhood is determined by three sub-categories: networking possibilities with other professionals, the lifestyle, and the patient clientele that the HWF encounters in that region.
To be able to connect with other professions to create a network and to have professional support is reported to be an important factor which, if not possible, would discourage the HWF to open a new ambulant clinic in that region.

"… and also the networking with colleagues if, for example, as a general practitioner, you are also dependent on having appropriate specialist practices and physiotherapists and so on in the vicinity, then you also try to come to these regions and establish yourself there."
P2, Regional Director Health insurance

Further, the **lifestyle conditions** that are preferred by the individual HCW influence the choice of the working and living location. Living cots are reported to be one of these factors contributing to the attractivity of the neighbourhood. Experts reported that it is unlikely that HCW would open their own ambulant clinic in an unattractive neighbourhood.

"… This means that not every region is interesting for a doctor in private practice because rent and cost of living are more or less expensive[.]“
P1, Head of Hospital Investment Unit

An available infrastructure in a neighbourhood, including opportunities for childcare or further training for the professional is reported to contribute to the decision of the working location of the HWF.

"... you also need a complete local infrastructure, you need childcare facilities, you also need further training opportunities near your home [,] so that you don't have to travel to

the larger city [.]"

P4, Project- & Healthcare Manager

Infrastructure is also reported to influence the patient's behaviour regarding the use of healthcare services. More specifically, if there is not public transport available to reach the healthcare service, the use of these decreases, which makes it less attractive for professionals to open a new ambulant clinic.

"... the use is also partly related to the transport infrastructure, whether I have it or not ...".

P1, Head of Hospital Investment Unit

It is explained that professionals tend to open an ambulant clinic in regions where they would encounter the **patient clientele** that seems attractive for them. The sub-category patient clientele refers to the additional revenue that professionals would get from private patients that pay for extra services and therewith positively contribute to the economics of the clinic. In turn, if the patient clientele doesn't fit the economic expectations of the HCW, it reduced the attractivity of the neighbourhood for opening an ambulant clinic.

"… that the attractiveness is actually enhanced by the fact that there are [...] enough... patients live there who [...] belong to the desired group (laughs), [...], who are also more financially strong, one must clearly say that."

P2, Regional Director Health insurance

The sub-category further refers to the health literacy of the patient clientele. Participants reported that a low health literacy in the population, results in a non-adequate use of resources. In general, it was noted that the health literacy of people is decreasing due to lack of population education and digitalization. Digitalization gives access to an overwhelming amount of information, that can be found on the internet regarding, any type of health issue. It is reported that this increases the possibility of believing in fake information and therewith negatively contributes to the health literacy of the population. Low health literacy compromises that patients end up availing the emergency service because they can't estimate the urgency of their problem or don't know which other service to use due to a lack of knowledge about the healthcare system.

"…Immigrants who are also not so familiar with the system, who then actually don't know that there are doctors in ambulant practice and who then tend to [...] try to find [...] hospitals and sit in the emergency room there [...] if there are any hospitals at all or [they]

don't go there at all [.]"
P2, Regional Director Health insurance

This lack of knowledge about how and when to use the healthcare services can also result in non-use of the healthcare services. This in turn is reported to make the neighbourhood unattractive for a HCW to open their own clinic.

"This use of medical recourses also leads to frustration on the part of the doctor and doesn't necessarily motivate to go even further into rural or sparsely populated areas."
P1, Head of Hospital Investment Unit

The category **societal transformation** consists of three sub-categories, industrialization, demographic change, and generational change. Here, it describes the development in society and technology that emerged with time.
The sub-category industrialization describes the changes in the population due to technical development such as higher mobility of people and digitalization. Digitalization was already explained in the section of health literacy (see above), as an aspect negatively influencing it. Higher mobility due to diverse possibilities of transportation, facilitates moving away from the place of birth, towards a more attractive neighbourhood. In the case of HCWs, this contributes to a HWF shortage in unattractive neighbourhoods and increases the average age of the population.

"...an over-ageing is taking place, intensified by the fact that the older population remains there, but also that the professions or those practising the professions actually tend to orientate themselves elsewhere and then move their practices and their activities towards the west, and as a result the areas are of course suddenly under-supplied[.]"
P2, Regional Director Health insurance

In the case of the younger population in general moving away from their hometown, it increased the average age of the population staying there and simultaneously decreases the number of family members caring for their older relatives. Consequently, this creates a higher demand for services to fill the arisen gap of family caregivers, which in turn enhances the HWF shortage.

"… or a long time, family structures provided some support, but these structures are breaking down more and more simply because people have become more mobile, and you can't keep up with them."

P1, Head of Hospital Investment Unit

The demographic change is reported to influence the healthcare supply situation, as the over ageing of the population creates as well as a higher demand in healthcare services (e.g. long-term care) and at the same time enhances the HWF shortage due to a lack of young professionals coming forward.

"...also with the demographic change that, of course, far too few doctors are coming up."
P4, Project- & Healthcare

The generational change here refers to the differences between generations that appear in lifestyle and work preferences. The new generation that already is, or is about to become the present HWF, prefers a different working situation and more work-life balance than the baby boomer generation. Since the current structure doesn't reflect these changes, it enhances the shortage of the HWF.

„…The young generation of doctors quite legitimately want a bit of a work-life balance and they don't want to work themselves to death around the clock and be available for their patients around the clock, but they also want to have some time off [.]"
P3, GP on island

The category rural familiarity refers to the HWF shortage in especially rural areas. The participant reported that people who grew up in a rural area are more likely to leave these than to stay or to go back. The participant founded this opinion in the general trend of society to move towards urban areas. This therewith contributes to the HWF shortage especially in rural areas.

"… that if you really know the region well and if you feel a certain connection to the region, then I think it is easier or more likely to become active there[.]"
P2, Regional Director Health insurance

Another expert made a contradictory statement. Education in rural areas, growing up in a rural area or having family and friends in a rural area is reported to influence the HWFs choice to work in a rural area and therewith contributes to the HWF shortage.

"In my experience, that's exactly what they don't want, they prefer to live in the cities rather than be self-employed and I think that's the case all over the world, that people

don't prefer to live in the countryside but actually prefer to live in the city where the conditions are supposed to be better."

P3, GP on island

4.3.3 Primary determinants

Five categories of primary determinants were identified (a) HWF shortage, (b) saturation of healthcare services, (c) non-adequate use of resources, (d) legislation and (e) financial issues, with two of them (d) and (e) containing each, two sub-categories. Primary determinants are the consequences of the secondary determinants and describe the factors having a direct influence on one or more of the main consequences as described above.

The **HWF shortage** refers to the lack of HCW due to different circumstances (secondary determinants) for a multitude of professions. This shortage can present itself in an insufficient number of HCWs or in a bad distribution across regions of the available HCWs. Because of this shortage healthcare providing institutions can't find professionals or successors to absorb their ambulant clinics. This shortage creates a gap in the healthcare services supply which can lead to the closure of hospitals, wards, or ambulant clinics.

"…Hospitals are so understaffed at the moment that they keep cancelling emergency rooms or have no beds because they have no staff…"

P3, GP on island

It also provokes other effects, like the non-functioning patient referral from the emergency unit to other wards in the hospital or from wards to further care services such as rehabilitation centres.

"… and this now leads to the fact that we have the so-called 'overcrowding' in the emergency rooms nationwide, because the referral doesn't work, it doesn't work on the wards that don't have nurses or doctors [.] "

P1, Head of Hospital Investment Unit

The non-functioning patient referral leads to an overload of patients, waiting for a service, which has the **saturation of services** as an effect. This is enhanced by higher service demand in the population and long waiting times. Consequently, there is a lack of attending capacity.

The **non-adequate use of resources** refers to the wrong or unnecessary use of health personnel and services by patients, such as paramedics or appointments for medical services e.g. x-ray. It is induced by bad patient management, low health literacy in the population and lack of professional skills in the profession of nurses. It causes a lack of resources in the sense that these resources are not available for cases that would really need them. The final consequence of this series of events is the lack of attending capacity.

"…because then basically they use this medical resource, which is not available for others…"

P1, Head of Hospital Investment Unit

The category of **legislation** refers to regulations, influencing the healthcare supply situation. It consists of two sub-categories: Strict regulations of the G-BA and regulations of the KV. Regulations made by the G-BA to provide good quality care, are perceived as very strict. They consist, amongst others, of meeting a minimum number of cases per year and require professionals to have specific qualifications. These requirements complicate finding the appropriate personnel, which in the worst case leads to the closure of the healthcare institution.

"…if you don't have at least a minimum amount of births per year, then it is considered unsafe for mother and child because the expertise is supposedly no longer there and then the delivery rooms are closed. The next two delivery rooms in the area have been closed…"

P3, GP on island

Further, because Hamburg in itself is a planning area (Plangebiet), the regulations for the distribution of ambulant clinics across Hamburg can, in the worst case, cause a medical underserved area. The organisational structure affects the distribution of ambulant clinics in the sense that a vacant panel doctors' position not necessarily needs to be filled again at the same location or where there is the highest need for health services, but that professionals have a certain freedom to open their clinic in a neighbourhood that seems attractive to them. The other way round, unattractive regions, mostly already having little healthcare supply, suffer from this distribution algorithm as professionals avoid opening their own clinic in that area.

"…Hamburg is in itself a planning area, so you can't say in the case of the branch office or the panel doctor seats 'we have a seat here in Hamburg-Harburg, for example, and it has

to be filled', but when a seat becomes vacant it applies to the whole of Hamburg and then it can also be the case that the seats then shift accordingly, so that a seat that becomes vacant is not filled again in the same place but in a completely different place."

P2, Regional Director Health insurance

The category of **financial issues** consists of three sub-categories. Financial issues have a direct impact on the closure of healthcare providing institutions and contribute directly to the lack of new ambulant clinics. Budget allocation, High financial risk, and too long travel time. The category budget allocation refers to the available financial resources for the health sector to promote healthcare services and projects, provided by each federal state. In Germany there is no legal basis for the allocation of the budget, but each federal state is responsible for its distributions. Depending on the priorities of each federal state, the budget allocated to the health sector can vary across states. This is reported to be a problem because it can result in federal states that have too little budget available to realise health projects or to promote health services, which then decreases the availability of health services in this area.

"…and it depends on whether a federal state specifically promotes individual large-scale projects or promotes them according to urgency or simply distributes the available budget funds across the board. ... This already makes differences in the range of services…"

P1, Head of Hospital Investment Unit

An essential determinant for the lack of new ambulant clinics is the high financial risk that the individual professional would need to take. It is reported to be non-profitable or uneconomic to open your own ambulant clinic because professionals would need to use their equity capital for the purchase of equipment or even for the provision of specific services such as small surgical interventions (e.g. removal of material).

"…*the doctor in private practice often has to invest much more of his own money in his infrastructure than a hospital operator and then receives even less money for the service itself."*

P1, Head of Hospital Investment Unit

In turn, the hospital is provided with budget for such services. This results in a lack of ambulant services and patients in need of these services search for hospitals. The visit in the hospital then further enhances the saturation of services.

“Then the general practitioner says 'Why should I do that, go to the hospital' and then it clogs up the roads again…”

P1, Head of Hospital Investment Unit

Besides, it is reported that the financial contribution of self-employed midwives for their professional indemnity insurance increased drastically, so that the costs are not bearable anymore. Without an indemnity insurance, however, they are not allowed to work. Many midwives therefore must give up their work which consequently reduces the availability of their services.

A too long travel time for the professional to reach their patients, is considered as uneconomic because of fuel prices and the patient less treated in that time, but which would bring money. Services are therefore not provided and thus resulting in a lack of ambulant services. This mainly occurs in rural areas.

“…and that certain regions are simply not attractive enough for service providers, regardless of the profession, because they have too long travel times.”

“This means that the physio would have to make a house visit. However, it is not economically interesting for him, neither with regard to the current fuel prices, nor that he is on the road for half an hour during which he could actually finish off the next patient…”

P1, Head of Hospital Investment Unit

4.4 Approaches to address the issue of Medical Deserts in Germany

In the following the approaches are considered by the participants to be effective to address medical underserved areas in Germany are described. In total 4 main categories of approaches were identified. (i) Regional focussed & patient orientated approaches, (ii) professional support & infrastructure, (iii) Planning & monitoring of the HWFs and populations needs and (iv) rural undergraduate training.

4.4.1 Regional focussed & patient orientated approaches

In general participants reported that it is important to have a regional focus when it comes to implementing approaches effectively. Because of the federalist structure of Germany, each federal state differs in the healthcare supply structure, which comes with different characteristics of available health care offers in each federal state. Therefore, it is reported to be difficult to implement one holistic approach to Germany. Moreover, it is reported that it is important to increase the health literacy in the population, for a right use of the available healthcare services.

Local healthcare centres:

Local healthcare centres aim to provide low-threshold services, such as medical or social counselling, close to the home of (potential) patients. A special focus here is put on supporting vulnerable population groups and to the local needs of the population. One aspect of this is to increase the health literacy in the population. Therefore, the location of such a centre has to be well thought and population characteristics must be considered. It can't be applied with the same structure to other regions with different population characteristics. An advantage of these centres is that the provided services don't always need to be provided by medical doctors but can be provided by other health professionals as well. Besides, centres try to have different language represented. In general they constitute a good addition to the existing healthcare services as they follow a concept to relieve the medical care in underserved areas and to build up a network to better connect the players with each other. Further, it can serve as a support opportunity for medical doctors when having difficulties with a patient due to for example language barriers. However, the implication of such centres also faces some challenges. The centres need to be recognized by the population as well as by doctors, which can, according to the experts, take up to four or five years before its being effective and fully recognized. Additionally, getting the financial support to run such a centre can be difficult.

Community health nurse:

This concept consists in community health nurses being provided with extra skills through further education and a wider range of tasks then traditional educated nurses. Their services are supposed to be complementary to the medical services. In general, community health nurses go out, do home visits and care for people in communities and not in hospitals or residencies. Besides the care and support of patients, they are also doing routine and prevention checks, health promotion, patient counselling, and coordination of health services. It therewith reliefs the work of doctors, trying to fill the gap that the lack of medical doctors creates. This concept is already implemented in some regions but not widely spread across federal states yet. Important to understand it that the concept of community health nurses.

Mobile care units:

Mobile care units such as patient busses are going to communities conducting general health checks prevention checks (e.g. mammography) and routine examinations with the aim of avoiding long travel time for patients. Besides, the health personnel not necessarily have to be medical doctors which, again, helps to fill the gap that the lack of medical doctors creates. Although already partly implemented, it is seen as a critical approach by the experts because such busses only have a very specific timetable. If patients miss the bus, this could

lead to frustration and end in not seeing a doctor at all. Besides the services provided in the bus is reported to be not so tangible since there is a lack of human contact.

