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Review

Enhancing the Sustainable Goal of Access to Healthcare: Findings from a Literature Review on Telemedicine Employment in Rural Areas

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Abstract: Fighting health inequalities is a challenge addressed by the United Nations Strategic Development Goals (UN-SDGs). Particularly, people living in rural areas suffer from a lack of health infrastructure, which would jeopardize their inclusion in universal coverage for specialist care. Delivering valuable healthcare in underserved areas can be achieved through the employment of new technical innovations, such as telemedicine, which improves service delivery processes. Accordingly, this paper discusses how telemedicine strategies have enhanced the sustainability of right of "access to healthcare" in rural areas. Once we derived the sustainability pillars for healthcare from the UN-SDGs 3 and 10 according to the WHO innovation assessment metrics, a PRISMA-based literature review was conducted using the Scopus database. English, peer-reviewed articles/reviews from 1973 to 2019 were considered. The enquiry covers two analyses: (i) quantitative-bibliometric on 2267 papers; and (ii) qualitative-narrative on the 30 most significant papers. Interest about the topic has increased in the last decade following digitalization diffusion. The most productive and collaborative countries are those with huge dimensions and under financial restrictions. From a sustainability-oriented standpoint, telemedicine enhances both emergency and diagnostic healthcare in rural areas by decreasing the cost of services, expanding coverage of specialist cares, and increasing the quality of the outcomes. For health policies, telemedicine can be considered a suitable solution for providing cost-effective and sustainable healthcare.

Keywords: access to healthcare; telemedicine; e-health; rural areas; remote areas; UN-SDG 3; UN-SDG 10; commons; value-based healthcare; health-related performance

1. Introduction

"*Inequalities (..) continue to persist across the world. (..) We cannot achieve sustainable development and make the planet better for all if people are excluded from opportunities, services and the chance for a better life*" [1] (p. 1). The above sentence, released by the United Nation in 2015, perfectly synthetizes how the exclusion from services and resources of groups of people could negatively impact on the effective development of the worldwide population.

It is well known that rural women are three times more likely to die while giving birth than women in urban areas (UN-SDG 10) [1]. Moreover, persons with disabilities are the largest minority in the world, but 80% of them live in developing countries (UN-SDG 10) [1], far from some facilities belonging to developed ones. Although today's world people are all interconnected, there still exists a lack of opportunities and rights that can jeopardize an inclusive and economic growth for all people.

As a consequence, reducing inequalities (UN-SDG 10) [1] means investing in supporting those vulnerable communities that are cut off from access to some rights [2], such as health, education, protection, and a decent job.

In particular, given that the *"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"* [3] (p. 1), and that at least half of the population worldwide is without access to essential healthcare services (UN-SDG 3) [4], the universal health coverage and its sustainable financing seem to be the most important preconditions for fighting inequalities (UN-SDG 3) [4].

Nevertheless, an aging population, related increases in chronic diseases and multi-pathologies [5], as well as new syndromes or viruses [6] are making it even harder to guarantee access to valuable services. As a consequence, National Healthcare Systems (NHS), Public Agencies, and decision-makers are always asked to further enhance people's right of access to healthcare. This requests a managerial change, based on the improvement of inter-organizational relationships and assets [7], that involves the government of healthcare offering an answer to people's necessities and expectations.

In the healthcare management field, the value created around a patient is usually measured for a group of people with similar needs (medical condition, epidemiology, and comorbidity) [8]. Therefore, it is expected that patients with the same demographic condition of "living in a rural area" tend to develop the same needs to get access to specialist care by surpassing barriers of time and distance.

In order to deliver valuable healthcare in rural areas [9,10], a possible strategy [11–13] is the employment of telemedicine strategies in service providing. Defined as "*the use of information and communication technology to provide health care services to individuals who are some distance from the health care provider*" [14] (p. 765), telemedicine brings biomedical data and information transmission (texts, sounds, images, etc.) for prevention, diagnosis, treatment, and follow-up of patients. [15]. From a managerially rational approach [16], telemedicine can be considered as a technological input able to improve the healthcare delivery process by changing the traditional "face-to-face" relationship between patient and physician. Surely, this impacts on healthcare organization and sustainability, both in terms of the financial resources involved and in terms of the outcomes obtained.

Starting from these preconditions, the challenge of this paper is to understand how telemedicine-based strategies, derived by the reality, have enhanced the sustainability of "access to healthcare" in rural areas.

Particularly, in coherence with both the value-based healthcare principals and the United Nation's SDGs 3 and 10 guidelines, this study aims at analyzing the main literature concerning with worldwide experiences of telemedicine employment in healthcare delivered to communities located far from urban hospitals. Oriented towards a managerial standpoint, this review intends to identify and discuss which leverages of sustainability have been achieved by telemedicine infrastructures in providing care to underserved areas. Finally, the ultimate aim of this work is to foster health policy debates about the employment of new digital technologies as drivers for healthcare system sustainability.

To achieve its purpose, this paper structure is based on the following outline: After this brief introduction, the second section reports a background addressing the issues of commons and healthcare sustainability and their relationship with telemedicine through the lens of value-based healthcare principles; particularly, the second section includes an interpretation of the concept of "healthcare sustainability" (as derived by SDGs 3 and 10 [1,4]) from managerial control and performance management standpoints. The third section explains the methodology of the study, while the fourth presents the findings of the inquiry. Section five discusses the results obtained and provides some consideration about the employment of telemedicine as an effective strategy for enhancing access to healthcare in remote locations. The last section summarizes the results obtained and lays the foundation for further research.

2. Background

In the fields of economics and social sciences, the cultural and natural resources accessible to all members of society are recognized as "Commons". Referring to resources shared by a group of people, these include knowledge, intellectual property, soft skills, and generally everything that can be recognized as "rights" of inclusion to services or facilities [2].

Held in common and not owned privately, these resources could be managed for individuals and for the collective benefits of groups of people (communities and user groups) [17–19]. Over the year, scholars have identified two generations of Commons: the first was about sharing of physical things, such as natural resources (e.g., forester, fisheries, grazing pastures, etc.); and the second one (New Commons) [2] is about an intangible pool of resources, such as science and culture, which can be generally recognized as "rights".

For the aim of this work, the New Commons alternative is particularly interesting, both because of its distributional implications and because of its potential for raising the rate of innovation and value creation.

Accordingly, Hess [2] have identified various innovated sectors, sub-sectors, and representative collective-action communities involved in new commons. One of these sectors is medical and health. In this field, referring to Commons (as the right to distribution) means referring to the access to healthcare that is the right to universal access to all medical services and sanitation.

Access to healthcare should be universal, guaranteed for all on an equitable basis. Healthcare should be affordable and comprehensive for everyone, physically accessible where and when needed [20]. Accordingly, if New Commons are related to the right of distribution and not to the right of exclusion, enhancing access to healthcare means improving an inclusiveness right.

Therefore, in the perspective of guaranteeing the right of health to the population by a worldwide NHS, "access to healthcare" could be considered as completely coherent with the following goals:

- "to reduce inequalities" (UN-SDG 10) [1];
- "to ensure healthy lives and promote well-being for all at all ages" (UN-SDG 3) [4].

The healthcare sector, however, is characterized by plenty of stakeholders with countless and often conflicting goals. Thus, in order to manage the complexity in this field and enhancing its performance, a profound analysis of stakeholder involvement within the several processes performed is requested. In particular, as underlined by Porter in 2010 [8], the lack of clarity about shared goals was the main reason for slowing down the performance improvement process in healthcare; moreover, the constant growth of the population's health needs has requested a more "patient-oriented" healthcare management. Hence, both for public and private healthcare providers, the traditional approach focused on staff needs over users' needs becomes no longer acceptable [21].

Starting from previous theories [22,23], value-based logic has involved an intellectual change: shifting from a healthcare based on the volume and intensity of services, to a "patient-centric" healthcare based on the value created for the consumer of the services. This logic has a twofold aim: improving outcomes and increasing the number of treatments. However, to be practically feasible, this approach implies a radical modification of the traditional paradigm of healthcare: moving from a vertical "organizational-centric" approach in treating diseases, to a horizontal one designed and tailored on the patient's expectations and needs. This implies that management should focus their attention on the process of caring rather than on the operational structure and procedures.

Therefore, distinguished by similar primary care needs [24], the patient population becomes the unit of analysis of healthcare policy. For the managerial assignments, this implies the necessity to analyse the omni-comprehensive cycle of care [8], rather than a clinical episode, individual phase, or single technology for treating diseases.

Accordingly, through the lens to reduce inequalities among people by healthcare management policies, the sustainability of healthcare can be translated in specific pillars that express those strategic objectives [25,26] to which a healthcare organization should tend in order to improve its own performance [27–29].

In particular, by reinterpreting the UN-SDGs 3 and 10 [1,4] in accordance with the evaluation metrics of the Health Impact Assessment (HIA) [30,31] released by the World Health Organization [32], it is possible to state that a healthcare intervention can be considered as sustainable if it respects one or more of these conditions (which can be named for this work aims as the *sustainability pillars for healthcare*):

- Reducing healthcare cost/Increasing healthcare efficiency (C/E);
- Enhancing healthcare utilization (U);
- Improving healthcare quality (Q).

Accordingly, the "Value in Health equation" [8] (p. 2477) can be expressed as the ratio between the outcomes and costs: Outcomes are multidimensional and related to a specific condition, whereas cost refers to the total amount of resource employed for the full cycle of care for the patient's medical condition (and not for the mere individual service). Very often, however, cost reduction regardless of the outcomes obtained is dangerous and self-defeating; it could lead to false "savings" by limiting effective care for patients. Accordingly, to reduce cost, the best approach is often to "*spend on more service to reduce the need for others*" [8] (p. 2477); it means that every health intervention has to be evaluated as the sum of its impacts as a whole, i.e., from a clinical, organizational, and economic standpoint.

