

## REVIEW ARTICLE

# Innovative shortcuts and initiatives in primary health care for rural/remote localities: a scoping review on how to overcome the COVID-19 pandemic

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## ABSTRACT:

**Introduction:** The COVID-19 pandemic has emerged as one of the greatest challenges to societies, world health systems and science in the past century, making it imperative to restructure care networks. Therefore, it is essential to discuss the role and initiatives of primary health care (PHC) to deal with it. However,

regarding the response to the pandemic, including the current global effort against COVID-19, the nuances of the rural/remote PHC context in the pandemic is barely visible. Rural and remote communities have differentiated health risks, such as socioeconomic disadvantages, difficulties in mobility and access to

health services, in addition to linguistic and cultural barriers. This scoping review aimed to analyze the set of individual and collective initiatives and innovations developed to face the COVID-19 pandemic, within the PHC scope, in rural and remote areas.

**Methods:** A scoping review methodology was applied to peer-reviewed articles. Eight databases were searched to identify scientific articles published in English, Spanish and Portuguese, initially from January 2020 to July 2021, complemented by a rapid review of articles published from January 2022 to April 2023. The main focus sought in the literature was the set of initiatives and innovations carried out within the PHC scope in rural and remote locations during the pandemic, as well as the comparison with pre-pandemic situations and between different countries. The bibliographic information of each search result was imported into Rayyan (Intelligent Systematic Review), followed by the screening and eligibility stages, performed independently by two reviewers, with a third reviewer being accessed in case of conflicts.

**Results:** This review included 54 studies, with publications mostly from Australia, Canada, the US and India. The main PHC initiatives were related to access; to the roles of community health workers and health surveillance; and to the importance of placing, retaining and valuing human resources in health. Cultural, equity and vulnerability issues occupy a major place among the initiatives.

**Keywords:**

COVID-19 pandemic, health services accessibility, organizational innovation, primary health care, rural health services, telehealth.

## FULL ARTICLE:

### Introduction

The current COVID-19 pandemic has emerged as one of the greatest challenges to societies and to global health systems and science in the past 100 years, making it imperative to restructure health networks and systems<sup>1</sup>. Fast and articulated responses are crucial to face these challenges, among them the definition of the role and responsibility of primary health care (PHC)<sup>2</sup>.

The scientific community responded very quickly to this exceptional health emergency and important articles were published focusing on the role of PHC<sup>3,4</sup>. However, the particularity of the rural context regarding the role of PHC in the pandemic was scarcely studied in the first year of the COVID-19 pandemic<sup>5</sup>. It is worth recalling that in rural areas a strong PHC is even more important, as it is able to reduce health inequities between urban and rural territories<sup>6</sup>.

The definition of rural and urban spaces includes some elements that are important for the creation of planning and management actions of the territories, even though they capture only part of the reality. These elements are based on political-administrative criteria, population size, population density, morphological territory patterns, economic activities and a population's way of life<sup>7</sup>.

Rural communities have differentiated health risks that add to the growing needs of their populations. They suffer chronically from socioeconomic disadvantages; difficulties in mobility, transport and access to health services; in addition to linguistic and cultural barriers. Added to these factors are the insufficient infrastructure of health services, the limitation of clinical equipment and the difficulty regarding the retention of health professionals in these regions<sup>5</sup>.

Regarding the innovations, telehealth and customized communication are highlighted. From an organizational point of view, rural and remote locations showed enormous flexibility to deal with the pandemic and to improve intersectoral activities at the local level. The description of rurality and remoteness is practically coincident with that of the specific populations, present in geographic areas of difficult sociospatial and cultural access. Rarely, there is an index to measure rurality, or its description deals with the need to overcome distances and obstacles.

**Conclusion:** The findings highlight and summarize knowledge about initiatives and innovations developed to face the COVID-19 pandemic, within the PHC scope in rural and remote areas in the world. This review has identified collective, clinical, intersectoral and, mainly, organizational health initiatives. An articulation between different government levels would be paramount in evaluating the implementation of policies and protocols in rural and remote locations for future sanitary crises. Innovations and lessons learned are equally relevant in strengthening health services and systems. This issue calls for considerable further exploration by new reviews and empirical research that seek evidence to assess the sustainability and effectiveness of the implemented measures to face post-pandemic difficulties and other adversities.