Telemedicine:

Telemedicine is reported to have a high potential as a complementary method of services. Especially for rural areas to overcome long distances. It can be used for patient counselling, meaning a direct contact between patient and professional but it can also be used for professionals getting support from other professionals. This of course depends on the health issue that the patient has. Providing psychotherapy online is reported to be very helpful. Further, information about the health issues for example a dermatological problem can be send by the GP to a specialist, getting respond within 48 hours. However, services such as ophthalmology are reported to be more difficult to realize via telemedicine. Besides it was recommended to be available in combination with services in person and not to fully replace the medial counselling in person because the personal contact is still highly valued in the population. Therefore, options for personal counselling should be maintained. Moreover, one need to keep in mind access barriers to such a service. These barriers could be constituted in the generational differences and knowledge about digital use, language barriers or internet connection issues. Thus, it doesn't address needs of the whole population and is not accessible for whole population and can only be partly a solution for a certain group patients and type of issues. It therefore, as reported by the experts, cannot be considered as solution for the whole society.

4.4.2 Professional support

Financial incentives:

Providing financial incentives to make rural or underserved areas more interesting for the younger generation or the HWF in general, was described as an approach, useful in Germany since the low salary and high financial risk when opening an own ambulant clinic were considered as factors contributing to the medical undersupply. So far, there have already been campaigns promoting the financial support and intending to increase the attractivity of underserved areas. Participants have divided opinions about their effectivity as some say that besides the money, also the work-life balance is highly valued these days and therefore wouldn't be enough of a motivation.

Temporary professional support:

Temporary professional support was in this context considered to be an approach that could be especially useful to (temporarily) increase the available healthcare services on islands. It consists in professionals coming to the islands as vacationer, having their own apartment and providing medical services to inhabitants and tourists being on holiday on the island. This could be especially helpful during the vacation season in summer, where there is an

increased demand of services in that time. For the patients this would reduce the need to go and seek other service that are difficult to reach. Although it is considered as a promising solution for the future it is difficult to implement in a short-term due to the law on panel doctors.

4.4.3 Planning & monitoring of the HWFs and populations needs

Nationwide demand planning:

Currently the need-based planning exists in Germany as an approach trying to reach a sufficient healthcare services supply. However, one participant considered the nation-wide demand planning as the theoretically most effective solution to provide a minimum supply of healthcare across Germany and to avoid medical underserved areas. Nevertheless, the participant also reported that due to the federalist structure it is very difficult to implement this approach any time soon. The nation-wide demand planning would be applied in hospital and ambulant care and for all other healthcare providers. More detailed, it would be calculated how many HCW are needed of what professions per 100.000 inhabitants and where they need to be located to be distributed equally and good to reach for the people.

Divided services:

The approach of divided services was reported as an approach seeking to split the working hours (service availability). Service times would be divided according to the times where most patients would come, such as in the whole morning and then again in afternoon or after work. In-between, where less patients would come for consultations anyway, less services would be provided, requiring less personnel. This would improve the working times, provide more work-life balance, and facilitate a better free time planning. This approach could be applied in ambulant clinics or hospitals. Nevertheless, it would be an approach mainly attractive to part-time workers because it otherwise would divide the schedule of fulltime workers in a very unattractive manner.

Special needs approval of over-target contracted doctor’s position:

The approach of a special needs’ approval of over-target panel doctors’ positions was considered as a solution to the unequal distribution of HCW across the planning areas that sometimes can occur. Although the limit of panel doctor positions in a certain planning area is already reached, a further panel doctor position would be approved, allowed to open a clinic in an underserved area. Available services in these underserved areas would increase. This is an approach which is already implemented.

Medical appointment service:

The medical appointment service is an existing service arranging medical appointments, provided by different health insurances, intending to compensate undersupply. Patients that are unhappy with their appointment because of too long waiting times for example, have

the opportunity to call their insurance and ask for a better appointment. The health insurance will use their expertise and knowledge about the healthcare provider situation and possibly free attending capacities to find an appointment that suits the patient better. This is especially useful for patients in emergency situations. It also supports he patient to find the right doctor or specialist. However, appointments for psychotherapy are not included.

4.4.4 Rural undergraduate training

Rural undergraduate training is reported to be an approach which is very useful in Germany. It is an approach that seeks to provide medical students with experiences in underserved or rural areas. These experiences shall create familiarity with that environment and increase the willingness of choosing this as a working place after graduation. Besides it was reported that focussing on recruiting students that already have the intention to work in an underserved or rural areas before starting the studies, or grew up in such an area, supports the approach.

5 Discussion

5.1 Summary of results and comparison with existing literature

This work provides and overview of factors contributing to MDs in Germany and approaches to mitigate these, from the perspective of healthcare professionals and policy makers. Participants mainly described MDs in Germany as territorial areas that have problems to access healthcare services due to geographically large distances. They were also described as urban areas with the characteristic of healthcare supply offers being used non-adequately, creating a lack of available resources. An older population was considered as a characteristic contributing to MDs in rural but also urban areas. The geographical distribution of MDs was described similarly to what is found in literature. Especially the so-called new federal states (Mecklenburg-Western Pomerania, Brandenburg, Saxony-Anhalt, Thuringia and Saxony) in eastern Germany are affected by MDs (Kassenärztliche Bundesvereinigung, 2023). Besides, also northern Germany, its islands (e.g. North Frisian Islands and Amrum) and some parts of southern Germany have difficulties with MDs.

MDs in Germany are caused by a combination of Factors. The main factors that lead to MDs in Germany are the lack of new ambulant clinics or services also reported by the KBV (Kassenärztliche Bundesvereinigung, 2023), the closure of healthcare providing institutions, and the lack of attending capacity. These are caused by the primary determinants like the HWF shortage (Kassenärztliche Bundesvereinigung, 2023), saturation of healthcare services (Atkinson & Boyon, 2022), non-adequate use of resources (Grote Westrick et al.,

2019), legislation, and financial issues. The HWF shortage leads to a gap in healthcare services and affects patient referrals, resulting in a saturation of services and a lack of attending capacity. Non-adequate use of resources is caused by factors such as bad patient management, low health literacy, and lack of professional skills. Legislation and financial issues, including strict regulations by the G-BA and KV, budget allocation (Kassenärztliche Bundesvereinigung, 2023), and a high financial risk (KBV, 2019), also impact the closure of healthcare institutions and the lack of new ambulant clinics. A factor additionally reported in literature is the amount of bureaucracy work decreasing the willingness to open an ambulant clinic (Kassenärztliche Bundesvereinigung, 2023). Secondary determinants of MDs include patient management, educational structure, working situation, societal transformation, attractivity of the neighbourhood, and rural familiarity. As also stated by Sundmacher (Sundmacher & Ozegowski, 2016) the fees for privately insured patients are higher, thus, doctors with a higher percentage of private patients usually earn more money and therefore prefer to open their clinic in a neighbourhood with a sufficient amount of private insured patients. These normally tend to be areas that have an average or even higher socioeconomic status. Factors such as the societal transformation (Ono et al., 2014), the increasing number of older people in rural areas (OECD, 2015) and weak infrastructure (Kassenärztliche Bundesvereinigung, 2023) additionally lead to an increasing discrepancy between rural and urban areas. Overall, these are the contributing factors which create MDs in Germany, with insufficient healthcare services in certain areas and a HWF shortage.

Eleven approaches to address the issue of MDs in Germany were identified. They can be categorized into four main categories: regional-focused and patient-oriented approaches, professional support, and infrastructure, planning and monitoring of HWF and population needs, and rural undergraduate training. Most approaches are summarised under the category of regional-focused and patient-oriented approaches. Regional-focused approaches emphasize the importance of tailoring healthcare solutions to the specific characteristics and needs of each federal state. These include establishing local healthcare centres, employing community health nurses, implementing mobile care units, and utilizing telemedicine. Professional support measures involve providing incentives and temporary support to healthcare professionals in underserved areas. Planning and monitoring initiatives aim to ensure a minimum supply of healthcare across Germany, including nationwide demand planning and divided services based on appointment peaks. Finally, rural undergraduate training focuses on recruiting students from rural areas to address the HWF shortage in those regions. Each approach has its own advantages and challenges, but implementing a combination of these strategies can help alleviate the problem of medical underserved areas in Germany.

5.2 Reflecting on factors in context of Germany

A multitude of factors was identified. As they can interact with each other, depend on each other, and/or influence each other it is not only one isolated factor leading to a MDs but a set of different factors. Further, because of the multitude of influences that they can have, it is not always possible to make a clear distinction of categories, and categories might overlap in certain aspects. This is further described in the following. The influencing directions of factors can be two folded. A factor can directly lead to a consequence or can serve as an enhancer for another factor. In other words, factors can be main consequences but also be primary or secondary determinants at the same time. And sometimes primary determinants can function as secondary determinants or the other way round. Even the main consequence *lack of new ambulant clinics and services* which is directly influencing the occurrence of a medical desert simultaneously enhances the overcrowding effect in emergency wards which in the end results in *lack of attending capacity*. Another example is the attractivity of the neighbourhood. This factor is considered as a primary determinant for the *lack of new ambulant clinics* as doctors avoid opening their clinic in areas that seem unattractive for them. Simultaneously it can be considered as secondary determinant for the HWF shortage (primary determinant) since living costs and the available infrastructure in a neighbourhood influence the HCWs choice of moving to a certain area. One could argue that maybe the category is formulated too broad. On the other hand, having this category which contains everything that contributes to an attractive neighbourhood, facilitates describing the phenomenon. Besides, certain factors can create a rebound effect leading to a circle of events that enhances the occurrence and persistence of MDs. More specifically, bad working conditions negatively influence the attractivity of a profession. This then can result in only a little amount of people working in this profession, which is called a HWF shortage. This HWF shortage in turn worsens the already bad working conditions by having more stress at work due to the lack of personnel. Another negative spiral starts with young professionals moving to a more attractive neighbourhood, because they want to live in an area that aligns with their lifestyle. Young people leaving, leads to an over ageing and a HWF shortage in that certain area. This in turn, makes the area more unattractive for other HCW. However, it simultaneously lowers the living costs such as rent in that aera. The lower living costs make the area more attractive to people with lower economic resources e.g. migrants. Anyhow, this again makes the specific area less attractive for the HWF because they won’t encounter their preferred patient clientele. This increases the disparity of healthcare demand and supply. Considering the multi-dimensional influence of factors, one needs to carefully consider different aspects when wanting to address the issue of MDs. However, all information is based on, although experts, a subjective opinion. Besides, one needs to distinguish between characteristics of an area and determinants influencing the

main consequences. This distinction might not always be super clear as certain characteristics of the society e.g. a low socioeconomic status could also be considered as a tertiary determinant for health literacy. Therefore, it is difficult to show the complexity of the whole concept of why MDs exist in a comprehensive way.

5.3 Reflecting on approaches in context of Germany

From the expert interviews three general concepts evolved that should be taken into account when addressing MDs: First, it is important to have a regional focus, considering the regional needs of the population when wanting to improve the medical supply in specific areas. In general, it was criticised by the experts that when trying to implement approaches, the focus of these often is not sufficiently on regional needs but have a too wide perspective on the whole of Germany. Because of the federalist organisational structure in Germany each federal state has its own unique advantages, disadvantages, and different grown healthcare supply structures. It is important to acknowledge that there is no one-fits-all solution that can universally be applied for whole of Germany. Looking from another perspective as provided by the expert P1, one could criticise that the federalist structure is a barrier to provide sufficient and uniform healthcare across Germany. Although the current organisational structure serves to address and respond to individual differences between populations needs across federal states, a nation-wide demand planning, providing uniform regulations for whole Germany, would better facilitate to guarantee a minimum of healthcare supply across Germany. The expert justifies this with the good health outcomes of the population in Nordic countries. There, the distribution of hospitals, inpatients clinics, is very dispersed but the few clinics that exists provide super high-quality care which is reflected in the good health outcomes. One example is the reporting on lowest proportion of low birthweight babies (OECD, 2020b). Secondly, one should consider changes in society such as digitalisation, trends of preferred working-time models and employment models. And third, increasing the health literacy in the population to promote the right use of available resources. These three concepts are intertwined and should therefore go hand in hand with each other. Besides, from the interviews one could suggest that there are differences in characteristics of MDs in rural and urban areas. All these aspects would require different or individually designed approaches to address the prevailing type of MDs.

5.3.1 Do the approaches address the factors?

Ideas of contributing factors and approaches to address MDs were collected independently. But of course, an important aspect is whether the identified approaches relate with the identified factors. The approach of a **community health nurse** for example gives more responsibility to the nursing profession since during a further training more skills area

learned. Moreover, a community health nurse has a more flexible working time, and it releases the saturated system with the work that they provide. The same applies for the **mobile care units**, that try to release the saturated healthcare system by going to the places where more services are needed. **Local healthcare centres** seem to be a very helpful approach. Since the professionals don't have to be medical professionals it supports the HWF shortage by taking over part of the high workload and therewith release the saturation of the healthcare services. This also applies for the concept of the community health nurse and the mobile care units. Additionally, due to its inter-professional approach it increases the networking with professionals in the surrounding area. Another important aspect is that local healthcare centres seek to address the health literacy of the population, which is reported to be a strong contributing factor. **Telemedicine** can help to address the issue of lack of networking possibilities in certain areas by getting support from other professionals via the internet. Furthermore, it can reduce the long waiting times and travel distances for patients. Providing **financial incentives** helps to address the high financial risk that HCW take when opening their own ambulant clinic but also makes the underserved areas more interesting for newcomers. **Temporary professional support** could help to address the issue of HWF shortage. Here, this approach was mentioned in the context of the island Amrum where especially in summer the local healthcare provider has difficulties to provide sufficient services for the population and the additional visitors. So, professionals coming during the summer to the island could be of great support, increasing the medical available supply services. The idea of **dividing the service times** according to the times where most patients would come, would help to address the issue of HWF shortage by providing better working conditions and adapting to the current needs and wishes of the younger HCW generation. **Special needs approval of over-target panel doctors position** addresses the lack of new ambulant clinics by ignoring the maximum number of allowed ambulant clinics in a planning area. This allows professionals to open their ambulant clinic in an underserved area to increase the available supply on site. However, this approach seems to be more symptom treating then really addressing the issue of a medical desert. It simply tries to weaken the results of a badly managed allocation of healthcare providers instead of making changes in the allocation algorithm itself. The approach of the **medical appointment service** is useful for better allocation of resources by make the highest use of what is available. **Rural undergraduate training** is one of the most relevant approaches especially addressing the HWF shortage in rural areas. All mentioned approaches find their justification by seemingly addressing at least one of the identified factors. However, only the fact that approaches address the identified factors doesn't make any statement about their effectiveness. Therefore, this cannot be seen as an evaluation of the approaches. Nevertheless, looking the other way round, the question

if there are factors that aren't sufficiently addressed by the available approaches, occurs. Of course, here again, one must consider that the initial question of this paper was to not state if factors are adequately addressed nor to provide a complete overview of existing approaches, but to get insight in the most useful solutions to MDs in the context of Germany. Therefore, the following statement is a personal and subjective impression that occurred during this work. The low health literacy in the population has a high impact on the user-behaviour of the society using the healthcare services, which in turn strongly influences the occurrence of MDs. However, although apparently being of high impact, this is not reflected in the presented approaches. Moreover, although given the current times with a lot of migration and movements in the population, surprisingly migration of doctors to Germany wasn't named as an approach to address the HWF shortage. Nevertheless, it is described in literature to be considered as option to address the issue of the HWF shortage (Kroll et al., 2019). When reflecting on the approaches it is important to consider that the presented opinion, although provided by an expert, is still subjective and therewith cannot be seen as the ultimate truth.