Thus, in the light of sustainability of healthcare, the concept of Value in Health [8] encompasses the following variables (enclosed in the Table 1) that can be clustered per correlation with the sustainability pillars for healthcare, as previously mentioned, and their connection with the WHO's HIA metrics.

Table 1. Relationships between the value-based healthcare variables, sustainability pillars for healthcare, and metrics for digital health intervention.

Value-Based Healthcare Variables (as derived by Porter, 2010 [8])	Sustainability Pillars for Healthcare (as derived by UN-SDGs 3 and 10, 2015 [1,4])	Metrics for Digital Health Intervention (as derived by WHO, 2016 [32])
Profitability	Reducing Healthcare Cost Increasing Healthcare Efficiency	Cost
Cost		Efficiency
Access to Services	Enhancing Healthcare Utilization;	Utilization
Patient-Centeredness		
Quality	Improving Healthcare Quality	Quality
Safety		
Patient Satisfaction		

Source: Authors' elaboration derived from Porter (2010) [8], UN-SDGs 3 and 10 (2015) [1,4] and the WHO (2016) [32].

The achievement of a high value for patients should be the purpose that drives the delivery of healthcare services. Patients, payers, providers, and suppliers can all benefit if the value improves while the economic sustainability of the healthcare system increases [8,24]. Consequently, the achievement of this goal could be considered as the most effective way to gather the interests of all stakeholders involved.

In particular, high-value healthcare delivery in rural and remote areas implicates a choice among two alternative strategies:

(1) "moving" patients to hospital;
(2) "moving" hospital to patients.

It is clear that the second choice is mostly valid only for those "soft" healthcare services (e.g., diagnosis, monitoring, follow-up, specialized medical consultation, etc.); but, this second strategy (patient-centric) is also the most effective, often thanks to the availability of new technologies and processes that foster new operational approaches.

Among these innovations, in particular, telemedicine is "*the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities*" [33] (p. 10). Telemedicine, moreover, can be considered as

"*a process, not a technology and shifts the paradigm of transporting the patient to the site of the expert care giver to transporting expert knowledge to the health care provider closest to the patient (i.e. move the information not the patient)*" [34] (p. 38).

Several experiences of telemedicine employment have shown improvement of outcomes and access for patients together with cost containment [35–37].

One of the major advantages of telemedicine over conventional care is the potential for increased access to medical care for a population that experiences a level of isolation (e.g., prisoners or persons working at sea or in war zones) [38]. Accordingly, many authors have demonstrated the positive impact of telemedicine strategies in healthcare delivery in remote areas, both for early diagnosis and follow-up. Moffat and Eley in 2010 [10] provided a literature background, with evidence, of the four areas of benefit of a telehealth service for the Australian population who live in a remote location: (i) patients and family, (ii) medical provider, (iii) participating hospital, and (iv) society. In particular, this study emphasized that a telemedicine strategy could have a positive impact on two on-going issues: the poorer health status of rural areas, and the crisis in the rural health force.

Moreover, Bradford et al.'s review [39] has examined factors influencing the sustainability of Australian telehealth services, with the aim to identify key points that have to be considered for evaluating the success or failure of a telemedicine strategy. The study confirmed that the assessment factors can be surely connected to the quality, utilization, and cost-efficacy of the service provided, as an explanation of healthcare sustainability by the above-identified pillars.

In accordance with these endpoints, Du Toit et al. [9] also showed that the "hub and spokes" model for delivering healthcare in remote areas is cost-effective. The authors underlined that the design of a healthcare policy based on a clear separation of tasks between a highly specialized healthcare center (the "hub") and rural clinics (the "spokes"), interconnected by telemedicine infrastructures, has an excellent impact on the management of rural and remote emergency departments.

In conclusion, on the basis of these preconditions, the following section aims at exposing and reporting how experiences of telemedicine employment can be effectively considered as a successful strategy to improve healthcare in locations far from a specialized hospital, enhancing the right of "access to healthcare".

3. Materials and Methods

A systematic literature review was conducted in the fields of health and healthcare management in order to understand how telemedicine approaches improve access to healthcare in rural areas, contributing in creating value for the patients. Scopus was the database used for conducting the research. The keywords used for the whole inquiry are contained in the following Table 2.

Keywords contained in the same column are an alternative within them. Papers that contain at least one keyword belonging to each column within title and/or abstract and/or keywords were considered relevant for this study. Other search criteria used to define the selection of papers are the following:

- Language: only studies published in English were selected;
- Document type: only peer-reviewed articles and reviews were considered. The other categories of study from Scopus as conference papers, editorials, book chapters, articles in press, conference proceedings, and letters were excluded.

All articles published from 1973 to December 2019 were considered. The study has involved two stages of enquiry.

Table 2. Keywords used for the enquiry.

1st Keyword		2nd Keyword
"e-health" or "ehealth" or "telecare" or "telemedicine" or "telehealth" or "telemonitoring" or "telepractice" or "telenursing"	**AND**	"rural areas" or "rural communities" or "rural population" or "remote areas" or "remote population" or "remote communities" or "province"

Source: Authors' illustration.

3.1. Stage One

After the extraction of the final sample, quantitative-descriptive and bibliometric analyses of the FULL dataset obtained was conducted by using a statistical-descriptive spreadsheet tool and the VOSviewer software on the metadata downloaded from Scopus. In particular, the following dimensions have been analyzed:

i. Papers/years;
ii. Journals;
iii. Countries;
iv. Research areas;
v. Collaboration among countries;
vi. Co-occurrence of keywords;
vii. Co-occurrence of terms within titles and abstracts.

For clearness, we specify that the bibliometric analysis of the literature is quite a new statistical method whose goals are studying the editorial and the textual information of written documents; this method appears to be a systematic, transparent, and replicable process for literature reviews [40,41], allowing users to quantitatively examine the bibliographic state of the art of a topic or issue, by statistically analysing interrelated information within a dataset (composed by a sample of paper).

According to Duriex [42] the bibliometric analysis is employed by scholars to statistically/mathematically measure the relative importance of a particular issue within a paper (e.g., scientific fields, keywords, authors, or country). There are three main types of bibliometric indicators: (i) *Quantity* (e.g., number of publications); (ii) *Performance* (e.g., impact factor of journals); and (iii) *Structural* (e.g., connections between publications, authors, or research fields). Unlike a meta-analysis, a bibliometric analysis is only aimed at quantitatively describing objective variables among a group of selected studies, without any reference to their contents or findings. The metanalysis, on the contrary, is a systematic review that statistically combines evidences and findings from several studies in order to obtain qualitative answers to scientific–medical queries [43].

Thus, in this study the bibliometric analysis has been conducted on the FULL dataset of 2267 selected papers with the purpose to depict the quantitative current state of research about the specific topic of telemedicine implementation in rural areas. No reading or comprehension of papers contents have been requested at this stage, given that a further step of enquiry has been run.

3.2. Stage Two

In order to understand which sustainable pillars have been touched by the experiences of telemedicine employment in rural areas arisen from the literature review, qualitative-descriptive and conceptual analyses [44,45] were further conducted.

In particular, the goal of this second stage of analysis was to understand which managerial issues have affected the sustainability of healthcare delivery and in which way. Accordingly, the enquiry firstly refers to the relevant studies belonging to the business management and accounting fields (BMA dataset), as provided by Scopus. Nevertheless, given that the BMA papers have represented only 1% of the FULL dataset, the research has enlarged the qualitative analysis by including also those papers belonging to the other subject areas, which represents those mostly considered as background; thus, the relevant studies that have been quoted at least 100 times (QUOTs dataset) also have been considered.

Both stages of the enquiry were conducted by applying the PRISMA logic [46] for papers selection. Accordingly, Figure 1 reports the exact extraction template for the FULL dataset and the BMA and QUOTs datasets.

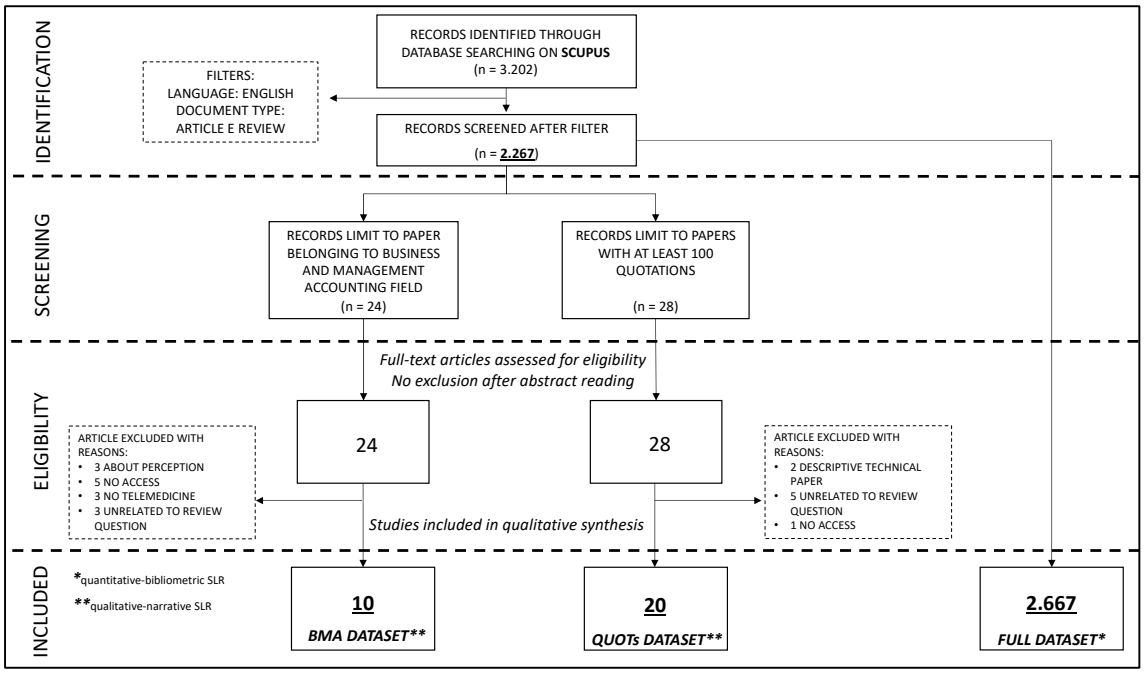


Figure 1. Paper selection and extraction template. Source: Authors' elaboration from the PRISMA model. * quantitative-bibliometric SLR; ** qualitative-narrative SLR.