In 2009, the OECD added the criterion of accessibility to the typology of population density, with the influence of distance from the rural area to the urban center. This criterion is translated, then, by the displacement time between non-urban areas and urban centers, delineating areas close to cities or remote areas<sup>8</sup>.

In this work, we propose to conceptualize PHC in the light of Vuori<sup>9</sup>, especially under four different forms of understanding: a set of activities, a level of care, a strategy for organizing health services and a guiding philosophy of actions in a health system.

In the international literature, PHC is guided by structuring axes, considered by their essential and derived attributes, which consist of first contact, longitudinality, integrality and coordination of care, family and community orientation, and cultural competence, respectively. In this sense, in addition to being a strategy for organizing health systems and services, PHC is based on a model for changing clinical and care practice<sup>10</sup>. In this way, PHC is ideally composed of multidisciplinary teams supported by integrated reference systems so that priority is given to the most vulnerable, and health inequalities are reduced – maximizing community and individual autonomy, participation, and control, and involving intersectionality<sup>11</sup>.

Furthermore, we understand PHC as a combination of primary care and public health functions in order to provide integrated care; a means to empower people and communities, and intersectoral actions<sup>12</sup>.

At the interface of PHC and rural and remote locations, an important international integrative review carried out by Franco et al defined three basic categories to outline the most relevant strategies: access to health services, health organization and the health workforce<sup>13</sup>. Access was related to geographic aspects,

users' displacement needs and access to hospital and specialized services, the healthcare organization (including structure and resources), operation of health services, and community-based management. Regarding the health workforce, the following stood out: professional profile and role, and attraction/retention factors. The authors highlighted the cross-cutting actions in relation to these three assessed dimensions: community work, extension and visitation models, information and communication technologies, access to assistance and professional training and development, equitably distributed according to population health needs<sup>11,13,14</sup>.

In line with the different individual and collective approaches, a quick and comprehensive review of the main international protocols highlighted the main dimensions outlined in PHC when facing the COVID-19 pandemic: public health, focused on epidemiological surveillance and care flows; the clinical dimension (continuity of care via telehealth); the organizational dimension; and the systemic dimension<sup>15</sup>.

A vast literature on the COVID-19 pandemic and its clinical and epidemiological management has been published since the start of the pandemic in 2020. Less frequent, however, is the approach of literature in the pandemic in the PHC context. Even less is known about the complex relationship between the ways of coping with the pandemic in remote locations, while having PHC as the main reference. Thus, the objective of this scoping review was to analyze the set of initiatives and innovations, both individual and collective, that were developed to face the COVID-19 pandemic within the scope of PHC, in rural and remote areas, during the first 18 months of the pandemic.

## Methods

The methodology used for the present study was a scoping review<sup>16</sup> aiming to carry out a literature mapping based on several study designs of the main concepts of the field of interest.

The scoping review allows evaluation of different types of studies, although it does not provide definitive evidence-based answers, being especially useful when the subject is complex and urgent, and when there are considerable gaps, even in the presence of emerging and hectic evidence, as is the present case. Thus, it allows the definition of key concepts and sources of evidence that can inform practices, policy formulation and research. In this process, it is essential to guarantee methodological rigor and transparency; the possibility of critical evaluation of the set and synthesis of the results, even without individualized and formal evaluation of the quality of the studies; and the balance between breadth and depth<sup>17</sup>.

In 2005, Arksey & O'Malley published the first methodological framework for conducting scoping reviews, as a six-step iterative process: (1) identifying the research question; (2) identifying relevant studies; (3) study selection; (4) charting the data; (5) collating, summarizing and reporting the results; and (6) optional consultation<sup>16</sup>. Subsequently, Levac et al improved these steps, including the relationship between the research objective and question, balancing the feasibility of the study with the necessary scope, carrying out the selection in groups in an iterative way, including quantitative summaries and thematic analyses, identifying the implications of the studies for practice and policies, and making consultation mandatory<sup>18</sup>. More recently, Peters et al added the need to align the research objectives and questions to the inclusion criteria; the planning of the stages of identification,

selection, extraction and presentation of evidence; the performance of a synthesis of the results, relating it to the objectives; and the formulation of conclusions and their practical implications<sup>19</sup>.