5.4 Are the expert interview results reflected in the comparison of factors and approaches?

As reported in the background, the main factors influencing the HWF shortage for western high-income countries are work-related factors, Lifestyle-related factors, and sociodemographic characteristics of the population (Flinterman et al., 2023). In the paper of (Seils et al., 2023) it becomes apparent that all main factors except for migration, apply to a different extend, to all the countries included in the comparison. Obviously, it is important to keep in mind that the specific factors, summarized under each of the main factors can vary across the countries and occupations as it is shown in the tables a1 and a2 in appendix 1. Most of the contributing factors specifically contributing to the HWF shortage in Germany summarized under the above-mentioned main factors by Seils et al., (Seils et al., 2023), were also identified in the expert interviews. These are financial issues (Goetz et al., 2013; Natanzon et al., 2010), the high workload (Goetz et al., 2013; Steinhaeuser et al., 2011), the work or patient variety (Natanzon et al., 2010), rural background (Natanzon et al., 2010; Wilhelmi et al., 2018) and proximity to family (here called: rural familiarity) (Wilhelmi et al., 2018). Factors identified in the previous study but not in the interview are the level of job satisfaction (Goetz et al., 2013), the working atmosphere (Natanzon et al., 2010), lack of access to leisure activities (Natanzon et al., 2010; Wilhelmi et al., 2018) and specific character traits of the HCW (Natanzon et al., 2010; Wilhelmi et al., 2018). However, the fact that these factors were not identified in the expert interviews doesn't necessarily mean that they don't exist. It could simply be due to the fact

that the focus of the expert interviews was not only the HWF shortage as a reason for MDs, but also looked on factors going beyond this. Their individual causes and consequences of the factors, however, depend on individual characteristics of a country.
Some of the approaches identified in the manuscript in preparation by Seils et al. (Seils et al., 2023) were also identified in the expert interviews. These are the rural undergraduate training, financial incentives, telemedicine, mobile care units and the concept of community health nurses. However, as the focus in this paper was specifically on Germany, approaches not previously described in the manuscript in preparation by Seils et al. (Seils et al., 2023) were identified, such as the concept of local healthcare centres, temporary support of professionals, divided services, special needs approval of over target panel doctors' positions and the medical appointment services.

Although the focus of the expert interviews was not on a specific healthcare profession but referred to HCW in general, differences in factors across different professions could be assumed. Reasons for these differences could for example be the education and training requirements and reimbursement and insurance covering. Education and training requirements such as a lack of professional skills and further education opportunities, were mentioned as a contributing factor especially for nurses. Besides, reimbursement and insurance covering could be reason for a difference since participants stated that a lack of financial reimbursement keeps medical doctors from opening their own ambulant clinic. Moreover, the missing insurance covering for especially midwives was reported to drastically influence their availability. A further aspect that peaked the eye is that approaches considered as relevant for Germany mainly support medical doctors or address nurses.

5.5 Personal impressions

In the following, different impressions are described that I gained during the whole process of this paper. Although I have certain knowledge about MDs, which helps me to understand and interpret the expert interviews (the source of my impressions), I can be wrong with my impression.

5.5.1 Country specific characteristics influencing medical deserts

During the interviews it became apparent that certain characteristics of an area or the country in general, that can make areas more prone to become a medical desert. Contributing factors to MDs therefore might have a different strength of impact on regions across Germany. Region specific characteristics are here referring to the geographical conditions, age, and socioeconomic status of the population or available/different grown healthcare structures across the federal states.
Geographical conditions such as isolation of islands can complicate the supply situation

since shuttling back and forth between and island and the land is a very unattractive condition for HCW and only hardly possible, as reported by the expert.

Further, the areas with more vulnerable populations such as those with a lower socioeconomic status amongst others really seem to have an impact on the vulnerability of the area to become a medical desert. The following example, taken from the interviews, will illustrate this. Investing equity capital to open an ambulant clinic doesn't is bearable if the individual person is sure of getting the money back by revenues from their patient clientele e.g. private patients. If, however, the area is characterised by a low socioeconomic status population, investing equity capital won't be rentable there and HCW won't end up opening their clinic in that area. Therewith they provoke unreservedness or at least don't contribute to available healthcare supply in that area.

As understood from the interviews the availability of healthcare services is also influenced by characteristics of the country. I think such characteristics for Germany are the history, the organisational structure, and the healthcare system. It seems like that Germanies history, and the federalist organisational structure caused and still causes different grown healthcare supply structures across the country. Participant reported that the history of Germany provoked an unequal basis in healthcare supply structures and therewith creates differences in the availability of services. Further participants stated that since Germany was split in east and west after the second world war, the healthcare supply was managed differently in these two areas and that this is now reflected in eastern Germany running more in hospital structures than western Germany. I therefore assume, that the closure of single hospitals wards or even whole hospitals due to the HWF shortage or unfulfillable regulations by the G-BA, might lead with a higher probability to a medical desert in eastern Germany then in western Germany.

While the federal government sets certain overarching policies and regulations, the responsibility for implementing and managing healthcare services primarily lies with the individual states. This can lead to variations in healthcare planning and delivery across different regions, as each state has some degree of autonomy in shaping its healthcare system (Bundesministerium für Gesundheit, 2022). I think these variations become visible in the example of the allocation of the budget for promoting healthcare projects, which is allocated according to the federal state's priorities. In case the federal state doesn't see the need to promote local health projects, this can provoke different healthcare supply situation that might be more or less prone to become a medical desert. In the end, the whole concept of MDs is embedded in the German system, which is defined by its political will and lived by the parties elected by society. In my opinion this political will decides on actions that could be conservative or progressive and therewith at the same time constitutes the motivation for the Government of Germany but also for the federal states governments to

allocate the budget available for the health sector.

Besides, I think to appropriately address the issue of MDs in Germany, the focus should be more on the changes that happen in society. On the one hand the changes within the HWF, meaning the wish for more work-life balance, plannable free time, and higher salary. On the other hand, changes in the population like the growing older population and the higher mobility of people. But also, the multitude of different cultures represented in Germany not least due to many migration movements that happened in the recent years. My impression is that these changes in society are underestimated or rather that the German healthcare system lags with recognising them and adapt to these changes and current circumstances. This impression is based in the here identified factors such as long working hours, low salary, the over ageing, higher mobility of people and the low level of health literacy, tearing a gap into the available healthcare supply, although these changes were foreseeable or are considered as an issue for already a long time. Also, it seems controversial that the health literacy is decreasing although everything else is developing further. This could be seen as another indices that Germany is not doing sufficiently to keep up with societies development. Therefore, I think to adapt to the new situation and circumstances in population is important to keep providing an appropriate and good quality health care.

5.5.2 The definition of medical deserts

One fact that kept showing up during the process of this work, is the question for an adequate and proper definition of a medical desert. I think the lack of a uniform and holistic definition of MDs in Germany makes the problem of it difficult to tackle. Maybe the needs-based planning for each federal state can, in a certain way, be seen as a definition for MDs as it consists of regulations that prescribe a certain level of available healthcare supply across regions. And additionally respects differences in population ageing, the socioeconomic status and morbidity of people. However, the needs-based planning as well as other available definitions mostly define MDs as a shortage of HCW and mainly refer to physicians or doctors in general, leaving aside other HCW that also significantly contribute to the healthcare service provision. Besides, available definitions and the needs-based planning miss on characteristics of MDs for a proper definition, such as the distance to the next healthcare facility and the socioeconomic status of the population, which should be considered when defining MDs (ROUTE-HWF Team, 2023). Besides, I think that also the geographical accessibility or geographical conditions are an important characteristic, when thinking of islands for example. This becomes apparent in the interview with P4, where the participant describes that in emergency cases one needs to take the rescue cruiser or the helicopter and that the GKV physicians law leaves no flexibility to be adapted to such special geographic conditions. I assume that the missing of these characteristics denies the

recognition of different types of MDs that exist. Additionally, measuring the extent and severity of MDs becomes challenging without a uniform definition or a definition missing on characteristics. It becomes difficult to collect accurate data and compare different regions or populations. I think this makes it hard to identify the most underserved areas and allocate resources effectively. From my perspective this causes further problems as different types of MDs require different approaches to mitigate them. Moreover, none of the definitions includes the patient's perspective, even though it's considered as important to have patients' contribution in developing a definition. It is especially relevant to mitigate MDs and to improve access to care for the ones using it and are affected by access barriers.

5.5.3 Perception of medical deserts

A further impression I got during this work is that the perception of MDs depends a lot on the perspective one has. In the following I explain how I got to that impression.

A phenomenon that occurs in society are areas that are perceived as underserved although healthcare services are, supposedly, available. In the following this phenomenon is named: artificial MDs. They are constructed by different perspectives on MDs - patients or policy makers perspective, the expectations, and customs that today's society has towards the healthcare supply. Also, the miscommunication of political decisions leading to a biased image and expectations of the medical treatment situation in the population contributes to this phenomenon. An illustrative example for this is the quality requirements towards hospitals set by the G-BA. To maintain a certain level of quality of care, a minimum of cases has to be met and the staff needs to have certain qualifications. With the current HWF shortage it is difficult to implement these requirements in all hospitals. Therefore, some wards or even hospitals must close. Patients, that live in the area where the hospital was closed, now have to drive more kilometres to reach the next hospital than they had to drive before and perceive the region therefore as underserved. On the other hand, from a policy makers perspective who wants to assure good-quality care a longer travel time to the next hospital is a tolerable aspect. Regions therefore wouldn't be considered as MDs, because according to their claims, sufficient healthcare is provided. This again, shows the importance of including patients' perspective in a definition for MDs, since they might give a different importance to aspects then policy makers would do and are the ones actually affected by access barriers. It also shows that a clear communication between the policy makers and its society about the objectives of political decisions is key avoid misunderstandings and artificial MDs.

Another dimension of the artificial medical desert is manifested in the healthcare supply that is available but doesn't reach the vulnerable groups. It doesn't reach the vulnerable groups because the education of the population to increase the health literacy, making the existing

services accessible and visible for whole population, is missing. I consider the accessibility to healthcare services as an aspect of respect towards the society and politics should be sensible towards their society, especially in a state with the system based on solidarity. I therefore think the aspect of accessibility for vulnerable groups should be considered when defining MDs. If another definition, with a patient's perspective would be used, to describing a type of medical desert where also the visibility of services is considered, this could be considered as a real and not only an artificial medical desert. Anyway, in this paper a medical desert is defined if there is a disparity between healthcare demand and supply, which in this case is not given, because the healthcare services exist.

Taking a step backwards to see the whole phenomenon of MDs from an international perspective it becomes visible that even the German definitions are adapted to the standards of high-income countries. Despite a reported nursing and physician shortage, and the reported density of doctors in rural areas below the European average (Blümel et al., 2020), in general Germany still boasts a higher density of practicing physicians and nurses across the whole country, compared to the EU average (OCED, 2021). Germany exceeds the EU average in terms of physicians and nurses per population, with 431 practicing physicians per 100,000 people compared to the EU average of 369, and 1322 practicing nurses per 100,000 people compared to the EU average of 816 (OCED, 2020). The country's substantial investment in healthcare, with a greater allocation of funds from public sources than any other EU nation, contributes to this advantage. Germany's health expenditure per capita with 4 831 € per person, is the highest among EU Member States, allowing for ample resources such as a larger number of hospital beds per population (40% higher than the EU average) (OCED, 2021).

In general, this shows how subjective the concept of a MDs can be, depending on the definition used, the perspective and the context one is looking from.

5.6 Strengths and limitations

The expert-interviews provide an in-depth insight into current contributing factors and approaches to mitigate medical deserts. However, the study has limitations that need to be considered. Firstly, the small sample size and narrow focus of the selected experts. Although the experts have expertise in the north of Germany, particularly in Hamburg, they may not fully represent the entire situation in Germany. Besides, identified factors and the view on approaches depend solely on the expert's opinions. It is crucial to be cautious when interpreting the results as no causality can be concluded. Another limitation is the purposive sampling method used to recruit experts. This methos is highly subjective because it is determined by the researcher generating qualifying criteria (Moser & Korstjens, 2018). Furthermore, the results of the study can only, if at all, be generalized to high-income

countries because the data collection was conducted in Germany and factors can even vary across high-income countries. Additionally, the study was conducted by a single researcher, which falls short of the quality criteria typically required for qualitative analysis. While the presented work aimed to strike a balance between depicting the complexity of the topic and simplifying it, it is important to acknowledge that it may not capture the complete complexity, and that elements might be missing. Finally, the perspective of patients was not included, which means that the full truth is not represented. Besides factors and a comprehensive representation of the medical desert situation might be missing. For future research, it would be valuable to focus on the existing differences between eastern and western Germany. Moreover, it is recommended to place more emphasis on gathering the perspectives of patients regarding MDs. Patients, being in frequent contact with the healthcare system, possess valuable knowledge about the barriers and gaps in accessing healthcare services. Their insights can provide essential information to address MDs. Patients' organizations can also contribute their collective expertise on this topic.