4. Results

Coherently with the extraction template (Figure 1), this section presents the results of the review by describing samples, as extracted from the literature:

- FULL dataset;
- BMA dataset;
- QUOTs dataset.

4.1. Qantitative-Descriptive and Bibliometric Analyses of the FULL Dataset

At the beginning of the process, 3202 papers were identified; afterwards, by following the search criteria, the final sample was composed of 2267 studies. In particular, 82% were articles and 18% literature reviews. The following figure (Figure 2) shows the number of papers per year. The topic has had a growing interest in the last ten years.

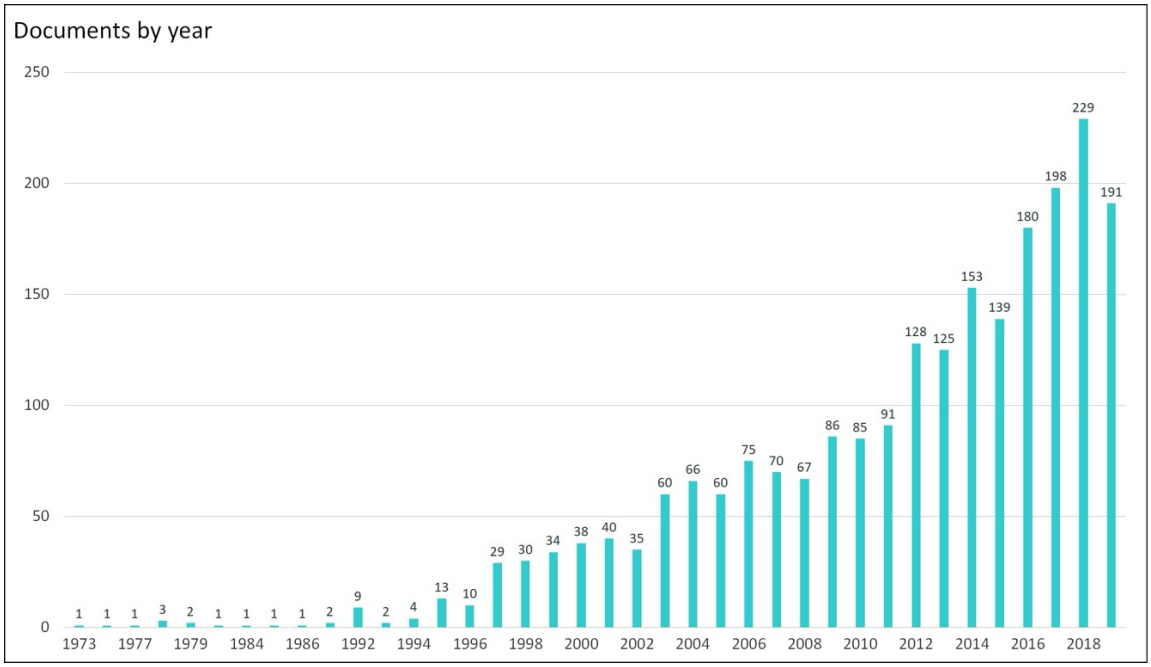


Figure 2. Document by years according to according to FULL dataset from Scopus. Source: Authors' elaboration from Scopus.

Figure 3 shows the five most relevant journals. The journal that contains most studies is the *Journal of Telemedicine and Telecare*, which started its productivity in 1995; while the most developing journal is *Telemedicine and E Health*, having the highest number of contributions per year since 2008.

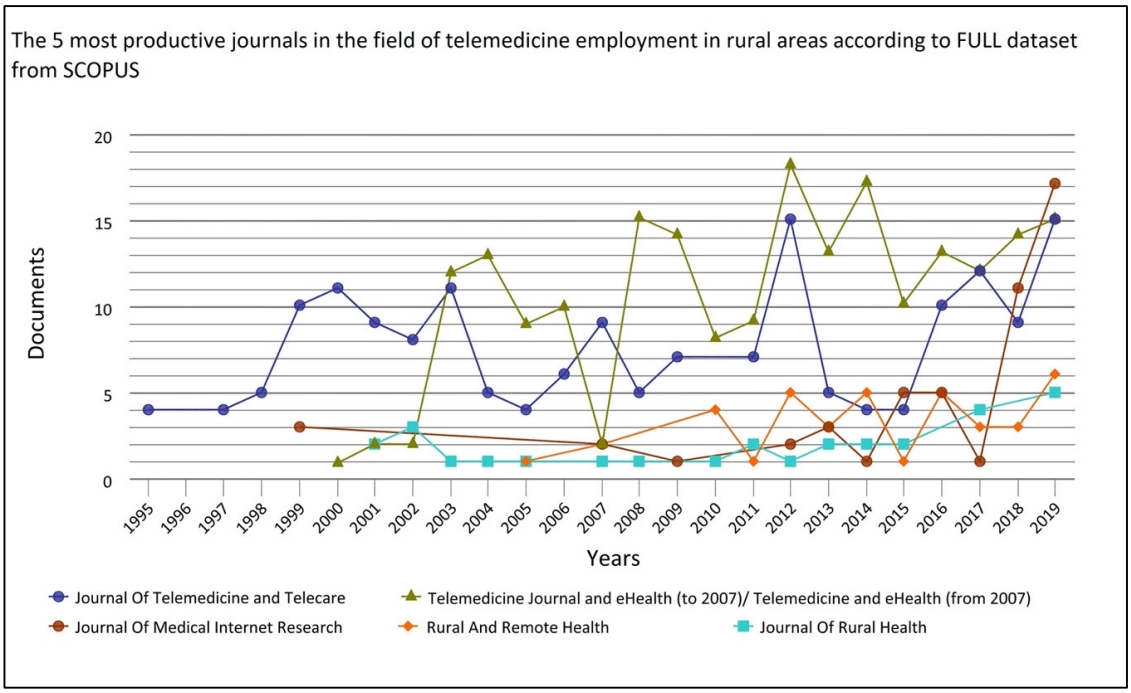


Figure 3. The 5 most productive journals in the field of telemedicine employment in rural areas according to the FULL dataset from Scopus. Source: Authors' elaboration from Scopus.

The most productive countries are shown in Figure 4; the majority of the articles were set in the United States.

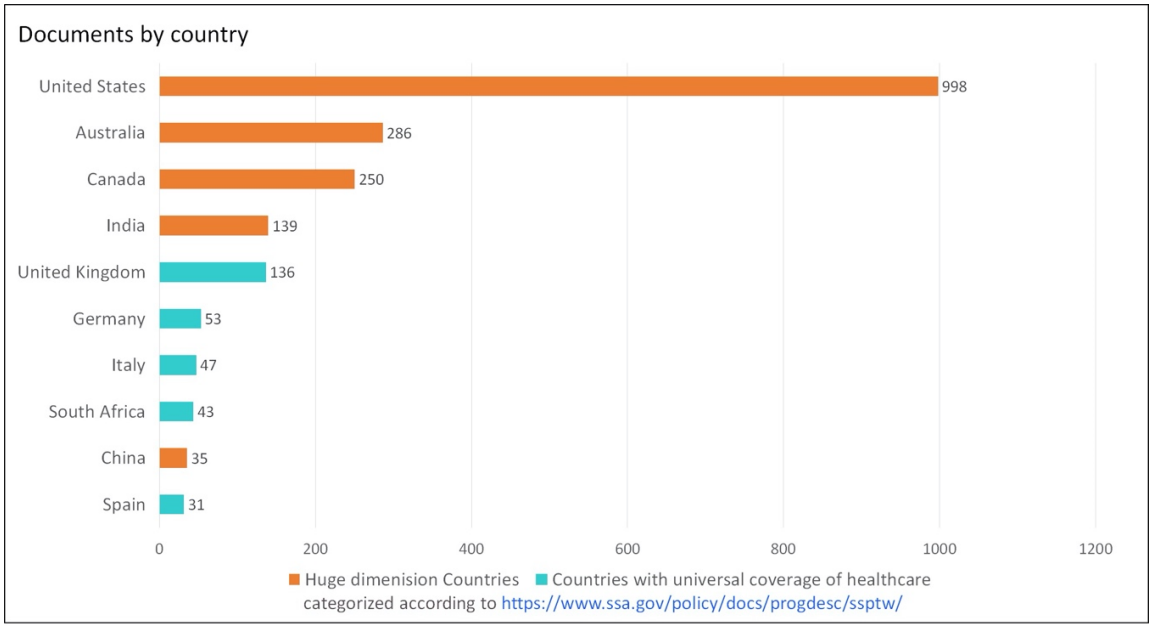


Figure 4. Documents by country according to the FULL dataset from Scopus. Source: Authors' elaboration from Scopus.