Based on the objective outlined in this study, the following research question is proposed: 'What individual and collective initiatives and innovations were developed within the scope of PHC to face the COVID-19 pandemic, in rural and remote areas?' We also sought to answer two derived questions: 'What are the necessary organizational and intersectoral initiatives?' and 'What are their challenges?'

Search words (Table 1) were identified based on a decision made by the researchers, aiming to allow the screening of the titles and abstracts of studies that encompassed the population, the concept and the context<sup>20</sup> guiding the review question. The population included traditional peoples, primary care users and communities attached to the territory. The concept was related to organizational, individual and collective initiatives to face the pandemic and the selected context was both clinical (PHC) and spatial (remote/rural locations).

The literature search was limited to publications in English, Portuguese and Spanish, initially limiting them to studies published between January 2020 and July 2021, complemented by a rapid review, including other relevant articles published between January 2022 and April 2023. The focus sought in the literature comprised the initiatives and innovations carried out within the scope of PHC in rural locations during the COVID-19 pandemic, as well as comparisons with pre-pandemic situations and between different countries.

The literature search was carried out in the PubMed and DOAJ, Gale, Onefile, Web of Science, Wiley, Proquest and SAGE databases. The bibliographic information of each search result was imported into Rayyan (Intelligent Systematic Review; <https://www.rayyan.ai>). Subsequently, articles in duplicate were removed and the abstracts were reviewed. The flowchart in Figure 1 depicts all the steps taken from the identification of the studies and their quantitative data. Selection, eligibility and inclusion steps are detailed below.

Titles and abstracts were independently evaluated (blinding) by two researchers, leading to the exclusion of studies that did not meet the inclusion criteria or that included any of the exclusion criteria defined by the researchers, as shown in Table 2. To resolve disagreements between the two researchers in this initial evaluation (only nine articles), a third researcher who had not participated in the first phase provided her opinion, which allowed reaching a final decision on the inclusion of the initial studies. The articles were classified according to the inclusion and exclusion categories, in addition to an intermediate category ('maybe'), so that they could be reassessed with greater precision and later defined through agreement among the researchers.

After this, the studies included in the first phase were read in full by two researchers, who independently reviewed them. The reading in full allowed the charting and summarizing of these articles in a data extraction instrument, built after testing some elements of analysis, which resulted in an analytical extraction table that allowed categorizing the items according to the content that answered the research question. The elements in this table (Appendix I) were independently analyzed by the researchers,

defining which studies would be included or excluded, after their full reading and synthesis.

We also checked for updates: a rapid review was carried out by two researchers for recent works in PubMed databases, published between 2022 and 2023. Thus we added 16 new articles, out of 44, which were also considered and will be thoroughly discussed along with the other results.

The articles were classified not only by country of study and origin of the first author, but also as sensitive or specific, according to their scope and comprehensiveness in relation to the inclusion and exclusion criteria. Thus, although a relevant set of studies did not fully meet the inclusion criteria, their reading was maintained to support the discussion, since they had important intersections between pairs of the PHC, rural and remote, and COVID-19 triad.

Based on the theoretical framework used in the review, the third researcher, once again, participated in the decision on the discordant articles, which allowed proceeding to the discussion of the review.

An important part of this analysis can be seen in the word clouds relating the answers of the articles to the research questions and their relationship with PHC and rural and remote locations. From these intersections, the word clouds were constructed, using the same language, aiming to visualize the frequency and relevance of the identified terms, in an open categorical way, as a representation of a hierarchical list of the selected extracts. Thus, the more frequently the term was identified, the larger its size, allowing a quick visualization of its magnitude and relevance in the qualitative analysis. Based on core PHC operational and strategic levers<sup>12</sup>, a cognitive map was also included, aiming to offer a synthesis of the observed and analyzed concepts (Appendix II).