6 Conclusion

The phenomenon of MDs is complex. Each factor can have various influences on other factors and is caused by a multitude of factors. It therefore is not solely one factor leading to an entire medical desert, if not an interplay of different factors, creating a medical desert. The qualitative analysis showed that there are three main consequences, resulting from primary and secondary determinants and causing MDs in Germany. The primary and secondary determinants, here reflect the complex interplay of factors. Efforts should be made to improve the working conditions and remuneration of healthcare professionals, challenging the outdated perceptions, and recognizing the vital roles they play in providing quality care. Additionally, some regions might be more prone to MDs than others due to their socioeconomic status, age of the population, their geographical conditions and available healthcare supply structures. Factors therefore could affect these regions more less severe. Furthermore, factors specific to Germany are shaped by Germanies history, it's system of government and its political will and the healthcare system. Therefore, although common challenges might exist, factors or at least their consequences and causes can vary across different countries.

To effectively address the issue of MDs, approaches need to be specifically designed and adapted to the contributing factors relevant to Germany. It is important that approaches have a regional focus and are patient orientated. A further important aspect to improve the healthcare supply situation in Germany, is not only focussing on the availability of services but also on the society having the knowledge of when and how to use available services. Although different approaches were named and most of them are about to be or are already implemented, they will take time to develop their effect. All of them, will in a long-term address the issue but the current lack of HCW for example is not being covered by these. A short-term and unbureaucratic implementation of approaches such as the temporary support by professionals on an island, however, seems to be difficult.

Since contributing factors and therewith applied approaches can also vary depending on the perspective one is looking from, a sound definition to identify medical desert, including the perspectives of policy makers, professionals, and patients, is essential to properly tackle MDs. Further research should focus on the patient's perspective of MDs. And differences in healthcare supply structures between eastern and western Germany should be considered.

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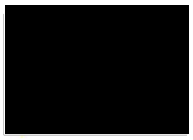
8 Declaration of independent work

I hereby declare that I wrote this thesis without any assistance and used only the aids listed. Any material taken from other works, either as a quote or idea have been indicated under ‘Sources’.



Appendix

Appendix 1: Tables with specific contributing factors and approaches for European countries

		FACTOR		Reference
Continent / Country (n)		**Main factor**	**Sub theme (n)**	
Europe (n=11)	Austria (n=1)	*Work-related factors*	High workload (n=1)	Hoffmann et al., 2015
	Switzerland (n=1)	*Work-related factors*	Financial issues (n=1)	Abbiati et al., 2020
			Lack of educational and proefssional development opportunities (n=1)	Abbiati et al., 2020
			Work atmosphere (n=1)	Abbiati et al., 2020
			Work variety (n=1)	Abbiati et al., 2020
	United Kingdome (n=3)	*Work-related factors*	Financial issues (n=1)	Edwards et al., 2015
		Lifestyle-related factors	Aproximity to family (n=2)	Edwards et al., 2015; Lee & Cunningham, 2019
		HWF characteristics	Rural training(n=1)	Edwards et al., 2015
			Preexisting geographical preferences (n=1)	Lee & Cunningham, 2019
	Germany (n=4)	*Work-related factors*	Financial issues (n=2)	Goetz et al., 2013; Natanzon et al., 2010
			Level of Job-satisfaction (n=1)	Goetz et al., 2013
			High workload (n=2)	Goetz et al., 2013; Steinhaeuser et al., 2011
			Working atmosphere (n=1)	Natanzon et al., 2010
			Work variety (n=1)	Natanzon et al., 2010
		Lifestyle-related factors	Aproximity to family (n=1)	Wilhelmi et al., 2018
			Lack of access to leisure activities (n=2)	Natanzon et al., 2010; Wilhelmi et al., 2018
		HWF characteristics	Rural background (n=2)	Natanzon et al., 2010; Wilhelmi et al., 2018
			Rural training (n=1)	Wilhelmi et al., 2018
			Character traits (n=1)	Natanzon et al., 2010
	Romania (n=1)	*Migration*	Migration to other countries	Duma et al., 2011
	Netherlands (n=1)	*Work-related factors*	High workload (n=1)	van Hassel et al., 2019
			Wokring atmosphere (n=1)	van Hassel et al., 2019
	Norway (n=1)	*Work-related factors*	Working conditions (n=1)	Holte et al., 2015

Table a2: Approaches to mitigate medical deserts in Europe.

Continent / Countries (n)		APPROACH		Reference
		Main topic	**Sub theme (n)**	
Europe (n=9)	France (n=1)	*Support and infrstructure*	Development of primary care teams (n=1)	Chevillard et al., 2019
	UK (n=1)	*Support and infrstructure*	Targeted Enhanced Recruitment Scheme (n=1)	Lee & Cunningham, 2019
	Germany (n=3)	*Undergraduate training*	Rural clinical rotation for 8 days (n=1)	Flum et al., 2016
		Support and infrastructure	Delegation of physicians' tasks to qualified, non-physician staff (n=1)	Dini et al., 2012
			Use of trained medical assistants (n=1)	Kuhn et al., 2017
		Innovative models of care	Patient buses (n=1)	Kuhn et al., 2017
			Mobile offices (n=1)	Kuhn et al., 2017
	Ireland (n=2)	*Undergraduate training*	School programs supporting early-entry rural and generalist pathways – North Dublin City General Practitioner Programme (n=1)	O Carroll & O'Reilly, 2019
		Postgraduate training	Small group continuing medical education (n=1)	Dowling et al., 2019
	Norway (n=1)	*Undergraduate training*	University-based rural clinical school (n=1)	Magnus & Tollan, 1993
	Multiple EU-countries (n=1)	*Undergraduate training*	Rural clinical rotations (n=1)	Ozegowski, 2013
		Professional support and infrastructure	Non-financial incentives (n=1)	Ozegowski, 2013
		Planning and monitoring of the HWF distribution	Quotas for physicians' contracts and practice license (n=1)	Ozegowski, 2013

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Appendix 2: E-mails to participants

Masterarbeit - Medizinisch Isolierte Regionen

Sehr geehrte/r Frau Herr XXX,

Mein Name ist Laura Seils und zurzeit schreibe ich meine Masterarbeit in dem Studiengang *Health Science* and der HAW-Hamburg.
Im Rahmen meiner Masterarbeit, möchte ich gerne Experteninterviews zu dem Thema „Medical Deserts“ oder "medizinisch isolierte Regionen" durchführen.
Aus diesem Grund schreibe ich Ihnen. Auf meiner Suche nach Experten in dem Bereich medizinisch isolierter Regionen bin ich durch die Webseite der *Kassenärztlichen Vereinigung XXX* auf Ihren Kontakt gestoßen.
Ich habe mich gefragt, ob Sie sich selbst als Expertin/Experte in diesem Bereich bezeichnen würden, oder ob Ihnen jemand bekannt ist, der ein breites Wissen in diesem Bereich hat.
Im Folgenden beschreibe ich kurz, worum genau es in dem Interview gehen soll. Vielleicht hilft Ihnen das bei der Einschätzung.

Generell stellen medizinisch isolierte Regionen ein Problem in der Gesundheitsversorgung der Bevölkerung dar. In der Literatur gibt es bereits einige Studien zu dem Thema von medizinisch isolierten Regionen, allerdings ist die Evidenzlage für Deutschland im speziellen eher gering.
Als Grundlage für das Experten Interview dient eine systematische Übersichtsarbeit zu den Definitionen, Charakteristiken, Einflussfaktoren und Lösungsansätzen für Medical Deserts.
<u>In dem Experteninterview wird es vor allem um die folgenden zwei Punkte gehen:</u>

1. Darum, herauszufinden, welche in der Literatur bereits identifizierten Einflussfaktoren auf Medical Deserts eine Relevanz in Deutschland haben, oder ob vielleicht weitere bisher nicht beschriebene Faktoren eine Rolle spielen, und

2. Welche Lösungsansätze bereits angewendet werden, bzw. welche Strategien in Deutschland kurzfristig und unbürokratisch implementiert werden könnten, um das Problem von medizinisch isolierten Regionen in Deutschland anzugehen.

Wenn Sie sich selbst mit dem Thema auskennen, oder Ihnen jemand einfällt an den ich mich sonst wenden könnte, würde ich mich sehr freuen von Ihnen zu hören.

Bis dahin, mit freundlichen Grüßen
Laura Seils

Appendix 3: Informed consent

Einverständniserklärung zur Erhebung und Verarbeitung von Interviewdaten

Erläuterung

Sie erklären sich dazu bereit, im Rahmen der Masterarbeit mit dem Titel:

„**Medical deserts in high-Income countries – A study on contributing factors and mitigation approaches with an in-depth qualitative focus into the perspective of German health professionals**“

von Laura Seils an einem Interview teilzunehmen. Sie wurden über Art, Umfang und Ziel sowie den Verlauf des o. g. Forschungsvorhabens informiert.

Das Interview findet online statt und wird aufgenommen und sodann in Schriftform gebracht.

Für die weitere wissenschaftliche Auswertung des Interviewtextes werden alle Angaben, die zu einer Identifizierung Ihrer Person oder von im Interview erwähnten Personen und Institutionen führen könnten, anonymisiert. Das Transkript des Interviews dient nur zu Analysezwecken und wird lediglich in Ausschnitten zitiert.

Ihre personenbezogenen Kontaktdaten werden von Interviewdaten getrennt für Dritte unzugänglich gespeichert und vertraulich behandelt.

Einverständnis

Sie sind damit einverstanden, im Kontext des o. g. Forschungsvorhabens an der Befragung teilzunehmen. Darüber hinaus akzeptieren Sie die o. g. Form der anonymen Weiterverarbeitung und wissenschaftlichen Verwertung des geführten Interviews und der daraus entstehenden Daten.

Ihre Teilnahme an der Erhebung und Ihre Zustimmung zur Verwendung der Daten sind freiwillig. Durch die Ablehnung entstehen Ihnen keine Nachteile. Ihnen ist bekannt, dass Sie diese Einwilligung jederzeit gegenüber Laura Seils widerrufen können mit der Folge, dass die Verarbeitung Ihrer personenbezogenen Daten, nach Maßgabe der Widerrufserklärung, für die Zukunft unzulässig wird. Dies berührt die Rechtmäßigkeit der aufgrund der Einwilligung bis zum Widerruf erfolgten Verarbeitung jedoch nicht.

Unter diesen Bedingungen erklären Sie sich bereit, das Interview zu geben und sind damit einverstanden, dass es aufgezeichnet, verschriftlicht, anonymisiert und ausgewertet wird.

_____

Vorname, Nachname in Druckschrift

_____

Ort, Datum / Unterschrift

Appendix 4: Expert interview guide in German and English

Interview guide for the expert interviews

1. Welche in der Literatur bereits identifizierten Einflussfaktoren auf medical deserts haben eine Relevanz in Deutschland. Spielen weitere (bisher nicht beschriebene) Faktoren eine Rolle?

2. Welche Lösungsansätze werden bereits angewendet und welche Strategien halten Sie für relevant in Deutschland, um das Problem von medical deserts in Deutschland anzugehen?

Hauptthema	**Unterthema**	**Fragen**	**Weitere Fragen und Gedankenanregungen**
Thema 1: Vorstellung des Interviewees		Wie ist Ihre aktuelle Berufsbezeichnung/Position?	
		In welcher Institution arbeiten Sie zurzeit?	
Thema 2: Einleitung medical deserts	2.1 Definition	Haben Sie noch weitere Fragen zu dem Begriff?	
	2.2 Vorkommen in Deutschland	Kennen Sie Gebiete in Deutschland die offiziell als medical deserts gelten?	Welche Gebiete in Deutschland würden Sie als medical deserts bezeichnen? Und warum?
Thema 3: medical deserts - Einflussfaktoren	3.1 Wahrnehmung /Wissen des Experten von Faktoren	Was würden Sie sagen sind die Einflussfaktoren generell und die vorherrschenden Einflussfaktoren auf medical deserts in Deutschland/in den Gebieten die Sie als medical desert beschreiben würden	
	3.2 Bewertung von in der Literatur schon vorhandenen Faktoren	Sie haben jetzt schon ein paar der Faktoren genannt, die auch in der Literatur genannt werden. Zusätzlich In der Literatur werden Faktoren wie XXX (abhängig von den Faktoren, die noch nicht genannt wurden) beschrieben, als Faktoren die einen Einfluss auf die medical deserts in Deutschland haben. Stimmen Sie dem zu?	Gibt es Faktoren, denen zu wenig Aufmerksamkeit geschenkt wird? Würden Sie sagen diese Faktoren gelten für ganz Deutschland oder eher speziell für eine bestimmte Region?
Thema 4: medical deserts - Lösungsansätze	4.1 Wahrnehmung /Wissen des Experten von Lösungsansätzen/Strategien	Von welchen Lösungsansätzen/Strategien haben, die hier in Deutschland angewendet werden haben Sie schon gehört?	
		Haben Sie einen anderen Lösungsansatz? Was für Idee haben Sie wie man die medical deserts verkleinern könnte?	Was halten sie von XXX (abhängig von den Lösungsansätzen die noch nicht genannt wurden) Lösungsansatz

		Würden Sie sagen diese Lösungsasätze sind effektiv in dem Kontext von Deutschalnd?	

Interview guide for the expert interviews

1. Which factors already identified in the literature as influencing medical deserts are relevant in Germany? Do other factors (not yet described) play a role?

2. What type of approaches to address medical underserved areas are adequate in the context of Germany?

Main topics	**Subtopics**	**Questions**	**Further questions and thoughts triggers**
Topic 1: Introduction interviewee		What is your current position/affiliation?	
Topic 2: Einleitung Medical deserts	2.1 Definition	What do you understand under the topic of „medical deserts“?	
	2.2 Occurrence of medical deserts in Germany	Are you aware of areas/regions in Germany that are designated as medical deserts?	What areas in Germany would you consider as medical deserts? And why?
Topic 3: Medical deserts - contributing factors	3.1 Experts awareness / knowledge of contributing factors	What contributing factors would you consider as general and the most prevalent factors to: - medical deserts in Germany - areas that you would consider as a medial desert	
	3.2 Rating of the contributing factors, presented in the literature	In the literature we identified XXX(referring to the ones the expert didn’t mention) as factors that contribute to medical deserts. Would you agree with that?	Are there factors that get not enough attention? Would you consider these factors as applicable throughout Germany or only to specific regions/areas?
Topic 4: Medical deserts - Lösungsansätze	4 Experts awareness / knowledge of approaches	What approaches that are implemented in Germany, are you aware about?	
		Do you have other/new ideas? What ideas do you have about how to mitigate medical deserts especially in Germany?	What do you think about the approach XXX (referring to the ones the expert didn’t mention)?