Several subject areas are involved. The following Figure 5 represents the documents divided by subject areas (as classified by Scopus, through its own experts, based on the scope and aims of the title and the related contents). Business management and accounting papers are enclosed in the "other" cluster and represents only about 1% of the FULL sample.

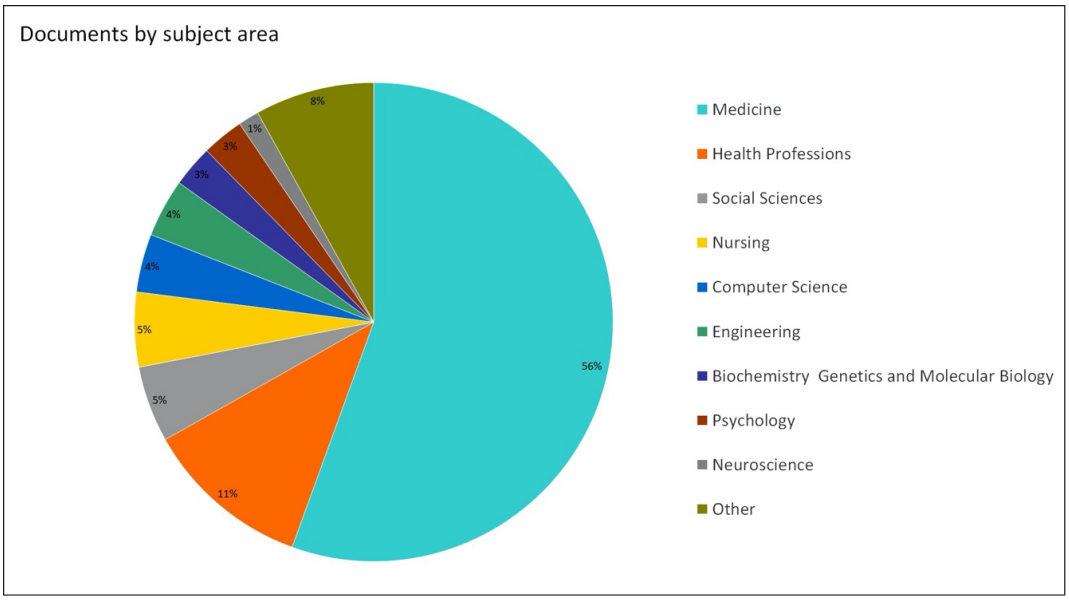
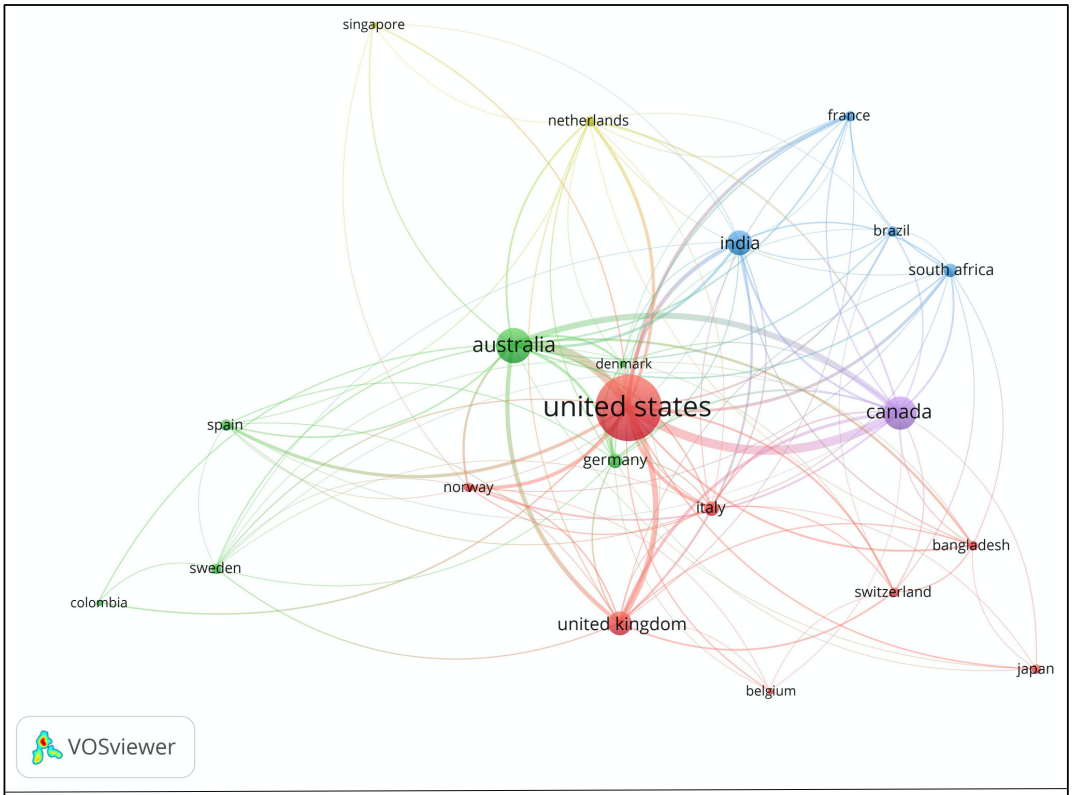


Figure 5. Documents by subject area according to the FULL dataset from Scopus. Source: Authors' elaboration from Scopus.

Figures 6–8 report the bibliometric analysis of the sampled 2267 papers (FULL dataset).



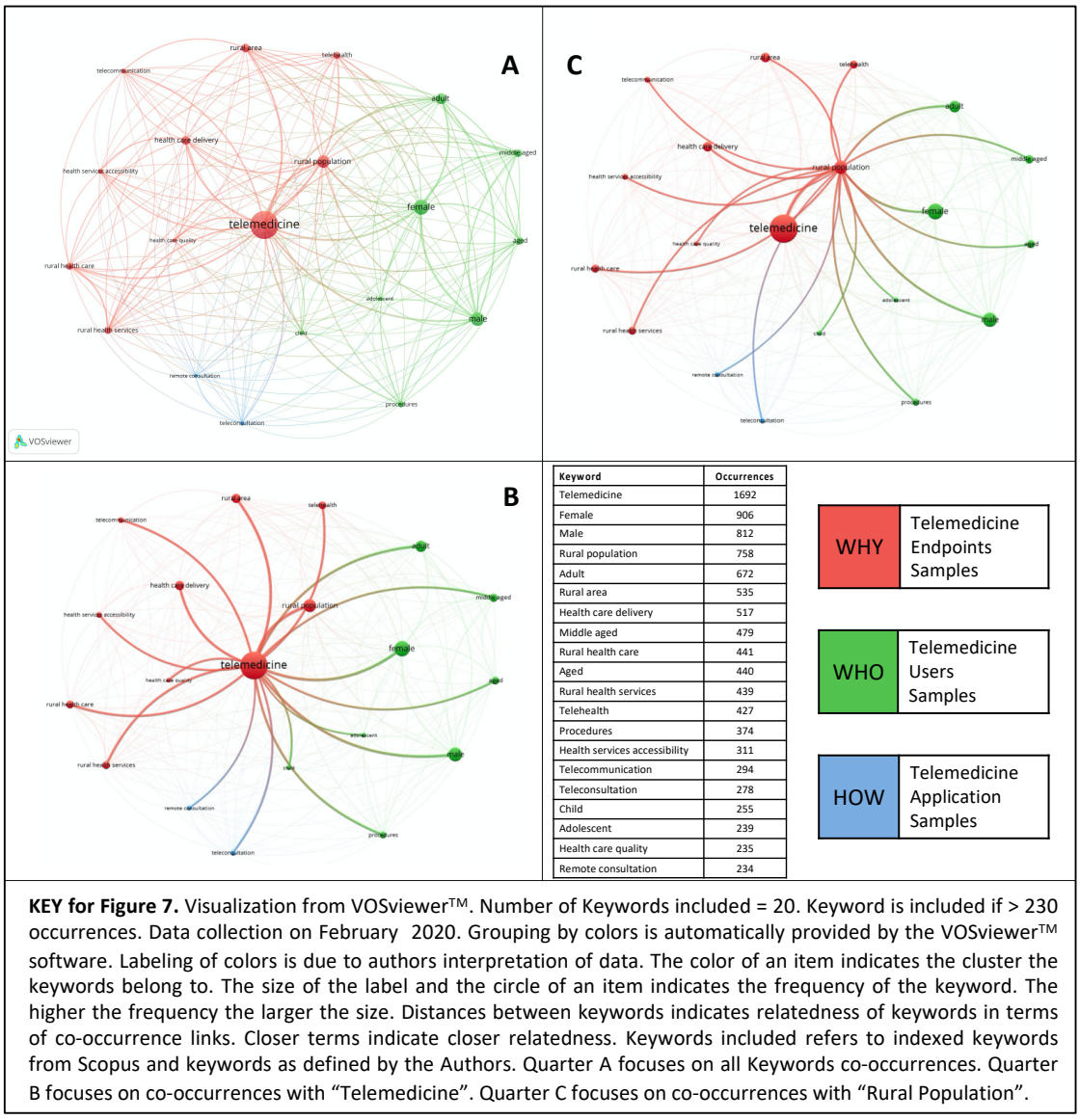
KEY for Figure 6. Visualization from VOSviewer™. Number of countries included = 21. Countries are included if > 230 citations. Data collection on February 2020. Grouping by colors is automatically provided by the VOSviewer™ software. Different colors are just due to increase readability of the chart. The size of the label and the circle of a country indicates the number of citations. The higher the numerousness the larger the size. Distances between circles indicates relatedness of countries in terms of scientific collaboration links. Closer countries indicate closer relatedness.