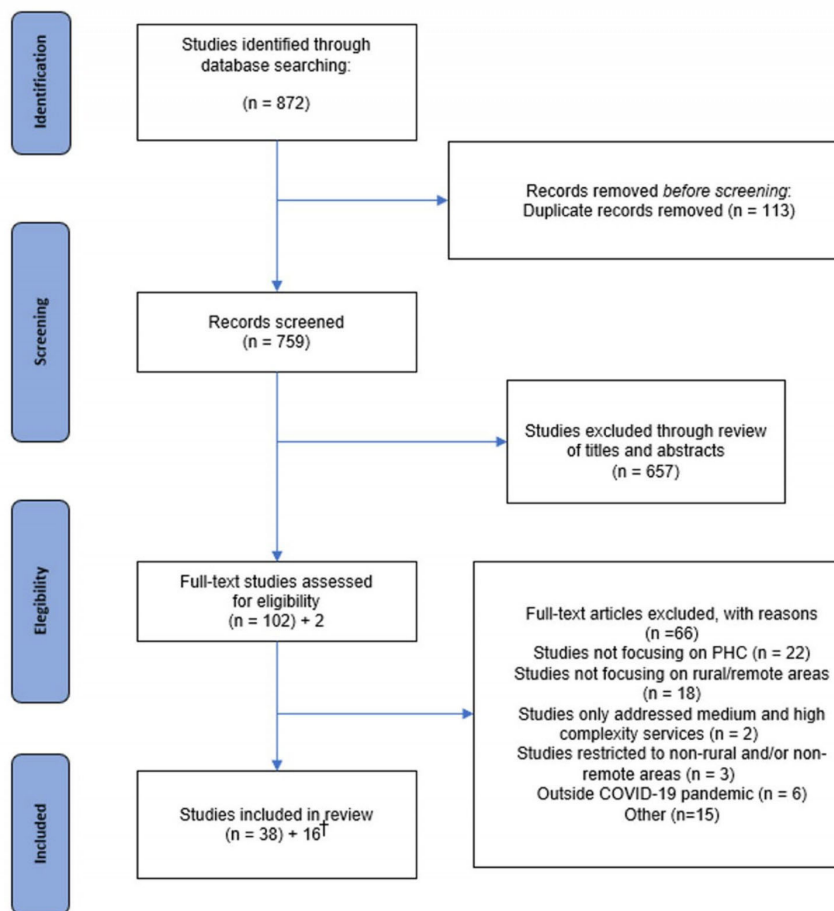
**Table 1: Keywords for electronic database search**

((primary health care) OR (family health strategy) OR (community health worker))
AND ((remote areas) OR (rural areas) OR (remote health system) OR (remote health service))
AND ((covid-19) OR (covid-19 pandemic))

**Table 2: Review inclusion and exclusion criteria**

Inclusion criteria	Exclusion criteria
<p>Articles published in English, Portuguese or Spanish. From January 2020 to July 2021.<sup>†</sup></p> <p>All types of studies, such as: original research, case reports, editorials, guidelines and protocols, review studies.</p> <p>Studies focusing on PHC or one of its components.</p> <p>Studies focusing in rural and/or remote areas and/or 'last mile' populations worldwide.</p> <p>Studies in the context of the COVID-19 pandemic.</p>	<p>Studies that addressed only medium and high-complexity services.</p> <p>Studies related to emergency and hospital care only.</p> <p>Studies restricted to non-rural and/or non-remote areas.</p> <p>Studies outside the COVID-19 pandemic.</p>

<sup>†</sup> A rapid review was carried out for recent works in PubMed databases, published between January 2022 and April 2023.



† A rapid review was carried out for recent works in PubMed databases, published between 2022 and 2023, whereby we included 16 new articles.

PHC, primary health care.

**Figure 1: PRISMA flow diagram for scoping review process.**

### Ethics approval

This work was a literature review and relied on secondary materials; thus, it did not require ethics review.

### Results

The main initiatives in PHC were related to healthcare access, but also to the coordination of care, comprehensiveness and longitudinality. Regarding innovations, telecare and customized communication stand out, as well as the role of community health workers and health surveillance, and the importance of retaining professionals and valuing human resources in health. Cultural, equity and vulnerability issues occupy an important space among the initiatives (Fig2).