Appendix 5: Transcription rules

Transkriptionsregeln

Die folgenden Transkriptionsregeln sind angelehnt an die inhaltlich-semantische Transkription und die erweiterte inhaltlich-semantische Transkription nach Dresing & Pehl (2018, S.21-25) und enthalten darüber hinaus auch allgemeine Regeln zur Schreibweise.

1. Die Transkription erfolgt wörtlich, also nicht lautsprachlich oder zusammenfassend.
2. Die Satzform wird beibehalten, auch wenn sie syntaktische Fehler beinhaltet, z.B.: ‚ein Eimer Kartoffeln kannst du auch mal schälen'.
3. Umgangssprachliche Partikel wie „gell, gelle, ne" werden transkribiert.
4. Die Interpunktion wird zugunsten der Lesbarkeit geglättet, allerdings werden Sinneinheiten beibehalten und Kommata entgegen der grammatikalischen Regeln weggelassen, wenn im Redefluss keine Pause erkennbar ist.
5. Rezeptionssignale der Interviewerin, wie „hm, aha, ja, genau", die den Redefluss der anderen Person nicht unterbrechen, werden nicht transkribiert.
6. Pausen unter ca. 3 Sekunden werden durch …, Pausen über ca. 3 Sekunden durch ein (…) markiert.
7. Besonders betonte Wörter oder Silben werden durch VERSALIEN gekennzeichnet.
8. Jeder Sprecherbeitrag erhält eigene Absätze. Zwischen den Sprechern gibt es eine freie, leere Zeile. Auch kurze Einwürfe werden in einem separaten Absatz transkribiert. Am Ende eines Absatzes sind Zeitmarken eingefügt.
9. Emotionale nonverbale Äußerungen der befragten Person und des Interviewers, welche die Aussage unterstützen oder verdeutlichen (wie lachen oder seufzen), werden in Klammern notiert.
10. Längere unverständliche Passagen werden mit (unverständlich) gekennzeichnet. Kann ein Wortlaut vermutet werden, wird die Passage mit einem Fragezeichen in Klammern gesetzt, z.B. „(?eingeladen)".
11. Die interviewende Person wird durch ein „I:", die befragte Person durch ein „R:" gekennzeichnet. Da es sich um mehrere Respondent_Innen handelt, erhalten alle eine Kennnummer und die Befragten im Paarinterview darüber hinaus noch einen Buchstaben.
12. Wortdopplungen werden transkribiert, ebenso wie Fülllaute der befragten Personen („hm, ja, aha, ähm, nich,…").
13. (Maß-)Einheiten werden ausgeschrieben, z.B. Euro, Prozent, Meter.
14. Wird in der Aufnahme wörtliche Rede zitiert, wird das Zitat in Anführungszeichen gesetzt: „Und dann haben wir schon gesagt "um Gottes Willen"."
15. Wortverkürzungen wie „runtergehen" statt „heruntergehen" oder „mal" statt „einmal" werden genauso geschrieben, wie sie gesprochen werden.
16. Auch Redewendungen/Idiome werden wörtlich wiedergegeben, z.B. „übers Ohr haun" (statt: über das Ohr hauen).
17. Nachträglich auf Wunsch der Respondent_Innen gelöschte Passagen sind entsprechend gekennzeichnet („Längere Passage auf Wunsch der Respondentin gelöscht").

Appendix 6: Case summaries

Table a3: Short case summary P1

Summary
P1 sagt, dass Flächenländer größere Versorgungsprobleme als die Stadtstaaten aufgrund fehlender Infrastruktur haben.
Zudem behauptet P1, dass die föderalistische Organisationsstruktur in medizinischer Versorgung zu ungleicher Budgetverteilung führt. Bundesländer selbst sind verantwortlich für Förderung und Priorisierung von Gesundheitsprojekten.
P1 vermutet die unterschiedliche ambulante Facharztdichte ist historisch bedingt durch Teilung von Deutschland in Ost und West resultiert in anderen Gesundheitsorganisationstrukturen in den jeweiligen Bundesländern, welche sich wiederum auf das Versorgungsangebot auswirkt.
P1 berichtet ganz klar, der Fachkräftemangel führt zu Versorgungsengpässen. Die sich speziell in überfüllten Notaufnahmen widerspiegeln, da der Abfluss der peripheren Versorgung nicht optimal funktioniert
P1 vermutet, dass aufgrund der Ausbildungsstruktur und Dauer ein Wohnortswechsel später unattraktiv ist.
P1 vermutet, dass Leute mit Hintergrund in ländlichen Regionen eher wieder dorthin zurück

gehen, aus Vertrautheit.
Unattraktive Arbeitsbedingungen (besonders finanziell, Patienten Klientel, Wegzeiten etc.) und ein zu hohes finanzielles Risiko für niedergelassene Ärzte, halten Fachkräfte ab in ländliche Regionen zu ziehen oder sich niederzulassen.
Lebensunterhaltungskosten und Zuzahlungen vom Staat beeinflussen Wahl des Niederlassungsorts.
Entwicklung der Gesellschaft hin zu höherer Mobilität bieten die Möglichkeit wo anders hinzugehen.
P1 stellt fest, dass die Varietät der Arbeit in medizinischen unterversorgten Regionen mehr Verantwortung bedeutet und damit auch mehr Wertschätzung und Anerkennung einhergehen sollte. Fehlende Anerkennung wird derzeit versucht finanziell auszugleichen, das ist aber laut P1 nicht ausreichend. Zudem sieht P1 mehr Verantwortung als einen Motivationsfaktor für zumindest einige Fachkräfte.
P1 ist davon überzeugt, dass mangelnde Gesundheitskompetenz in der Bevölkerung zur unangemessenen Ressourcen Nutzung führt und somit die Unterversorgung beeinflusst. Die Falschnutzung von Ressourcen wiederum hat, laut P1 einen Einfluss auf die Motivation des Arztes der in seiner Praxis hauptsächlich Patienten behandelt die ihn eigentlich gar nicht aufsuchen müssten.
P1 sagt, dass Misskommunikation von politischen Entscheidungen zu falscher Wahrnehmung und Erwartungshaltung in Bezug auf die Versorgungssituation in der Bevölkerung führt.
P1 behauptet, dass eine intersektorale und interdisziplinäre Bedarfsplanung für stationäre, ambulante Pflege und Heilmittelerbringer (wie viele Plätze/sitze auf 100000 Einwohner) einen Lösungsansatz darstellt, um überall eine Mindestversorgung sicherzustellen. Sieht dies allerdings nicht als kurzfristig und unbürokratisch umsetzbar.
P1 sieht lokale Gesundheitszentren, niederschwellige wohnortnahe Angebote und nicht zwingend ärztlich, für primäre Entscheidungen/Versorgung als Lösungsansatz, der aber nicht kurzfristig und unbürokratisch umsetzbar ist.
P1 sieht die Delegation am ad Personam in lokalen Gesundheitszentren als möglichen Lösungsansatz, der aber zurzeit nur teilweise umsetzbar ist, aufgrund fehlender Gesetzlicher Verordnung für die Berufe.
P1 sieht Telemedizin als eine Option aber aufgrund teilweise mangelnder Medienkompetenz in älteren Generationen auch als nicht einfach umsetzbar.
P1 vermutet, dass Veränderungen in der Ausbildung hin zu mehr Verantwortung für den Einzelnen ein Ansatz wäre, für nachhaltigere Ressourcen Nutzung (weniger und sinnvoller) (z.B. Krankentransport).
P1 sieht Ausbildung in medizinisch unterversorgten Regionen und Finanzielle Anreize als effektive Strategie.
P1 sagt, die fehlende gesetzliche Grundlage für Finanzierung von Projekten führt dazu, dass Lösungsstrategien nicht in der Fläche umsetzbar sind

Table a4: Short case summary P2

Summary
P2 sagt, ein Missverhältnis zwischen Angebot und Nachfrage gibt es innerhalb Hamburgs, aber auch in gesamt Deutschland, insbesondere in Ostdeutschland.
Dieses Missverhältnis wird durch Wegzug und Zuzug getriggert
P2 sagt, grade im Osten Deutschlands führt der Wegzug der jüngeren Generation (generelle Bevölkerung und Fachkräfte) zu Überalterung der Bevölkerung und zu unterversorgten Gebieten.
P2 berichtet, dass der Wegzug in Hamburg an der Unattraktivität der Stadtteile liegt.
P2 betont, dass die Attraktivität des Stadtteiles einen Einfluss auf die Lebensunterhaltungskosten hat. Je attraktiver der Stadtteil, desto höher die Kosten.
P2 erklärt, Zuzügler der generellen Bevölkerung neigen dazu sich in Gebieten mit geringeren Kosten anzusiedeln (unattraktivere Stadtteile). Fachkräfte hingegen siedeln sich eher in Regionen an, die Ihrem Lebensstil entsprechen und in denen sie ein attraktives Patienten Klientel finden (privat Patienten). Dieses Zuzugsmuster erhöht das Missverhältnis von Angebot und Nachfrage was es wiederum für Fachkräfte noch unattraktiver macht in strkturschwächere Regionen zu ziehen da der Workload sehr hoch ist.
P2 berichtet zudem, dass auch Vernetzungsmöglichkeiten mit anderen Professionen einen Einfluss auf die Niederlassungswahl haben.

P2 sagt, dass Zuzügler aus anderen Kulturkreisen möglicherweise nicht vertraut sind mit dem Gesundheitssystem und Ressourcen daher falsch nutzen.
P2 bestätigt, dass die Arbeitsbedingungen einen Einfluss darauf haben, ob Fachkräfte an dem Ort bleiben oder weg gehen.
P2 glaubt, dass Fachkräfte die Vertrautheit und Verbundenheit mit einer Region empfinden, eher dazu tendieren wieder zurückzugehen.
P2 berichtet, dass ein Lösungsansatz ist Anreize durch Studienplätze in ländlichen Regionen zu schaffen, bewertet dies aber eher als schwierig umzusetzen aus organisatorischen gründen.
P2 sieht eine Ursache der Unterversorgung in der Fehallokation von Ressourcen, durch mangelnde Gesundheitskompetenz in der Bevölkerung und fehlende Information und Transparenz über Gesundheitsangebote, die zu einer künstlichen Unterdeckung der medizinischen Versorgung führen. Als Lösung dafür sieht P2 die lokale Analyse der Veränderung/Eigenschaften der Bevölkerung (z.B. Migrationsanteil) um die Versorgung/Maßnahmen den Bedürfnissen und Eigenschaften der Bevölkerung anzupassen.
P2 sagt das Konzept eines Gesundheitskiosk ist ein guter Lösungsansatz verlangt aber auch eine gute vorherige Bedrafsplanung und finanzielle Klärung.
P2 sieht das Konzept der Community Nurse als eine gute Ergänzung zur ärztlichen Beratung und betont, dass es keine Konkurrenz zu der Ärztlichen Versorgung darstellt sondern als Entlastung dient. P2 sieht dies jedoch nicht als unbürokratisch und schnell umsetzbar.
P2 sagt unbürokratisch und schnell geht im Gesundheitssystem eigentlich nichts.
P2 sieht Ursachen für den Fachkräftemangel in unattraktiven Arbeitsbedingungen (z.B. Unterbezahlung, Schichtarbeit etc.) und fehlender Werbung für das Leben auf dem Land
P2 sieht Behandlungsbusse für „Routinesachen“ als Lösungsansatz um Fahrzeiten zu sparen.
Eine weitere Lösung sieht P2 in Sonderbedarfszulassungen von Kassenärztlichen sitzen in Regionen mit Bedarf, obwohl dieser Sitz außerhalb des eigentlichen „Solls“ ist.
P2 sieht digital Health als eine Lösung die allerdings nur einen bestimmten Anteil der Bevölkerung als Zielgruppe abdeckt.
P2 hebt hervor, dass persönliche Beratung immer noch einen großen Stellenwert in der Bevölkerung hat.
Einen Arzttermin Service an und versucht so Unterversorgung mit Expertenwissen über mögliche verfügbare Kapazitäten auszugleichen und somit Wartezeiten zu reduzieren sieht P“ als einen guten Lösungsansatz

Table a5: Short case summary P3

Summary
P3 sieht als Gründe für die Unterversorgung hauptsächlich politische Entscheidungen wie zum Beispiel die Qualitätssicherung durch die Schließung von Krankenhäusern welche als Folge lange Reisewege hat. P3 hält das speziell für die Insel als problematisch aufgrund der geographischen Situation.
Als weitere Ursache der Unterversorgung beschreibt P3 den Fachkräftemangel aufgrund von zu geringer Ausbildung und unattraktiven Arbeitsbedingungen (vor allem Bezahlung), fehlender Work-Life-Balance.
P3 betont die Varietät der Krankheitsbilder als ein sehr positives und spannendes Merkmal Ihrer Arbeit und könnte sich nicht vorstellen wo anders zu arbeiten
P3 glaubt, dass Leute aus medizinische unterversorgen Regionen/ländlichen Regionen später lieber in die Stadt zu den besseren Arbeitsbedingungen ziehen wollen und nicht zurück in ihre Heimat wollen.
Als Lösungsansatz sieht P3 die Ausbildung in medizinisch unterversorgten Regionen
Gemeindeeigenes Gesundheitszentrum sieht P3 als weiteren Lösungsansatz um die medizinische Versorgung speziell auf Amrum (Inseln generell) zu verbessern.
Telemedizinische Ergänzung ist ein Konzept das gut funktioniert laut P3.
Zeitlich begrenzter Besuch von Fachärzten auf der Insel sieht P3 als eine gute Gelegenheit um die Unterversorgung in den Touristischen Monaten zu verbessern, sieht dies jedoch nicht kurzfristig und unbürokratisch umsetzbar
Mehr Flexibilität im Kassenarztrecht für Inseln würde die Einführung lokaler Methoden zur Verbesserung der Gesundheitsversorgung erleichtern sagt P3.
P3 berichtet, dass von der Regierung eingeführte Methoden zur Erleichterung des Patientenmanagement nicht effektiv sind und die Bürokratie verkomplizieren.
P3 schlägt Bürokratieabbau als Lösungsansatz vor um flexibler auf Bedürfnisse der Bevölkerung

einzugehen und so das Versorgungsangebot zu verbessern.
P3 berichtet, dass politische Entscheidungen eine andere Tragweite haben auf Amrum aufgrund der geographischen Situation.