Figure 6. Most quoted countries and collaboration among countries according to the FULL dataset from Scopus. Source: Authors' elaboration from VOSviewer™ software.

For an appropriate understanding of the three figures, it has to be taken into consideration that the graphic representation of the bibliometric results highlights a correlation between some variables (keywords, terms, authors, and country). Thus, figures representing bibliometrics findings should be read by the following general rules:

- the greater the circle representing the variable, the higher the recurrence of that variable in the sample of papers;
- the thicker the connection line among two variables, the stronger the relationship among those variables in the sample of papers;
- the closer the circles representing two variables, the higher the correlation among the two variables.

The Figure 6 shows the most quoted countries and the level of research collaboration among them.



Keyword	Occurrences
Telemedicine	1692
Female	906
Male	812
Rural population	758
Adult	672
Rural area	535
Health care delivery	517
Middle aged	479
Rural health care	441
Aged	440
Rural health services	439
Telehealth	427
Procedures	374
Health services accessibility	311
Telecommunication	294
Teleconsultation	278
Child	255
Adolescent	239
Health care quality	235
Remote consultation	234

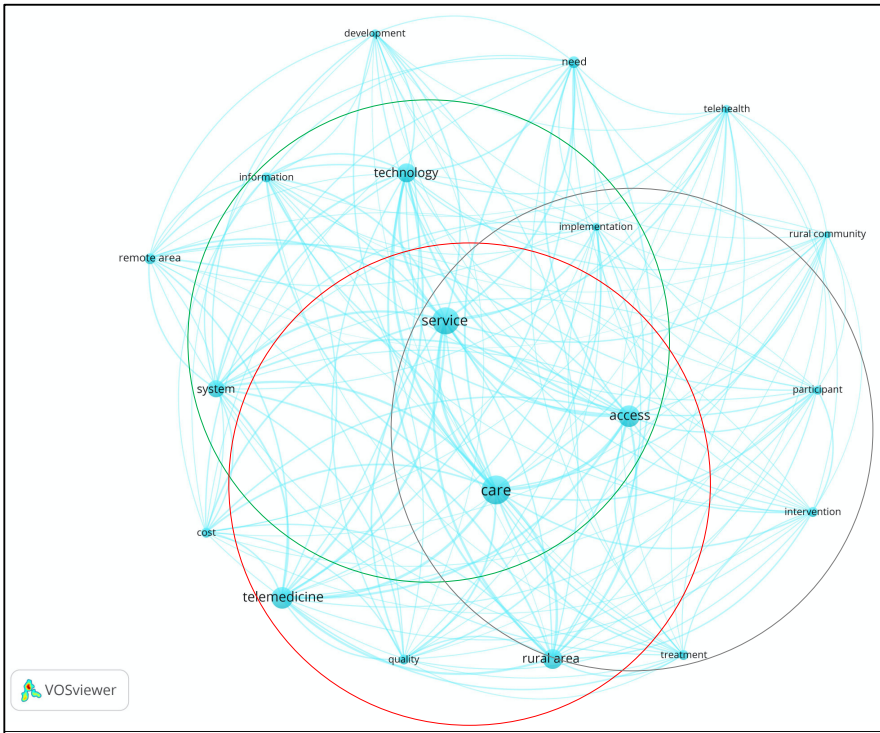
KEY for Figure 7. Visualization from VOSviewer™. Number of Keywords included = 20. Keyword is included if > 230 occurrences. Data collection on February 2020. Grouping by colors is automatically provided by the VOSviewer™ software. Labeling of colors is due to authors interpretation of data. The color of an item indicates the cluster the keywords belong to. The size of the label and the circle of an item indicates the frequency of the keyword. The higher the frequency the larger the size. Distances between keywords indicates relatedness of keywords in terms of co-occurrence links. Closer terms indicate closer relatedness. Keywords included refers to indexed keywords from Scopus and keywords as defined by the Authors. Quarter A focuses on all Keywords co-occurrences. Quarter B focuses on co-occurrences with "Telemedicine". Quarter C focuses on co-occurrences with "Rural Population".

Figure 7. Keyword co-occurrence according to the FULL dataset from Scopus, with a focus on "telemedicine" and "rural population" terms. Source: Authors' elaboration from VOSviewer™ software.

With specific regards to the "co-occurrence" analysis (Figures 7 and 8), this shows the statistical correlation among two terms within a dataset examined [47]: the higher the frequency with which the two terms are simultaneously cited, the stronger their expected logical connection.

Particularly, Figure 7 highlights the analysis of keyword co-occurrence within the FULL dataset for the specific terms "telemedicine" and "rural population". These terms are the most quoted keywords belonging respectively to the "1st Keyword" and "2nd Keyword" groups (as shown in the Table 2).

Figure 8, finally, highlights the co-occurrence analysis of the two most recurring terms within the sole title and abstract of papers belonging to the FULL dataset. Excluding terms generally related to every study in the healthcare field and not specific to the aim of this research, the figure emphasizes the three most recurrent terms, namely "care", "service", and "access".



Keyword	Occurrences
Care	1107
Patient*	1101
Service	1041
Study*	1033
Access	852
Telemedicine	828
Rural area	780
Use*	748
Technology	747
System	651
Data*	569
Time*	473
Year*	459
Need	446
Remote area	411
Quality	397
Intervention	395
Treatment	386
Cost	383
Information	378
Person*	369
Participant	357
Implementation	333
Development	320
Telehealth	315
Country*	307
Rural community	278
Paper*	274

* Term excluded due to its low specificity for the research enquire

KEY for Figure 8. Visualization from VOSviewer™. Number of terms included = 19. Terms are included if > 230 occurrences. Data collection on February 2020. The size of the label and the circle of an item indicates the frequency of the term. The higher the frequency the larger the size. Distances between circles indicates relatedness of items in terms of co-occurrence links. Closer terms indicate closer relatedness. Red circle includes those terms most correlated with the item "Care". Green circle includes those terms most correlated with the item "Service". Grey circle includes those terms most correlated with the item "Access".

Figure 8. Co-occurrence of terms among the titles and abstracts according to the FULL dataset from Scopus. Source: Authors' elaboration from VOSviewer™ software.

4.2. Qualitative Analysis of the BMA Dataset: Papers Belonging to Business Management and Accounting Field

In Table 3 are all the papers belonging to the business and management accounting field.

Clustered per country, in addition to authors, aims and findings, the last column of the table shows which sustainable variables have been debated within each paper (as deducted by the literature in the background section). Seven papers are empirical researches (*), and three are theoretical researches (**).

4.3. Qualitative Analysis of the QUOTs Dataset: Papers Quoted at Least 100 Times

In Table 4 are reported all papers that have been quoted at least 100 times. The number of citations is listed. Clustered per discipline, authors, country, aim, and findings, the last column of the table shows which sustainable variables have been touched within each paper (as deducted by the literature in the background section). Twelve papers are empirical researches (*), and eight are theoretical researches (**).

Table 3. Business and management accounting papers.

Country	Authors	Aim	Findings	Sust. Var.
USA	**Dhillon H.S. et al. [48]	Describing procedures used for estimating the impacts of telemedicine-based technological alternatives for delivering primary care in rural areas.	The use of telemedicine: - expands the role of physician in rural areas; - lowers costs; - enhances access to primary healthcare.	C/E U
	**Garshnek V. et al. [34]	Discussing the new frontier of telemedicine beyond its current and common use.	Telemedicine makes real both the vision of an enhanced accessibility of medical expertise and a global network of healthcare available in any situation.	U
	*Whitacre B.E. [49]	Examining the benefits of telemedicine for hospitals and their surrounding communities.	Each community recognizes an impact of at least $20,000/year in cost-savings or other economic opportunities generated by the telemedicine employment. Estimated average annual impact is about $522,000 with a maximum over $1,300,000.	C/E
	*Ishfaq R., Raja U. [50]	Planning model that incorporates different operational and service elements of the rural telemedicine healthcare network.	It is economical to operate more small-service area telemedicine centers than fewer large telemedicine healthcare centers.	C/E U
	*Venkatesh V. et al. [51]	Examining how the use of eHealth kiosks can alleviate the problem of high infant mortality in rural India.	Infant mortality in rural India can be effectively combatted with an ICT intervention by disseminating authenticated health information about infant healthcare, positively altering infant healthcare practices and promoting the utilization of professional medical care.	C/E U
INDIA	*Tiwari A. et al. [52]	Analyzing the application of telemedicine technology towards benefiting the rural people.	The telemedicine is the best example of the ICT helping the poor in improving the standards of their lives and making them live better lives, although the critical factors of the process are making people understand the process and the use of it.	C/E U Q
	*Srivastava S.C., Shainesh G. [53]	Understanding how orchestrate an innovative assembly of ICT and No-ICT resources in use telemedicine.	Innovative ICT tools have the potential to be significant service levelers and hence to contribute to balanced growth in the developing world	U
	*Anil A., Jayakumar M.S. [54]	Assessing how far the use of ICT has resulted in strengthening rural health care services and the key issues being faced by its utilization.	Telemedicine is a potential tool that can give technical support to bridge the rural–urban disparity. It allows to saving time and cost of travelling along by bringing high quality specialist diagnosis to the rural area.	C/E U

Table 3. *Cont.*

Country	Authors	Aim	Findings	Sust. Var.
BANGLADESH–MALAYSIA	**Zishan M.S.R. et al. [55]	Discussing the current scenario of e-Health system in Bangladesh and Malaysia.	Telemedicine/e-health can: - reduce the cost of treatment of the villagers; - provide emergency medical treatment for patients that take a lot of time to reach in the urban areas to get proper medical treatment; - be a solution for the health care budget of the developing countries; - virtually bring the urban hospitals in rural areas.	C/E U
NETHERLANDS–SOUTH-AFRICA	*Barjis J. et al. [56]	Proposing a patient monitoring system for supporting the model using Unstructured Supplementary Service Data (USSD) technology.	The use of telemonitoring shows that the perceived value was high for both patients and caregiver. This creates a path to a more sustainable solution, as it is in the interest of the caregivers to sustain the use of the DSS.	U Q

Paper type: * empirical research; ** theoretical research. Source: Authors' illustration.