Most articles included originated in Australia, Canada, the US and India. In Africa, articles from Nigeria, South Africa and the Greater Horn of Africa (Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan, Tanzania and Uganda) stood out. In Latin America, Argentina, Brazil, Ecuador and Peru stand out. In Europe, Spain, Denmark and the UK were also present.

An interesting point is that the description of rurality and remoteness is practically superimposed with that of the specific populations, present in geographic areas of difficult sociospatial

and cultural access (Fig3). Very few studies indicate an index to measure rurality – presenting, at best, vague descriptions of rurality and remoteness, which are illustrated in the distances and obstacles to overcome.

Most of the publications analyzed are research articles, but editorials, letters to the editor, short reports, comments, special communications and guidelines were also included, provided they contained the relevant information to answer the research question. In particular, attention is drawn to the continuing education guideline for telecare, a publication of the Spanish Society of Primary Care Physicians<sup>21</sup>. This guideline offers a step-by-step guide for carrying out remote consultations, differentiating teleconsultation from video consultation, and providing instructions from consultation planning and opening, to the information necessary for clinical management, as well as communication with the patient and instructions in case of clinical worsening or need for validation with a face-to-face consultation<sup>21</sup>.

The main initiatives identified, classified by dimension, along with the factors that facilitate or limit its implementation, are listed in Table 3. It is noteworthy that the initiatives specific to rural and remote locations are predominantly of an organizational nature, while there is a scarcity of initiatives in the other dimensions,

mainly in the collective action one. Another important aspect is that access to and the quality of health care were present in all dimensions. Moreover, the issue of retaining professionals and attracting the health workforce deserves to be highlighted in the organizational dimension<sup>22,23</sup>.

We found new evidence that shed light on the set of initiatives, most of them also in the organizational dimension, such as

asynchronous forms of communication<sup>24</sup>, medical education<sup>25</sup>, human resources training and mental health support<sup>26</sup>. In the clinical field, the most recently published studies also address initiatives on new models of assessment and virtual screening<sup>27</sup>, in addition to the provision of remote antiviral treatment<sup>28</sup>. In the systemic dimension, the most recent evidence regards the articulation of intersectoral workgroups<sup>29</sup>.