Table a6: Short case summary P4

Summary
Als Teil der Ursache für die Unterversorgung in Deutschland und Grundherausforderung zur Verbesserung bezeichnet P4 die medizinisch, sozial und gesundheitlichen abgehängten Regionen. Es fehlt die Vernetzung von existierenden individuellen guten gesundheitlichen Versorgungsstrukturen.
P4 beschreibt des Weiteren, dass es trotz einer vorhandenen guten Versorgungsstruktur eine Fehlallokation von Gesundheitsangeboten gibt, da die Struktur nicht sensibel genug für alle Bevölkerungsgruppen (insbesondere vulnerable) ist. Dies führt dann zu einer Fehlleitung in der gesamten „Patienten journey“.
P4 glaubt, dass die Fehlallokation durch fehlende Gesundheitsförderung, Prävention und Aufbau der Gesundheitskompetenz in der Bevölkerung entsteht und durch zu fachspezifische Betrachtung verstärkt wird. Es fehlt der ganzheitliche Ansatz.
P4 beschreibt das Arbeiten in der Stadt als attraktiver, was in einer höheren Gesundheitsversorgungsdichte in Großstädten resultiert.
In ländlichen Gebieten sieht P4 die Ursache der Unterversorgung eher bei einer zu geringen Arztdichte, verursacht durch den demographischen Wandel und unattraktiven Arbeits- und Lebensbedingungen (z.B. Infrastruktur, wohnortnahe Weiterbildungsangebote).
Arbeitsmodelle sind, vor allem in ländlichen Regionen, unattraktiv und müssten and die Zeit angepasst werden
P4 beschreibt folgendes als Ursache für den Fachkräftemangel generell: unattraktive Arbeitszeit Modelle, geringe monetäre Wertschätzung, zu wenig Verantwortung, Hierarchieverhalten von Ärzten zu anderen medizinischen Disziplinen
P4 glaubt, dass die östlichen Bundesländer in der Versorgungsstruktur hinterher hängen durch viele ländliche Strukturen
P4 glaubt, dass die Ausbildung in medizinisch unterversorgten Regionen, oder staatliche Förderung eine guten Lösungsansatz darstellt
P4 sieht das föderalistische System als ein Störfaktor für die Umsetzung eines einheitlichen Gesundheitssystem von Nord- nach Süddeutschland. P4 glaubt daher, dass die Gesundheitsversorgung regional populationsorientiert sein sollte aufgrund Bundesland/Regionen unterschiedlicher Attraktivitätsfaktoren, Nachteilen und Bevölkerungseigenschaften.
Gesundheitskioske sieht P4 als einen guten Lösungsansatz um die Versorgung regional zu verbessern und unterschwellig auch die Gesundheitskompetenz zu erhöhen
P4 ist davon überzeugt, dass die Verbesserung der Gesundheitskompetenz in der Bevölkerung ein wichtiger Schritt ist, um die Versorgung zu verbessern, bzw. die Fehlallokationen zu verringern.
Mobile Praxen/Patienten Busse sieht P4 als nicht so erfolgreich und glaubt das Konzept ist nicht zu Ende gedacht, da es beim Verpassen des Busses eher frustrierend wirken kann.
P4 glaubt, dass das Konzept der Community Nurse einen großen Mehrwert für Bevölkerungen im regionalen Kotext hat.
P4 sieht digital health Konzepte als eine gute Ergänzung zu der Versorgung in Person, besonders in ländlichen Regionen wo die Wege weiter sind.
P4 sagt man sollte die lessons learned aus der Corona Pandemie heranziehen, um zu sehen welche potenziellen Lösungsansätze daraus abgeleitet werden können und dass der Fokusmehr auf präventivem als auf reaktivem Handeln liegen sollte und schon vorhandenen Ressourcen dazu genutzt werden können.
P4 sagt, dass berufsübergreifend interdisziplinäre, multiprofessionelle Arbeit und Netzwerkbildung viele Ressourcen bieten, um die Versorgung zu verbessern im ambulanten aber auch im stationären Sektor.

Appendix 7: Coding guide

Main consequences				
Category	**Content Description**	**Application of category when…**	**Examples for application**	**Distinctions (optional)**
Lack of new ambulant clinics or services	Category describes the occurrence of medical deserts due to a **lack of new** ambulant clinics or ambulant services resulting in insufficient healthcare supply. It's caused by unattractive conditions for the HWF to open an ambulant clinic or provide ambulant services. The medical desert in this context is caused	When the lack of new ambulant clinics or the lack of ambulant service provision is reported to lead to an underserved area or to a disparity between healthcare supply and demand.	*P1: „…Patienten sagen 'ja aber ich find im Umkreis niemanden für die Materialentfernung oder für das Fäden ziehen oder sonst irgendwas und ich muss 50 km ins Krankenhaus fahren' dann haben sie halt im 50 km Umkreis niemand der die Material Entfernung macht und das macht schon so nen Medical desert."*	
Closure of healthcare providing institutions	Category describes the occurrence of medical deserts due to a **closure** of healthcare providing institutions. The closure of these decreases the healthcare supply offer which then, when not covering the populations demand anymore, results in an underserved area. It is provoked by the HWF shortage, financial issues and strict regulations of the federal joint committee.	When the closure of hospitals, single awards or ambulant clinics is reported to lead to an underserved area or to a disparity between healthcare supply and demand.	*P3: „…bricht ja auch die Flächenversorgung von den Krankenhäusern total zusammen grade […]"*	

Lack of attending capacity	Category describes the occurrence of medical deserts due to non-sufficient capacity to attend patients. It doesn't solely result from the lack of services but also due to the saturation of these, mainly induced by the demand/population side, through a higher demand in services and a non-adequate use of resources.		When the lack of attending capacity is reported to lead to an underserved area or to a disparity between healthcare supply and demand: -lack of (medical) appointments -long waiting time -HWF shortage contributing to saturation of Services	*P2: „…dann ist es zum Teil doch so dass dann gesagt wird […] wir haben unseren Terminplaner voll und sie können in vier Monaten kommen'[…]"*	
Primary determinants					
Category	**Sub-category**	**Content Description**	**Application of category when…**	**Examples for application**	**Distinctions (optional)**
HWF shortage		Describes the lack of healthcare workers and how it manifests itself.	Coded when it is described how the HWF shortage manifests it self: -HWF shortage due to wrong distribution across regions -little number of HWF available -Lack of substitution -non-functioning patient referral	*P3:„…Krankenhäuser sind im Moment so in Personalnot das sie immer wieder auch die Notaufnahme abmelden oder keine Betten haben weil sie kein Personal haben…"*	Not to be coded: factors that influence the HWF shortage (e.g working conditions)
Non-adequate use of resources		Describes the wrong or unnecessary use of resources by patients, due to a lack of professional skill or low health literacy, leading to a lack of attending capacity and how it manifests itself.	Coded when the use of a resource is described that the expert considers as wrong used -unnecessarily attending health personnel - use of services that are not properly justified	*P1: „…weil sie dann sozusagen diese ärztliche Ressource in Anspruch nehmen die dann für andere nicht zur Verfügung steht…"*	See category Saturation of services

Saturation of services		Describes the overload of the available healthcare services due to the HWF shortage and a higher demand of services in the population, resulting in a lack of attending capacity	Coded when an event that leads to overcrowding of the services is described such as a higher demand of services or the HWF shortage. When the cause is NOT a wrong use of services.	*P1: „…und das führt jetzt […] dazu, dass wir das sogenannte 'overcrowding' haben in den Notaufnahmen bundesweit, weil der Abfluss nicht funktioniert, der funktioniert nicht auf den Stationen die keine Pflegekräfte oder Ärzte haben [.]“*	Not to be confused with the category non-adequate use of services, because the cause is not the wrong use of services due individual characteristics of the people (low health; lack of professional skills and responsibility) but an overload of these due to a higher demand in the population and the HWF shortage in general.
Legislation		Describes regulations that have an influence on the healthcare supply situation.	Coded when the cause for a change in healthcare supply offer is a regulation made by the government of Germany or the state pairlaments		

Legistlation	Strict regulations of federal joint committee (Gemein-samer Bundesausschuss)	Describes regulations set by the federal joint committee that are meant to maintain a good quality of care but are perceived as strict and difficult to fulfil by the healthcare providing institutions	Coded when the closure of a healthcare providing institute is reported due to these regulations such as: -meeting a minimum number of cases per year -special qualification of professionals	*P3: „… wenn man nicht mindestens so uns so viel Geburten pro Jahr vorweisen kann dann gilt das als unsicher für Mutter und Kinde weil dann die Expertise angeblich nicht mehr da ist und dann werden die Kreißsäle geschlossen. Also hier sind im Umkreis die nächsten beiden Kreißsäle geschlossen worden…“*	
	Regulations of the association of Statutory Health Insurance Physicians	Describes the fact that Hamburg due to its organisational structure is a plan area (Plangebiet) which influences the allocation of new ambulant clinics and if allocated badly causes an underserved area. The new clinics doesn't always have to be located in that area where there is the highest need, but professionals have a certain freedom to open their clinic in a neighbourhood that seems attractive to them. The other way round unattractive regions, mostly already having little healthcare supply, suffer from this distribution algorithm.	Coded when the regulation is reported to negatively influence the allocation of new ambulant clinics.	*P2: „…Hamburg ist an sich ein Plangebiet […] also man kann jetzt nicht sagen bei der Niederlassung oder bei den Kassenarztsitzen 'so wir haben jetzt hier ein Sitz in Hamburg-Harburg zum Beispiel und der muss besetzt werden' [,] sondern wenn ein Sitz frei wird dann gilt der für ganz Hamburg und dann kann es dann eben auch sein[,] dass sich die Sitze dann auch entsprechend verlagern das nicht […] ein frei werdender Sitzt eben an dem Ort wieder wieder belegt wird sondern an ganz anderer Stell“*	

Financial issues		Describes financial issues such as: lack of financial support for health promoting projects, a high financial risk for professionals when opening their own clinic, and further uneconomic aspects, as a reason for the closure of healthcare providing institutions and the lack of new ambulant clinics	Coded when financial issues are reported as a barrier for opening new ambulant clinics or lead to the closure of existing healthcare institutions		
	Budget allocation	Describes the available financial resources that the federal states has available to promote the healthcare supply. Due to the lack of a legal basis for funding and depending on the priorities set by each federal state, the available budget allocated to the health sector can vary. If the health sector is provided with little budget to realise health projects or to promote health services, the availability of these decreases in this area.	Coded when a lack of budget is reported to negatively influence the availability of healthcare services.	*P1 „…und da hängt es davon ab[,] ob ein Bundesland gezielt einzelne Großprojekte fördert oder nach Dringlichkeit fördert oder die zur Verfügung stehenden Haushaltsmittel einfach pauschal verteilt. ... Das macht dann schon im Versorgungsangebot unterschiede…“*	

Financial risk	High financial risk	Describes the issue of a high financial risk for the individual HCW when wanting to open an own ambulant clinic.	Coded when following aspects is reported: - unecono-mic to open clinics - unecono-mic to buy equipment -high use of equity capital -no indemnity insurance (for midwives) -low rentability of providing services	*P1: „…der niedergelassene Arzt [muss] häufig viel mehr Eigenmittel in seine ja ich sag mal Infrastruktur stecken […] aus seinem eigenen persönlichen Portemonnaie als ein Krankenhausträger [und dann] für die Leistung selber sogar noch weniger Geld bekommt. Dann sagt der niedergelassene Arzt 'Warum soll ich das machen, geh doch ins Krankenhaus' und dann verstopft es wieder die Wege…“*	
	Too long travel time	Describes the issue of long travel time for professionals to reach their patients, being considered as uneconomic and therefore leading to a lack of service provision, especially in rural areas.	Coded when travel time is reported to be a factor influencing the HCW in their choice of opening a clinic or providing a service.	*P1: „… und das sind einfach bestimmte Regionen für Leistungserbringer egal welcher Profession nicht attraktiv genug weil sie zu lange Wegzeiten haben.“*	
Secondary determinants					
Category	**Sub-category**	**Content Description**	**Application of category when…**	**Examples for application**	**Distinctions (optional)**
Patient management		Describes how medical appointment allocation and a too narrow view on the patients' health issue provokes a misallocation of resources and leads to a lack of attending capacity.	Coded when aspects of patient management are mentioned such as: -clinics not allocating appointment to urgency of patients' issues -seeing the patient, not in a holistic way		

Patient management	Non-urgency ranking	Describes the issue that clinics don't differentiate sufficiently between patient with routine or preventive concerns and urgent cases and don't allocate their appointment capacity accordingly.	Coded when lack of urgency ranking is reported to result in a misallocation of available appointment capacity.	*P1: „…sie wollen zum Hautkrebsscreening, ja [,] da können sie teilweise ein paar Monate auf ein Termin warten [,] aber sie drängeln sich in die Reihe mit all denen wo sich plötzlich [ei]ne Hautveränderung eingestellt hat. Die mit der plötzlichen Hautveränderung bekommen aber kein Termin…"*	
	No holistic patient approach	Describes that some professionals only focus on the patient's specific medical condition, neglecting other aspects also having an influence on the patient's health issue. Therewith they lose the holistic view on the patient and unnecessarily prolong the understanding and solving of the actual health problem. This implies a use of resources that could have been avoided.	Coded when a too specific focus on one medical condition is reported to influence the wrong use of resources.	P4: *„Und dann ist glaub ich eine ganz große Fehlallokation [,] dass dann Patienten durch diverse Systeme geschleust werden [,] weil man nicht genau weiß*[,] *was die eigentlich genau haben, also es wird zu sehr fachspezifisch manchmal geschaut glaub ich eh und nicht der gesamte Patient oder der Mensch betrachtet."*	
Educational structure		Describes aspects of the further training options and the skills and knowledge gained during the training.	Coded when: -duration and location are reported to be an issue for undergoing further training (regardless of the profession) -lack of professional skills is criticised by the HCW and influences the non-adequate use of resources		

Educational structure	Duration and location of further training	Describes the occasion that if the location of further training is too far away and the duration too long, professionals are less willing to undergo this further training which then can result with a lack of HCW in that field.	Coded when: -location or -Duration of further training are reported to be a factor for not doing it.	*P1: „…wenn Sie nach alter Ausbildung äh Fachkrankenpflegekraft für Kinderheilkunde sind, brauchten Sie zwei bis drei Jahre Berufserfahrung, dann eine zweijährige Fachweiterbildung für die Neonatologie der Zeit ist die Familiengründung abgeschlossen und Sie sind nicht mehr breit ohne weiteres den Wohnortwechsel für zwei Jahre durchzuführen weil diese Fachweiterbildung nur an wenigen Standorten angeboten wird.“*	
	Professional skills	This category especially refers to the profession of nurses. It describes the event that nurses often find them self in a situation where they depend on support of other professionals because they aren’t able to take the responsibility of taking a decision about the patients. This is because of the lack of professional skills that are taught during education. A further effect of the lack of responsibility is a low recognition for their work in public and other professions. This makes the profession of nurses unattractive and contributes to the shortage of nurses.	Coded when: - lack of professional skill reported to influence the responsibility - Lack of responsibility reported to influence the dependence on other professions -Lack of responsibility reported to influence avoidable use of resources - lack of personal and/or professional recognition is described as a factor demotivating the HWF to work in specific areas	*P1: „…die Pflegekraft im Krankenhaus setzt sie selbstverständlich die Heparin Spritze wenns in der Verordnung steht. Im niedergelassenen Bereich die normale Pflegekraft die zur Grundpflege kommt darf es schon mal nicht weils vielleicht nur eine Altenpflegerin ist oder eine angelernte Kraft da muss eine examinierte Kraft kommen und wenn die examinierte Kraft feststellt da ist jetzt was anderes [als das was zu Beginn vermutet wurde,] dann darf sie auch nichts anderes tun und muss den Arzt verständigen oder den Rettungsdienst verständigen Halleluja.“*	