Table 4. Most quoted papers.

Discipline	No. Qs	Authors	Country	Aim	Findings	Sust. Var.
Health Policy	152	**Arora S. et al. [57]	USA	Assessing the impact of the Extension for Community Healthcare Outcomes (ECHO) model to delivering specialist medical care in rural areas.	Thanks to the ECHO model, HCV cares delivered in rural areas are safer and more effective, as provided by specialists belonging to an academic medical center.	U
	142	**Wade V.A. et al. [58]	Australia	The economic evaluation of synchronous or real-time video communication in telehealth delivery.	Video communication offers value to healthcare. Patients' health outcomes were equal (and in some cases better) than conventional care.	C/E U
	140	**Ricketts T.C. [59]	USA	The characteristic of rural health care system in America.	The healthcare conditions of rural areas are unfavorably with the rest of nation.	U
	120	**Moffatt J.J., Eley D.S. [10]	Australia	Identifying benefits attributable to telehealth for both people living and professionals working in remote locations of Australia.	Patients living in remote locations of Australia get benefit from telehealth by increasing access to services and high-skilled health professionals.	U
	115	**Preston J. et al. [60]	USA	The cost of telemedicine and the improvement of health care in rural areas using telemedicine.	Telemedicine cuts the cost of healthcare and improve its quality.	C/E Q
	105	**Dávalos M.E. et al. [61]	USA	Tracing guidelines for conducting cost-benefit analysis of telemedicine programs.	Identified general outcomes of telemedicine programs that can be converted into dollar values.	C/E
Psychiatry	182	*Kroenke K., et al. [62]	USA	Determining whether centralized telephone-based care management coupled with automated symptom monitoring could improve pain and depression rate in rural patient with cancer.	Telecare improves outcomes of life quality domains (vitality, anxiety, physical symptom). It also improves secondary depression- outcomes of Mental Health Inventory (depression severity and diagnostic status).	Q
	159	*Morland L.A., et al. [63]	USA	Demonstrating the non-inferiority of telemedicine strategies compared to traditional cares in person service for rural combat veterans with post-traumatic stress disorder.	Providing tele-psychotherapy is feasible and produces outcomes as good as in-person treatment	Q

Table 4. *Cont.*

Discipline	No. Qs	Authors	Country	Aim	Findings	Sust. Var.
	140	**Griffiths K.M., Christensen H. [64]	Australia	Discussing the usefulness of internet-based depression information and AI automated therapy programs in rural regions.	The programs are cost-effective self-help tools as adjunct to GP treatment for rural residents with depression.	C/E U
	105	*Mitchell J.E. et al. [65]	USA	Comparing efficacy and acceptability of a "cognitive-behavioral" therapy delivered in-person to a therapy delivered via telemedicine.	Telemedicine therapy is acceptable for participants and roughly equivalent in outcome to in-person therapy.	U
	104	*Marcin J.P. et al. [66]	USA	Reporting the satisfaction of a telemedicine program regarding a medical need assessment of parents/caregivers of children with special health care needs in rural areas.	Telemedicine pediatric subspecialty consultations to rural and underserved community are feasible. They are considerable as highly satisfactory by both the parents/caregivers and rural healthcare providers.	U Q
Neurology	206	*Audebert H.J. et al. [67]	Germany	Estimating the effects of a rural stroke network with telemedicine support from Germany on the quality of cares.	Telemedicine networks, empowered by international academic stroke centers, offer new and innovative approaches to improve acute stroke care for patients living in suburban areas.	Q
	144	*Wang S. et al. [68]	USA	Assessing the employment of remote evaluation of acute ischemic stroke (REACH) and the comparison between values of bedside and remote evaluators.	The REACH system is a suitable tele-stroke tool to delivering consultations to rural and "underserved" areas. It may also provide opportunities for rural hospitals in TPA management.	U
	127	*Hess D.C. et al. [69]	USA	The development of stroke network to bringing guideline driven stroke care to rural, unserved areas.	The REACH strategy suggests that patients can be treated rapidly, safely, and effectively with TPA in rural community hospitals.	U Q
	118	*Wiborg A., Widder B. [70]	Germany	The opportunity to improve stroke care in rural areas by using a conventional videoconference system.	Videoconference system improves stroke care in rural areas where management in a stroke unit is hindered by long transportation distances	Q

Table 4. *Cont.*

Discipline	No. Qs	Authors	Country	Aim	Findings	Sust. Var.
Rehabilitation	190	**Burdea G.C. [71]	USA	Reviewing the benefits brought by virtual reality-enhanced and virtual reality-based rehabilitation to groups of patients.	Virtual Rehabilitation is: - economy of scale; - interactivity and patient motivation; - beneficial in reducing healthcare costs; - promoter of high-quality healthcare in rural areas.	U Q
	117	*Russell T.G. et al. [72]	Australia	Evaluating the equivalence of an Internet-based tele-rehabilitation program compared with conventional outpatient physical therapy for patients who have had a total knee arthroplasty.	Patients reported a high level of satisfaction and the outcomes achieved were comparable with in person rehabilitation	Q
Cardiology	116	*Sørensen J.T. et al. [73]	Denmark	Evaluating the impact of pre-hospital diagnosis on time from emergency medical services in cohort of patients with STEMI.	Pre-hospital diagnosis on time: -can be successfully implemented; - allow to offer the treatment for patient that live in rural areas; -reduce long term mortality.	U Q
	105	*Sable C.A. et al. [74]	USA	Evaluating the impact of telemedicine on delivering pediatric cardiac cares in community hospitals.	The methodology improves patient care: it enhances echocardiogram quality, aids sonographer education. Telemedicine positively impacts on referral patterns, time management without increasing the echocardiography utilization.	Q
Dermatology	209	*Wootton R. et al. [75]	United Kingdom	Comparison real time tele-dermatology with outpatient dermatology.	If the equipment were purchased at current prices and the travelling distances greater, tele-dermatology could be considered as a cost-effective alternative to conventional care.	C/E U

Paper type: * empirical research; ** theoretical researches. Source: Authors' illustration.

5. Discussion

In order to facilitate the analysis and the discussion of findings, this section follows the results section's outline.

5.1. Quantitative and Bibliometric Analyses of the FULL Dataset

An analysis of the samples by publication year disclosed an even higher interest about the topic from 2009 until now. The increasing number of studies might be caused by the scientific advancement and the subsequent increasing of new technologies availability [76]. The number of journals in which the papers included in the FULL dataset were published are 159; probably due to the complexity and the extent of the topic or for the specific target of audience, the three most relevant journals are in the field of e-health and telemedicine. Among these three, the most productive journal is *Telemedicine and E-Health* (which has changed its name since 2007 from *Telemedicine Journal and eHealth*), having the highest number of articles about the topic in the last decade. To be thorough, the following Table 5 reports the number of studies belonging to the BMA and QUOTs datasets published within the top-five journals.

Table 5. Number of papers belonging to the BMA and QUOTs datasets published within the top-five journals.

Rank (no. Papers Published)	Journal	No. Papers in BMA Dataset	No. Papers in QUOTs Dataset
1 (208)	*Telemedicine Journal and eHealth (to 2007)/Telemedicine and eHealth (from 2007)*	0	1
2 (177)	*Journal of Telemedicine and Telecare*	0	0
3 (48)	*Journal of Medical Internet Research*	0	0
4 (39)	*Rural and Remote Health*	0	0
5 (28)	*Journal of Rural Health*	0	0

Source: Authors' illustration.

As expected, Table 5 shows that no BMA papers were published in the top-five journals, while just one paper from the QUOTs dataset was. This means that telemedicine development as a sustainability leverage for rural healthcare is a phenomenon still understudied by scholars; according to higher-ranked journals, the top published researches mostly address the technical, clinical, and socio-demographic aspects concerning the theme.

The analysis of productivity per country reveals a clear division of the sample among:

- countries of huge dimension with a heterogeneous land morphology (USA [77], Australia [78], Canada [79], India [80], and China [81]), which tend to use new approaches and technologies in providing healthcare in areas unserved by local hospitals and far from urban centers;
- countries aimed at providing universal coverage of healthcare at the point of service [82] (United Kingdom [83], Germany [84], Italy [85], South Africa [86], and Spain [87]), which, due to financial restrictions and necessities, are looking for strategies and new technologies to decrease the costs of healthcare.

The most productive country, in term of number of publications, is the USA (998), followed by Australia (286) and Canada (250). These are highly developed countries, which, according to MEDTEC [88], tends to develop a higher usage of new technologies infrastructures in comparison with developing ones. The fourth most productive country is India, with 139 articles, followed by the United Kingdom (136).

The extent of subject areas included in the FULL sample is very heterogeneous. Many different fields of literature are embraced by the theme of telemedicine as a methodology for healthcare provided

in remote areas. Precisely 55% of the sample belong to pure medicine, while about 38% of the sample regards clinical-based subjects (e.g., health professionals, nursing, social science, biomedical engineering, etc.)

To be more accurate, the following Table 6 reports the number of studies belonging to the BMA and QUOTs datasets published within the different disciplines.

Table 6. Number of papers belonging to the BMA and QUOTs datasets published within the different disciplines.

Rank (% of Publishing)	Discipline	No. Papers in BMA Dataset	No. Papers in QUOTs Dataset
1 (56%)	Medicine	0	20
2 (11%)	Health Professionals	0	0
3 (5%)	Social Sciences	0	0
4 (5%)	Nursing	0	0
5 (4%)	Computer Science	0	0
6 (4%)	Engineering	0	0
7 (3%)	Biochemistry, Genetics, and Molecular Biology	0	0
8 (3%)	Psychology	0	0
9 (1%)	Neuroscience	0	0
10 (8%)	Other	10	0

Source: Authors' illustration.

Particularly, papers that address the theme of pure economic sustainability (a subject of business management and accounting) are only 1% of the sample (including in the "others"); this confirms that economic and managerial aspects of telemedicine in rural areas are still understudied [61,89].

With regard to the bibliometric enquiry, the analysis of research collaboration among countries (Figure 6) shows a strong interconnection between the most productive countries (USA, Australia, and Canada); due to their huge rural area extension together with high financial support possibilities, they seem to share research interests and efforts in studying how to solve the problem of delivering healthcare in areas located far from specialist hospitals.

With regard to the co-occurrence analysis of the most significant keywords in the FULL dataset, Figure 7 has highlighted the following main findings:

- "*Telemedicine*" is a "barycentric" term within the others; it seems to be an all-embracing item that generally connects the sphere of kind of users (e.g., terms: "female", "adult", "child") with the sphere of healthcare expected outcomes and applications (e.g., terms "health care quality", "health care delivery", "heath service accessibility") through the use of remote service delivery tools (e.g., terms: "remote consultation", "teleconsultation"). Accordingly, in the authors' opinion, the keyword "*Telemedicine*" is well linked with those terms that represent the demographic features (green-labeled terms) and socio-helpful needs and expectations (red-labeled terms) of rural habitants.
- "*Rural Population*" instead, is a term more connected with those words regarding the demographic/epidemiologic features of specific clusters of people (e.g., terms "female", "adult", "middle aged"), whose healthcare necessities (ref. "rural penalties" [69]) could be satisfied by the employment of innovative strategies in health service delivery (e.g., terms: "telemedicine", "telehealth", "health care delivery"). Accordingly, in the authors' opinion, the keyword "*Rural Population*" is prevalently connected to those terms that call for new technologies and applications

(red-labeled terms) as a solution for healthcare needs, particularly common in groups of people (green-labeled terms) in unserved areas.

As a consequence, the statistical connection among "*Telemedicine*" and "*Rural Population*" is the strongest (closest terms) within the FULL dataset. Within the 2267 papers sampled, this shows that telemedicine could be surely considered as an effective solution for some healthcare needs arising from rural area habitants.

Moreover, in order to verify the coherence between findings from Figure 7 and the literature landscape of the FULL dataset, the terms' co-occurrence in the abstracts and titles were analyzed and shown in Figure 8. Usually, the title and abstract of a paper tend to inform and captivate potential readers just about the general topic of the research, without including specific and technical insights, which would be requested for further reading. For the aim of this work, this enquiry was particularly significant because it allowed to connect the theme of "the telemedicine employment in rural areas" with the terms related to the reason why a potential reader would be interested therein.

Thus, excluding those terms with a low specificity for the enquire, the Figure 8 highlights that the most recurrent terms within titles and abstracts are Care (1107 occurrences), Service (1041 occurrences), and Access (852 occurrences). By analyzing these three terms and their correlations with the adjacent words (within the colored circles), in the authors' opinion it is positive that studies concerning the telemedicine sphere are prevalently aimed at addressing the issue of enhancing the access to high-quality care and services from underserved patients.

This analysis confirms that a possible solution to the problem of increasing accessibility to healthcare services, which regards the health policy and management fields (e.g., terms "access", "service", "care"), is represented by new health technologies (e.g., terms "technologies", "system", "telemedicine") and strategies (e.g., terms "intervention", "treatment", "implementation").

5.2. Qualitative Analysis of the BMA Dataset

In the field of business, management and accounting, particular attention is paid to the sustainable variable of cost reduction and efficiency improvement. Several authors have underlined how the economy of a rural community could be positively affected by the use of telemedicine in providing healthcare [48,49,51]. In particular, this has been considered an inexpensive solution that allows cost saving for staff traveling, transportation, and working time [54].

According to Zishan [55], telemedicine is able to reduce costs of treatments, becoming a solution for increasing the value of healthcare [8], especially in those underserved areas, where scarce resources are not sufficient to address the needs of people. Particularly, the use of telemedicine in rural areas is also devoted to the long-term and chronic diseases; for these heterogeneous uncommunicable pathologies [90] (e.g., diabetes, heart failure, depression), telemedicine is considered as a "low-cost option" for providing early diagnosis and remote support for decision-making about care [50].

Moreover, accordingly to Venkatesh [51], telemedicine could indirectly decrease healthcare costs as a whole; it contributes in avoiding costs for potential subsequent expensive emergency care. Reference [51], by focusing on telemedicine coaching to inexpert mothers living in provinces of India, demonstrates how providing proper health information remotely regarding the care and the growth of infants can drastically reduce the need of expensive healthcare caused by unexpected infant health deterioration.

By the BMA sample, the interest related to cost reduction is matched with the possibility of improving access to healthcare. Garshek [34] and Srivastava [53] have identified telemedicine as a strategy for providing early diagnosis and emergency interventions in places where these healthcare services are not otherwise available. This telecommunication-based innovation [91] brings expert opinions, correct diagnosis, and best practices directly to the patients—no matter how distant patients are from physicians [51,52,54,55] nor how barren the geographical area is.

From this perspective, telemedicine can be considered an "operating tool" allowing rural population to get access to similar healthcare services accessible by urban people.

The BMA dataset, which prevalently focuses on the economic sustainability of healthcare in rural areas, shows that telemedicine employment can be considered a suitable strategy for improving the cost-efficiency of healthcare (C/E) and increasing the utilization (U) of specialist services in remote areas.

Lastly, the following Table 7 summarizes how the strategic objectives (as derived as sustainability pillars from the UN-SDGs 3 and 10, according to the WHO [32]) can be explained by the operating objectives derived by the literature analysis on the BMA dataset.

Table 7. Strategic and operating sustainability objectives the BMA dataset.

Strategic Objectives	**Operating Objectives**	
Sustainability Pillars for Healthcare (as Derived by UN-SDGs 3 and 10, 2015 and WHO, 2016)	**Sustainability Variables (as Derived by the Literature Review on BMA Dataset)**	**Source**
Reducing Healthcare Cost Improving Healthcare Efficiency	- reducing travelling expenses both for patients and clinical staff	[49,50,52,54]
	- increasing clinical staff productivity	[49,54,55]
	- increasing the cost-effectiveness of clinical resources involved in healthcare	[52,54]
	- reducing losses for missed work for both patients and their caregivers	[49]
	- reduces costs for potential subsequent examinations or emergency cares	[51]
	- reducing patients' referrals	[48]
Enhancing Healthcare Utilization	- improving early interventions	[34,50,55]
	- fostering access to new technologies and interventional strategies	[52]
	- increasing the coverage of services, including emergency cares	[50,52,53,55]
	- improving information available for patients/caregivers	[51]
	- enhancing better communication among patients and clinicians	[55]
	- expanding roles of non-physicians	[48]
Improving Healthcare Quality	- improvement of communication exchange among patient and physician	[55,56]
	- enhancing the efficacy of specialist diagnosis	[54]
	- improving healthcare practices and the skilling-up of local practitioners	[34,51,52]

Source: Authors' illustration.

5.3. Qualitative Analysis of the QUOTs Dataset

As mentioned in the methods section, the qualitative analysis of a further sample of papers in addition to the BMA dataset has been necessary in order to consider findings from the most known studies belonging to areas of interest different from the managerial ones.

From a different discipline standpoint, the reading of the most quoted papers has given us the possibility to highlight which issues of telemedicine utilization can be considered more relevant for healthcare sustainability in remote areas.

All articles included in this sample address clinical subjects, whose most-analyzed aspect regards increasing the quality of care and accessibility to services through telemedicine employment.

As expected, the majority of studies has recognized that the most significant disadvantage for rural residences is the distance to the specialist healthcare provider. This jeopardizes their possibility to get the care they need [92]: rural residents experience the "rural penalty" [69]. Thus, as stated by Ricketts [59], telemedicine can be considered as a possible solution to the problem of access to specialist healthcare for rural residents.

Accordingly, the evaluation of the impact of faster information, triggered by telemedicine infrastructures, mainly involves those studies that address the following themes of research regarding the healthcare sphere:

- early diagnosis and emergency cares (6 empirical studies);
- biomedical parameter monitoring and long-term cares (5 empirical studies).

In particular, telemedicine specialist consultations can be critical for stroke management in neurology [67] and early diagnosis in cardiology [73]. As a contrast, remote monitoring of biomedical parameters can be considered as effective for those medical disciplines who need to evaluate a patient's health status evolution, such as rehabilitation, psychiatry, and dermatology.

As a bridge among these two kinds of disciplines, particularly, the health policy papers (6 theoretical researches) analyze the diffusion of investment in telemedicine infrastructure as an answer to the healthcare accessibility crisis in remote areas [59,61].

Several authors [65,66,70,71] have recognized telemedicine strategies as a tool to facilitate the access to high-quality healthcare. Accordingly, Griffiths [64], in the field of mental health assistance, has observed that telehealth represents an efficient alternative both for depression management in rural regions and for exceeding of the strong self-reliance culture belonging to rural residents.