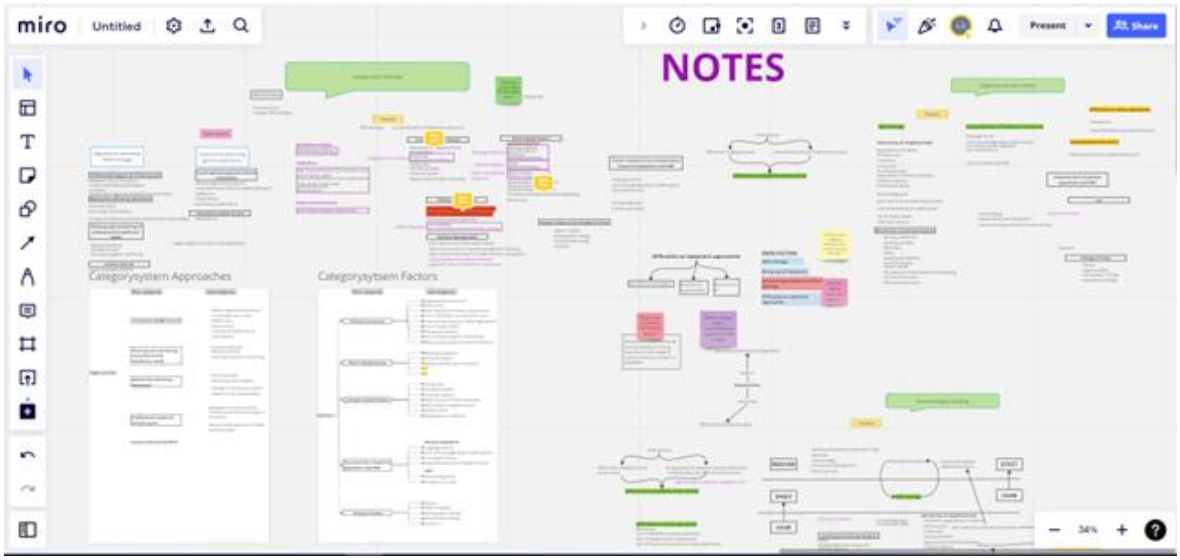
Working situation		Describes low salary, bad working conditions and patient variety as factors influencing the attractivity of the working situation. The working situation influences the choice of working locations but also the decision whether to study a medical profession or not. It therewith is a factor contributing to the HWF shortage	Coded when: -low salary or -working conditions or -patient variety Are reported to influence the attractivity of the working situation		
	Low salary	Describes the low salary as a contributing factor to the HWF shortage	Coded when: -lack of financial recognition or - low salary/ payment are reported to negatively influence the working situation for HCW.	*P2: „Und insofern da muss man echt noch weiter dran arbeiten [,] dass die Attraktivität auf finanzieller Seite eben auch steigt[.]“*	
	Working conditions	Describes the high workload that HCW have. It can manifest itself in long working hours, I a high need to colleague substitution. It further refers to the condition of exhausting shift work and a lack of part-time jobs. These conditions are perceived as negative and thus contribute to the HWF.	Coded when: -long working hours or -shift work or -high colleague substitution or -employment and not, self-employed or -part-time/ full-time jobs are reported to negatively influence the attractivity of the medical professions	*P3: „… 21 Bereitschaftsdienste im Monat und 30 oder 31 Notarztdienste 24 stunden sieben Tage die Woche das will halt auch nicht jeder und ich glaub das ist halt ein Grund dafür warum es so schwierig ist Leute zu bekommen […]“*	
	Patient variety	Describes the wide range of patients with a multitude of different health issues that would come to see a HCW in regions where the supply is very low.	Coded when: The variety ofpatients is described as a positive challenge	*P3: „… das macht die Arbeit spannend. Ich wäre NIEMALS wo anders Allgemeinmedizinerin geworden [,] weil ich stell mir das sehr sehr langweilig vorstelle […]“*	

Attractivity of neighbourhood		Describes why an area is being considered as attractive for opening an own clinic and how the attractivity of the neighbourhood contributes to the attractivity of working and living situation of the HCW.	Coded when: -networking or -Lifestyle of HCW or -patient clientele are reported to influence the attractivity of the neighbourhood		
	Networking	Describes that the possibility of building a network with HCW from other professions is considered to be a factor influencing the professionals' decision whether to open a new clinic in a specific area or not.	Coded when: -Inter-professional exchange -professional support -Networking Is reported to be a condition for opening an ambulant clinic.	*P2: „… und eben auch die Vernetzung eben auch mit Kollegen [,] wenn man eben auch als Allgemeinmediziner zum Beispiel auch ehm ja auch darauf angewiesen ist [,] dass im Umfeld eben auch entsprechende Facharztpraxen und Physiotherapeuten und so eben auch sind dann versucht man ja auch genau in diese Regionen zu kommen und sich dort niederzulassen.“*	
	Lifestyle	Describes the preferred conditions of HCW for living in an area referring to the living costs and available infrastructure.	Coded when: -living cots -high/low rent -public transport -childcare opportunities -opportunities for further training	*P1: „…das heißt nicht jede Region ist auch für einen niedergelassenen Arzt interessant[,] weil Miete, Lebenshaltungskosten teurer oder billiger sind[.]“*	

Attractivity of neighbourhood	Patient clientele	Describes the type of patients that would make a neighbourhood more attractive for HCW to work there. It is divided in two further aspects (i) **the additional revenue** that the HCW would get from patients with a private insurance and the (ii) status of **health literacy of the population living in that area**. The status of the health literacy essentially influences the behaviour of patients using the healthcare services and therewith contributes to the attractivity of the neighbourhood.	Coded when one of the following criteria (regarding patients) is reported to influence the attractivity of a neighbourhood for opening an ambulant clinic, For **(i)** *-IGEL Leistungen* -Privat patients For **(ii)** - Lack of knowledge about when to use which healthcare service - Lack of knowledge about urgency of problem - lack of knowledge about home remedy - overuse, wrong use, no use of healthcare services is reported - Lack of population education	*P2: „[…] dass sie dort sich ungern niederlassen oder dort eher hingehen wo mehr … diejenigen wohnen oder diejenigen Bewohner sind die in Hamburg sind die sie als Zielgruppe eben auch identifizieren also auch wenn Sie sich den Anteil der selbst zahlenden Kunden noch anschauen den Teil der Privat versicherten[…]“*	
Societal transformation		Describes the development of society and technology over time. It refers to the industrialization, the demographic- and generational change as aspects influencing the HWF shortage.	Coded when aspect of -industrialization -demographic change -generational change Are mentioned to contribute to the HWF shortage		

	Industrialisation	Describes the changes in the population due to technical development such as higher mobility of people, making it easier to move and digitalization, increasing the probability of believing in fake news.	Coded when: -higher mobility of the population or -Moving away from place of birth (and leaving behind family) or -moving to more attractive neighbourhoods or - digitalization decreasing health literacy are reported	*P1: „… einfach weil die Leute mobiler geworden sind und man kommt nicht hinterher das aufzubauen.“*	
	Demographic change	Describes the over ageing of the population and the lack of young workers.	Coded when aspects of the demographic change are reported to enhance the HWF	*P4: „…haben wir eher das Problem dass die Arztdichte einfach zu gering ist weil: Demographischer Wandel…“*	
	Generational change	Describes differences between generations that appear in lifestyle preferences.	Coded when experts report differences in lifestyle or working preferences across generations	*P3: „…junge Ärztegeneration die wollen ganz zu P3 „…Recht ein bisschen Work-life Balance und die wollen sich nicht rund um die Uhr totarbeiten…“*	
Rural familiarity		Describes any kind of boundary to the rural living such as having a rural background or having undergone rural training	Coded when it is reported that the rural boundary positively or negatively influences the choice of healthcare workers to work in a rural or underserved area	*P2: „…dass es eben auch wirklich wenn man ehm so das sich gut auskennt schon in der Region und wenn man eben auch so ne gewisse Verbundenheit spürt zu Region dann glaub ich ist es schon eher ist es etwas leichter…“*	

Appendix 8: Notes taken during research process



Appendix 9: Intra-coder check

Category	Example for citation german	Example for citation english
Lack of new ambulant clinics or services	*„…Patienten sagen 'ja aber ich find im Umkreis niemanden für die Materialentfernung oder für das Fäden ziehen oder sonst irgendwas und ich muss 50 km ins Krankenhaus fahren' dann haben sie halt im 50 km Umkreis niemand der die Material Entfernung macht und das macht schon so nen Medical desert.“* P1, Head of Hospital Investment Unit	*"…Patients say 'yes, but I can't find anyone in the surrounding area to remove the material or pull out the stitches or anything else and I have to drive 50 km to the hospital', then they just don't have anyone in a 50 km radius who does the material removal and that makes such a medical desert."* P1, Head of Hospital Investment Unit
Closure of healthcare providing institutions	*„…bricht ja auch die Flächenversorgung von den Krankenhäusern total zusammen grade …“* P3, GP on island	*“…the area coverage of the hospitals is totally collapsing at the moments ..]".* P3, GP on island
Lack of attending capacity	*„…dann ist es zum Teil doch so dass dann gesagt wird […] wir haben unseren Terminplaner voll und sie können in vier Monaten kommen'…“* P2, Regional Director Health insurance	*"...then it is sometimes the case that they say [...] we have a full schedule and they can come in four months.”* P2, Regional Director Health insurance

Primary determinants			
Category	**Sub-category**	**Example for citation german**	**Example for citation english**
HWF shortage		*„…Krankenhäuser sind im Moment so in Personalnot das sie immer wieder auch die Notaufnahme abmelden oder keine Betten haben weil sie kein Personal haben…“* P3, GP on island	*“…Hospitals are so understaffed at the moment that they keep cancelling emergency rooms or have no beds because they have no staff…”* P3, GP on island
Non-adequate use of resources		*„…weil sie dann sozusagen diese ärztliche Ressource in Anspruch nehmen die dann für andere nicht zur Verfügung steht…“* P1, Head of Hospital Investment Unit	*“…because then basically they use this medical resource, which is not available for others…”* P1, Head of Hospital Investment Unit
Saturation of services		*„…und das führt jetzt […] dazu, dass wir das sogenannte 'overcrowding' haben in den Notaufnahmen bundesweit, weil der Abfluss nicht funktioniert, der funktioniert nicht auf den Stationen die keine Pflegekräfte oder Ärzte haben [.]“* P1, Head of Hospital Investment Unit	*“… and this now leads to the fact that we have the so-called 'overcrowding' in the emergency rooms nationwide, because the referral doesn't work, it doesn't work on the wards that don't have nurses or doctors [.] “* P1, Head of Hospital Investment Unit

Legislation	Strict regulations of federal joint committee (Gemein-samer Bundesausschuss)	*„… wenn man nicht mindestens so uns so viel Geburten pro Jahr vorweisen kann dann gilt das als unsicher für Mutter und Kinde weil dann die Expertise angeblich nicht mehr da ist und dann werden die Kreißsäle geschlossen. Also hier sind im Umkreis die nächsten beiden Kreißsäle geschlossen worden…“* P3, GP on island	*“…if you don't have at least a minimum amount of births per year, then it is considered unsafe for mother and child because the expertise is supposedly no longer there and then the delivery rooms are closed. The next two delivery rooms in the area have been closed…”* P3, GP on island
	Regulations of the association of Statutory Health Insurance Physicians	*„…Hamburg ist an sich ein Plangebiet […] also man kann jetzt nicht sagen bei der Niederlassung oder bei den Kassenarztsitzen 'so wir haben jetzt hier ein Sitz in Hamburg-Harburg zum Beispiel und der muss besetzt werden' [,] sondern wenn ein Sitz frei wird dann gilt der für ganz Hamburg und dann kann es dann eben auch sein[,] dass sich die Sitze dann auch entsprechend verlagern das nicht […] ein frei werdender Sitzt eben an dem Ort wieder wieder belegt wird sondern an ganz anderer Stell“* P2, Regional Director Health insurance	*“…Hamburg is in itself a planning area, so you can't say in the case of the branch office or the panel doctor seats 'we have a seat here in Hamburg-Harburg, for example, and it has to be filled', but when a seat becomes vacant it applies to the whole of Hamburg and then it can also be the case that the seats then shift accordingly, so that a seat that becomes vacant is not filled again in the same place but in a completely different place.”* P2, Regional Director Health insurance
Financial issues	Budget allocation	*„…und da hängt es davon ab[,] ob ein Bundesland gezielt einzelne Großprojekte fördert oder nach Dringlichkeit fördert oder die zur Verfügung stehenden Haushaltsmittel einfach pauschal verteilt. ... Das macht dann schon im Versorgungsangebot unterschiede…“* P1, Head of Hospital Investment Unit	*“…and it depends on whether a federal state specifically promotes individual large-scale projects or promotes them according to urgency or simply distributes the available budget funds across the board. ... This already makes differences in the range of services…”* P1, Head of Hospital Investment Unit