Moreover, many studies have defended that telemedicine employment reduces both the mortality rate [47,67] and the risk of disabilities for patients [67]. As a consequence, this innovation allows to provide highly specialized healthcare in remote areas [60,68,71] by creating a coordination between primary care providers and the specialist [66].

Telemedicine strategies lead to different kinds of qualitive improvements of outcomes for different subjects living in rural locations; the main ones are listed below:

- reduction of patients' pain and depression degree [62];
- availability of better diagnostic images for doctors [74];
- better involvement of patients' motivation [71].

Moreover, based on the "hub and spokes" model [93], telemedicine improves patient care by increasing the capacity of the rural clinician to manage the patient locally, minimizing time away to support networks and reducing unnecessary retrieval [94,95].

Thanks to telemedicine infrastructures, the quality of care in rural areas could be improved also by supplying training to local providers [10]; this allows sharing of "evidence-based" best practices [57], developed in an urban hospital context. Accordingly, in the context of a rehabilitation program, Burdea [71] identifies teleconsultation as a provider of expertise coming from a highly qualified center. In this study, telemedicine allows the utilization of better care and it improves the outcome, confirming findings from the reviews provided by Moffatt [10] and Wade [58]. In particular, these authors stated that telemedicine is also useful to improve the timeliness of service delivery and it may contribute to decreasing the urban–rural health disparities.

Hess [69], in particular, has stressed the condition of suburban hospitals that are lacking acute stroke units and he identified the "tele-stroke network" as the solution to enhance specialist competences in underserved areas. Accordingly, in the neurology and cardiology fields Wiborg [70], Wang [68], and Kleindorfer [96] have underlined how telehealth improves stroke care in rural areas by bringing stroke expertise to rural community hospitals.

In this sense, according to Ricketts [59], e-health solutions can be surely considerable as "the single most important strategy" aimed at flattening the difference in available resources between rural and urban areas.

Everything considered, the QUOTs dataset, which mainly addresses the theme of sustainability of a universal high-quality healthcare, shows that telemedicine employment can be considered a suitable strategy for improving the quality of care (Q) by allowing, also, a higher coverage of services in rural areas (U).

Table 8 summarizes how the strategic objectives (as derived as sustainability pillars from the UN-SDGs 3 and 10, according to the WHO [32]) can be explained by the operating objectives derived by the literature analysis of the QUOTs dataset.

Table 8. Strategic and operating sustainability objectives of the QUOTs dataset.

Strategic Objectives	**Operating Objectives**	
Sustainability Pillars for Healthcare (as Derived by UN-SDGs 3 and 10, 2015 and WHO, 2016)	**Sustainability Variables (as Derived by the Literature Review on QUOTs Dataset)**	**Source**
Reducing Healthcare Cost Improving Healthcare Efficiency	- reducing visit length	[75]
	- reducing time for examination	[71]
Enhancing Healthcare Utilization	- reducing drop-out	[63]
	- fostering access to specialist cares	[65,71]
	- providing treatments that are not otherwise available	[58]
	- improving specialist second-opinion consultations	[66]
	- skilling-up of local practitioners	[10]
	- improving early clinical assessment	[10,74]
	- enhancing the continuity of care	[10,72]
Improving Healthcare Quality	- reducing mortality rate	[67,73]
	- reducing severe disability rate	[67]
	- improving patients' motivation to healthcare participation	[71]
	- enhancing better outcomes	[62]
	- expanding Evidence Based best practices	[57]
	- enhancing high-quality healthcare	[70]
	- fostering delivering "right" specialist care to "right" patient	[60,69]
	- enhancing better diagnosis	[74]
	- improving healthcare coordination	[66]
	- improving more immediate treatments	[58,64]

Source: Authors' illustration.

6. Conclusions

This paper addresses the theme of inequalities in healthcare. Through the lens of value-based healthcare principles [8], the work aims at highlighting how digital technologies enhance the sustainability of care in unserved areas. In particular, the study analyses telemedicine as a strategy to improve the accessibility of healthcare in rural areas by increasing the coverage of specialist services.

To this end, this work, firstly, retraces the objectives provided by United Nations in SDGs 10 and 3 [1,4] (respectively, "Reducing Inequalities" and "Promoting Healthy Living"); secondly, it derives from the UN-SDGs three sustainability pillars for healthcare, namely:

- Increasing healthcare cost/Improving healthcare efficiency (C/E);

- Enhancing healthcare utilization (U);
- Improving healthcare quality (Q).

In the field of performance management [25,27,28,82], these pillars can be considered as strategic objectives obtainable through the achievement of specific operating objectives.

Thus, in the perspective of the achievement of these sustainability pillars, we conducted a PRISMA-based literature review about the effects of telemedicine strategies on healthcare delivery. Precisely, in the context of rural areas, the aim of this review was to understand how telemedicine employment contributes to achieving these strategic pillars, and, in turn, how they can be practically expressed in sustainability variables, representing operating objectives.

First of all, the quantitative results of the study show that the interest about this topic has increased in the last decade following technological and digitalization advancement. Apart from that, countries much involved in studying this phenomenon are those particularly involved in extending the coverage of healthcare within vast territories and under financial restrictions related with universal healthcare coverage.

Furthermore, the qualitative analysis of both empirical (20) and theoretical (10) studies has shown that telemedicine improves both the economic and the clinical sustainability of healthcare in rural areas. The following Figure 9 shows which sustainability variables are enhanced by telemedicine employment as support in delivering healthcare in rural areas.

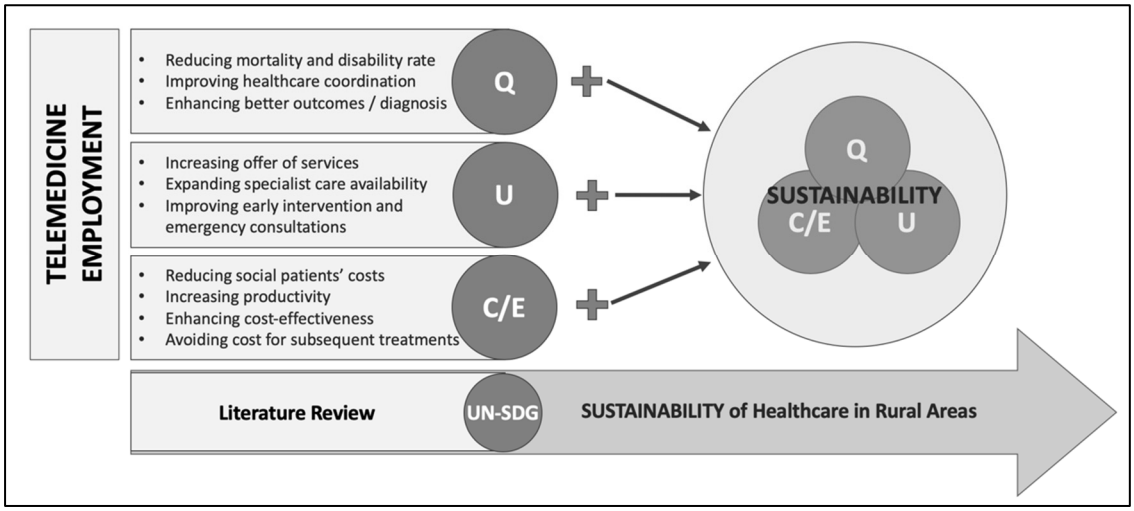


Figure 9. Findings of the study. Source: Authors' elaboration.

Particularly, Figure 9 shows relationships among findings from the literature review (light grey) and the sustainability pillars drown by UN-SDGs (darker grey). As a whole, the figure shows that telemedicine, by directly influencing the three leverages, has positive effects on the sustainability of "access to healthcare" in rural and unserved areas.

This study has shown that telemedicine can significantly improve healthcare provision in remote areas of both emergency and non-emergency care. In particular, it can be confirmed that telemedicine allows for simplified access to specialist consultation via one port of call (or transmission) [60]: this provides remote diagnosis and, when required, it might assist in managing patients locally, by also reducing unnecessary transfers. In rural healthcare, telemedicine can be considered a cost-effective strategy that increases the quality of outcomes of local services [97,98] and whose infrastructural costs could be easily paid back [75].

Thus, answering the research question, the experiences that arose by the review of the literature performed in this work allow to state that telemedicine strategies have enhanced the sustainability of the right [1] "access to healthcare" in rural areas.

In particular, telemedicine guarantees more effective, fair, and reliable levels of care; as a whole, this contributes to creating higher value for patients in their entire process of care [8]; "telemedicine-based" healthcare, in fact, takes into consideration all the necessities belonging to rural patients (medical, social, and economic), and not only those strictly related to clinical conditions [16,30,31].

This study represents the first review on the specific theme of telemedicine's role in the sustainability of healthcare delivery in rural areas. As a consequence, the contribution fosters the debate, both for academics and practitioners, about the role of information technologies and new organization models for a sustainable, highly valuable healthcare system where the physical relationship between patients and clinicians is arduous or impossible. Telemedicine employment is not an issue regarding only those rural or remote areas far from hospital; but it could also regard, for instance, urban area lockdown due to an epidemic (e.g., Covid-19 [6]) where common healthcare services are temporarily suspended in order to limit the risks of infections.

Accordingly, the exploitation of telemedicine potentialities, both economic and clinical, should be carefully evaluated by health policy makers, also according to the WHO's assessment metrics for digital innovation [32]. This theme surely addresses the sphere of healthcare management and the performance governance [99,100] of healthcare organizations, as discussed in this work.

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