Financial issues	High financial risk	*„…der niedergelassene Arzt [muss] häufig viel mehr Eigenmittel in seine ja ich sag mal Infrastruktur stecken […] aus seinem eigenen persönlichen Portemonnaie als ein Krankenhausträger [und dann] für die Leistung selber sogar noch weniger Geld bekommt. Dann sagt der niedergelassene Arzt 'Warum soll ich das machen, geh doch ins Krankenhaus' und dann verstopft es wieder die Wege…“* P1, Head of Hospital Investment Unit “*Das ist einfach auch teuer nh also ist viel Arbeit und kommt hinterher nicht so viel bei rum das will keiner…“* P3, GP on island	*“…the doctor in private practice often has to invest much more of his own money in his infrastructure than a hospital operator and then receives even less money for the service itself. Then the general practitioner says 'Why should I do that, go to the hospital' and then it clogs up the roads again…”* P1, Head of Hospital Investment Unit *“It's just too expensive, so it's a lot of work and you don't get much out of it afterwards - no one wants that…”* P3, GP on island
	Too long travel time	*„… und das sind einfach bestimmte Regionen für Leistungserbringer egal welcher Profession nicht attraktiv genug weil sie zu lange Wegzeiten haben.“* *„Das heißt der Physio müsste ein Hausbesuch machen. Für ihn ist es aber wirtschaftlich nicht interessant also weder was die jetzigen Spritpreise betrifft noch dass er ne halbe Stunde unterwegs ist in der er eigentlich den nächsten Patient abfrühstücken könnte...“* P1, Head of Hospital Investment Unit	*“…and that certain regions are simply not attractive enough for service providers, regardless of the profession, because they have too long travel times.”* *“This means that the physio would have to make a house visit. However, it is not economically interesting for him, neither with regard to the current fuel prices, nor that he is on the road for half an hour during which he could actually finish off the next patient…”* P1, Head of Hospital Investment Unit
Secondary determinants			
Category	**Sub-category**	**Examples for application**	
Patient management	Non-urgency ranking	*„…sie wollen zum Hautkrebsscreening, ja [,] da können sie teilweise ein paar Monate auf ein Termin warten [,] aber sie drängeln sich in die Reihe mit all denen wo sich plötzlich [ei]ne Hautveränderung eingestellt hat. Die mit der plötzlichen Hautveränderung bekommen aber kein Termin…“* P1, Head of Hospital Investment Unit	*“…they want to go for skin cancer screening, […] sometimes they can wait a few months for an appointment [,] but they push their way into the queue with all those who have suddenly developed a skin change. But those with the sudden skin change don't get an appointment…”* P1, Head of Hospital Investment Unit

Patient management	No holistic patient approach	*„Und dann ist glaub ich eine ganz große Fehlallokation [,] dass dann Patienten durch diverse Systeme geschleust werden [,] weil man nicht genau weiß*[,] *was die eigentlich genau haben, also es wird zu sehr fachspezifisch manchmal geschaut glaub ich eh und nicht der gesamte Patient oder der Mensch betrachtet.“* P4, Project- & Healthcare Manager	*“And then I think there is a very big misallocation [,] that patients are then channelled through various systems [,] because you don't know exactly what they actually have, so sometimes people look too much subject specific, I think, and not at the whole patient or the person.”* P4, Project- & Healthcare Manager
Educational structure	Duration and location of further training	*„…wenn Sie nach alter Ausbildung äh Fachkrankenpflegekraft für Kinderheilkunde sind, brauchten Sie zwei bis drei Jahre Berufserfahrung, dann eine zweijährige Fachweiterbildung für die Neonatologie der Zeit ist die Familiengründung abgeschlossen und Sie sind nicht mehr breit ohne weiteres den Wohnortwechsel für zwei Jahre durchzuführen weil diese Fachweiterbildung nur an wenigen Standorten angeboten wird.“* P1, Head of Hospital Investment Unit	*“…if you are a specialist nurse for paediatrics after the old training, you need two to three years of professional experience, then two years of further training in neonatology, by which time the family has been founded and you are no longer prepared to change your place of residence for two years because this further training is only offered at a few locations.”* P1, Head of Hospital Investment Unit
	Professional skills	*„…die Pflegekraft im Krankenhaus setzt sie selbstverständlich die Heparin Spritze wenns in der Verordnung steht. Im niedergelassenen Bereich die normale Pflegekraft die zur Grundpflege kommt darf es schon mal nicht weils vielleicht nur eine Altenpflegerin ist oder eine angelernte Kraft da muss eine examinierte Kraft kommen und wenn die examinierte Kraft feststellt da ist jetzt was anderes [als das was zu Beginn vermutet wurde,] dann darf sie auch nichts anderes tun und muss den Arzt verständigen oder den Rettungsdienst verständigen Halleluja.“* *„…wenn die Pflegekraft zum Beispiel ein vernünftigen Bodycheck eigenverantwortlich machen dürfte und sagen könnte, nach meinem dafür halten kann ich hier nichts feststellen es muss nicht zwingend das obligatorische Röntgen passieren […] Dann würden sie viele Transporte sparen viel Wartezeit in der Notaufnahmen sparen viele Strahlenbelastungen*	*“…the nurse in the hospital gives the heparin injection as a matter of routine if the prescription says so. In the ambulant sector, the normal nurse who comes for basic care is not allowed to do it because it may only be a geriatric nurse or a semi-skilled nurse, a registered nurse has to come and if the registered nurse finds out that there is something else [than what was suspected at the beginning] then she is not allowed to do anything else and has to inform the doctor or the ambulance service.”* *“…if, for example, the nurses were allowed to do a reasonable body check on their own responsibility and could say, according to my own judgement, I can't find anything here, it doesn't necessarily have to go through the obligatory X-ray [...] Then they would save a lot of transports, save a lot of waiting time in emergency rooms, save a lot of radiation*

Educational structure		*sparen, viele Arztstunden sparen.“* *„…aber das ist ja auch ein Stückchen Verantwortung und Verantwortung bedeutet auch Wertschätzung und Anerkennung und genau das ist es was jetzt von Pflegekräften bemängelt wird […]“* P1, Head of Hospital Investment Unit	*exposure, save a lot of doctors' hours.”* *“But that is also a bit of responsibility and responsibility also means appreciation and recognition and that is exactly what is now being criticised by care workers […]“* P1, Head of Hospital Investment Unit
Working situation	Low salary	*„Und insofern da muss man echt noch weiter dran arbeiten [,] dass die Attraktivität auf finanzieller Seite eben auch steigt[.]“* P2, Regional Director Health insurance	*"And in this respect, we really have to work on increasing the attractiveness on the financial side as well [.]”* P2, Regional Director Health insurance
	Working conditions	*„… 21 Bereitschaftsdienste im Monat und 30 oder 31 Notarztdienste 24 stunden sieben Tage die Woche das will halt auch nicht jeder und ich glaub das ist halt ein Grund dafür warum es so schwierig ist Leute zu bekommen […]“* P3, GP on island	*"... 21 on-call services a month and 30 or 31 emergency doctor services 24 hours a day, seven days a week - not everyone wants that and I think that's one reason why it's so difficult to get people [...]".* P3, GP on island
	Patient variety	*„… das macht die Arbeit spannend. Ich wäre NIEMALS wo anders Allgemeinmedizinerin geworden [,] weil ich stell mir das sehr sehr langweilig vorstelle […]“* P3, GP on island	*"... that makes the work exciting. I would NEVER have become a general practitioner anywhere else because I imagine it to be very, very boring[...]".* P3, GP on island
Attractivity of neighbourhood	Networking	*„… und eben auch die Vernetzung eben auch mit Kollegen [,] wenn man eben auch als Allgemeinmediziner zum Beispiel auch ehm ja auch darauf angewiesen ist [,] dass im Umfeld eben auch entsprechende Facharztpraxen und Physiotherapeuten und so eben auch sind dann versucht man ja auch genau in diese Regionen zu kommen und sich dort niederzulassen.“* P2, Regional Director Health insurance	*"… and also the networking with colleagues if, for example, as a general practitioner, you are also dependent on having appropriate specialist practices and physiotherapists and so on in the vicinity, then you also try to come to these regions and establish yourself there."* P2, Regional Director Health insurance
	Lifestyle	*„…das heißt nicht jede Region ist auch für einen niedergelassenen Arzt interessant[,] weil Miete, Lebenshaltungskosten teurer oder billiger sind[.]“* *„…die in Inanspruchnahme hängt auch mit der verkehrstechnischen Infrastruktur teilweise zusammen*	*"…This means that not every region is interesting for a doctor in private practice because rent and cost of living are more or less expensive[.] “* *"… the use is also partly related to the transport infrastructure, whether I have it or not [...]".*

Attractivity of neighbourhood	Lifestyle	*ob ich sie hab oder ob ich sie nicht habe […]“* P1, Head of Hospital Investment Unit *„… man braucht auch komplett Infrastruktur vor Ort[,] es braucht Kinderbetreuungsangebote es braucht auch vielleicht wohnortnahe Weiterbildungsangebote [,] dass man nicht in die größere Stadt fahren muss [.]“* P4, Project- & Healthcare Manager	P1, Head of Hospital Investment Unit *"…you also need a complete local infrastructure, you need childcare facilities, you also need further training opportunities near your home [,] so that you don't have to travel to the larger city [.]"* P4, Project- & Healthcare Manager
	Patient clientele	*„… das so tatsächlich die Attraktivität ehm dadurch dass da eben […]genügend... Patienten Patientinnen eben auch wohnen die […]zu der gewünschten Gruppe gehören (lacht) sag ich mal so ganz neutral ehm die eben auch zahlungskräftiger sind da muss man auch deutlich zu sagen auch […]“* *„…Zuwanderer haben[,] die auch mit dem System auch nicht so vertraut sind die dann eben tatsächlich ehm ja das gar nicht kennen dass es niedergelassene Ärzte gibt und ehm die dann in ihrem Inanspruchnahme Verhalten dann eher […] versuchen […] Krankenhäuser zu finden und sich dort in die Notaufnahme setzten […] sofern überhaupt Krankenhäuser da sind oder eben auch gar nicht dahin gehen [.]“* P2, Regional Director Health insurance *„Diese ärztliche Inanspruchnahme führt auch beim Arzt zum Frust und motiviert nicht unbedingt sich dann noch weiter in ländliche oder dünn besiedelte Gebiete zu begeben.“* P1, Head of Hospital Investment Unit	*"… that the attractiveness is actually enhanced by the fact that there are [...] enough... patients live there who [...] belong to the desired group (laughs), [...], who are also more financially strong, one must clearly say that.”* *“…Immigrants who are also not so familiar with the system, who then actually don't know that there are doctors in ambulant practice and who then tend to [...] try to find [...] hospitals and sit in the emergency room there [...] if there are any hospitals at all or [they] don't go there at all [...]".* P2, Regional Director Health insurance *"This use of medical recourses also leads to frustration on the part of the doctor and doesn’t necessarily motivate to go even further into rural or sparsely populated areas.”* P1, Head of Hospital Investment Unit

Social transformation	Industrialisation	*„…ne Überalterung stattfindet verstärkt eben dadurch dass die ältere Bevölkerung da bleibt aber auch die Berufe oder die Berufsausübenden eben auch tatsächlich sich eher wo anders hin orientieren und dann ihre Praxen und ihre Tätigkeiten eben auch so Richtung Westen verlegen und dadurch natürlich die Gebiete auf einmal unterversorgt sind„[…]“* P2, Regional Director Health insurance *„…Langezeit haben da ja Familiäre Strukturen etwas aufgefangen aber diese Strukturen zerbrechen zunehmend einfach weil die Leute mobiler geworden sind und man kommt nicht hinterher das aufzubauen.“* P1, Head of Hospital Investment Unit	*"...an over-ageing is taking place, intensified by the fact that the older population remains there, but also that the professions or those practising the professions actually tend to orientate themselves elsewhere and then move their practices and their activities towards the west, and as a result the areas are of course suddenly under-supplied"[...]".* P2, Regional Director Health insurance *"… or a long time, family structures provided some support, but these structures are breaking down more and more simply because people have become more mobile, and you can't keep up with them."* P1, Head of Hospital Investment Unit
	Demographic change	*„…auch mit dem demographischen Wandel dass natürlich auch viel zu wenig Ärzte nach kommen* P4, Project- & Healthcare Manager	*"...also with the demographic change that, of course, far too few doctors are coming up."* P4, Project- & Healthcare Manager
	Generational change	*„…junge Ärztegeneration die wollen ganz zu Recht ein bisschen Work-life Balance und die wollen sich nicht rund um die Uhr totarbeiten und rund um die Uhr für ihren Patienten erreichbar sein ehm sondern die wollen auch mal frei haben [.]“* P3, GP on island	*„…The young generation of doctors quite legitimately want a bit of a work-life balance and they don't want to work themselves to death around the clock and be available for their patients around the clock, but they also want to have some time off [.]"* P3, GP on island

Rural familiarity		*„…dass es eben auch wirklich wenn man ehm so das sich gut auskennt schon in der Region und wenn man eben auch so ne gewisse Verbundenheit spürt zu Region dann glaub ich ist es schon eher ist es etwas leichter, oder etwas wahrscheinlicher dort auch tätig zu werden[.]“* P2, Regional Director Health insurance *„Also meiner Erfahrung nach wollen die genau das nicht, die wollen lieber in die Städte Ballungsräume eben eher in die Anstellung als in die Selbstständigkeit und ich glaub das ist überall auf der Welt so dass man nicht auf dem Land lieber also leben möchte ehm sondern tatsächlich lieber in der Stadt wo die Bedingungen angeblich besser sind [.].“* P3, GP on island	*"…that if you really know the region well and if you feel a certain connection to the region, then I think it is easier or more likely to become active there[.]"* P2, Regional Director Health insurance *"In my experience, that's exactly what they don't want, they prefer to live in the cities rather than be self-employed and I think that's the case all over the world, that people don't prefer to live in the countryside but actually prefer to live in the city where the conditions are supposed to be better.”* P3, GP on island

Appendix 11: Category system

Factors

Main consequences

Lack of new ambulant clinics or services
Closure of healthcare providing institutions
Lack of attending capacity

Primary determinants

HWF shortage
Saturation of services
Non-adequate use of resources

Legislation
Strict federal joint committee regulations
Planning areas

Financial issues
Budget allocation
High financial risk
Long travel times

Secondary determinants

Patient management
No urgency ranking of patients
Non-holistic patient approach

Educational structure
Further training
Lack of professional skills

Working situation
Low salary
Working conditions
Patient variety

Attractivity of neighbourhood
Networking possibilities
Lifesytle
Infrastructure
living costs
Patient clientel
Low Health Literacy
Additional revenue

Societal transformation
Industrialisation
Generational change
Demographic change

Approaches

Regional focus & patient orientated

Local healthcare center
Community Health Nurse
Mobile care units
Telemedicine

Professional support

Financial incentives
Temporary professional support

Planning & monitoring of HWFs and populations needs

Nation-wide demand planning
Special needs approval of over-target contracted doctor's position
Medical appointment service

Rural undergraduate Training

Rural student recruitment
Rural education

Appendix 12: Detailed overview of individual influences of all contributing factors

Abbreviations: DCh: Demographic change; GCh: Generational change