**Table 3: Top-ranked initiatives and their facilitating and limiting factors<sup>3-5,21-65†</sup>**

	<b>Initiative</b>	<b>What facilitates?</b>	<b>What makes it difficult?</b>
<b>PUBLIC HEALTH/COLLECTIVE</b>	Case surveillance/isolation	Applications for monitoring/community health workers/testing	Resistance to isolation; lack of national coordination in policy implementation
	Routine/COVID vaccination [refs 44, 45]	Community health workers and clear communication	Fake news about vaccine efficacy and adverse events
	Rapid tests [refs 27, 30, 31-35, 70, 75]	Community health workers and mass testing	They do not have high accuracy initially
	Service flows/protocols	Organized and coordinating primary health care	Multiple versions and updates/low accountability
	Reduction of risk factors, knowledge and prevention of systemic arterial hypertension	Health education/community health workers and community support	Difficulty measuring blood pressure/lack of government support
	Post-COVID systemic arterial hypertension treatment/control algorithms	Single medication two classes of drugs Pan American Health Organization initiatives	Simultaneous control in the pandemic/finding the right balance between chronic and acute diseases
	Border surveillance	Public places for quarantine	Need for testing and inspection personnel
<b>INDIVIDUAL/CLINICAL</b>	Continuity of care/new models of assessment/virtual triage [refs 27, 46, 47, 59]	Telecare/flexibility	System collapse; lack of health professionals
	Non-communicable chronic diseases/mental health/maternal-child health/rehabilitation	Integrated planning	Pent-up and post-COVID chronic needs
	Incentive to reduce smoking [ref. 57]	Mental health monitoring	Lack of communication with family members/remote rural areas
	Electronic prescription	Supply chain provision	Frauds and excesses, with reduced inventories
	Remote treatment and control [refs 4, 5, 21, 22, 28, 33, 36-41, 47-49, 56-58, 63, 64]	Internet of Things Electronic health record	Difficulties faced by users, especially regarding access and Indigenous populations
	Remote learning	Community health workers and apps with frequently asked questions	Device availability/access/ interoperability
<b>ORGANIZATIONAL</b>	Telecare and communication platforms and asynchronous messages [refs 5, 21, 22, 24, 32, 33, 35-41, 48, 49, 56, 57, 63, 64]	Transparency and customization	Access in remote locations/language barriers
	Essential supply chain personal protective equipment/ drugs [refs 3, 5, 31, 38, 61, 66, 74]	Planning/artificial intelligence and machine learning	Logistics and need for redistribution/production
	Hiring and retaining human resources; medical education broadened [refs 22, 23, 42, 50, 51, 66]	Minimum stay of one trimester Interculturality	Hiring agencies and competition with urban areas
	Human resources training and Mental healthcare [refs 5, 22, 23, 26, 38, 41, 43, 50, 52, 56, 57, 74]	Distance education and mental health monitoring/breaks/benefits	Burnout/lack of supervisors/students without practice
	Communication with society [refs 5, 22, 36, 38, 45, 61, 63, 73, 74]	Adequate and clear training	Lack of understanding of cultural aspects and needs
	Expansion of community health worker/nurse/general practitioner or family doctors functions	Legal and professional support	Non-acceptance by doctors and class councils of this expansion to other professionals
	Specialist support – other levels of attention	Integrated/remote planning	Referral without support and follow-up/discussion
<b>INTERSECTORAL/SYSTEMIC</b>	Data sharing	Legal and IT support	Technological barriers/data confidentiality
	Articulation between different levels of government [refs 29, 52]	Better resource allocation	De-coordination and politicization
	Intersectoral articulation and accountability/private health sector [refs 25, 29, 52]	Gain of scale/security	Competition for resources/disagreement priorities
	Food and nutrition security [refs 31, 34, 61, 74]	Local production and financial incentives	Shortage/mobility restriction
	Reduction of inequalities	One-off programs and aid	Prejudice, stigmas and privileges/access barriers
	Social and economic support	Emergency aid and regulations	Inflation, unemployment and education disruption
	ONE Health – multidisciplinary approach, integrating human, animal and environment health [ref. 58]	Financial incentives, food aid Access to animal health care, Community Health	Environmental disasters and changes in pasture sites







access more complex tests. Clinical initiatives address the reduction of risk factors, such as smoking<sup>57</sup>, related to the isolation of communities and mental health problems, in addition to remote treatment, which is so relevant in these areas, but still shows important infrastructure deficiencies. A novel approach in the set of initiatives in the clinical dimension was related to delivering time-critical COVID-19 antiviral therapeutics to individuals across large, remote and logistically complex regions. An Australian study evidenced that a variety of modes of transport were used to transfer medicines between these regions, not only efficiently, but also in a culturally safe way for First Nations people<sup>28</sup>.

In the intersectoral dimension, the main initiatives are focused on the One Health strategy, which unifies human, animal and environmental health, more evident in pastoral communities and localities<sup>58</sup>, and food and nutritional security, with the risks of shortages in remote locations, especially in those without sufficient agricultural activities<sup>69</sup>. On the other hand, there is a greater scarcity related to initiatives aimed at sharing information, reducing inequalities and articulating different levels of government, which ignore mostly rural or remote locations, regarding their specific needs.

The main managerial innovations are related to diagnostic telecare<sup>21,59</sup>, remote monitoring and treatment (including rehabilitation and mental health) and IT applications related to epidemiological and health surveillance, and interdisciplinary teaching and research aspects<sup>60</sup>. Innovations in telehealth are addressed in some studies as potential strategies to reduce inequities, since they are characterized as a resource that results in improvement in healthcare access<sup>59,60</sup>.

Other possibilities for innovation include opportunities to increase vaccination rates with community strategies, further expansion of the scope of practices carried out by nurses and family doctors, improving communication between PHC and other levels of care, and improving the logistics of essential health supply chains.

Moreover, the diversified actions of collectives and community associations evidenced during the pandemic allow the activation of a very comprehensive social network, highlighting the importance of maintaining a well-established bond with the community in non-emergency times too, as a way of strengthening PHC. Health communication and education actions, population-wise, reinforce the importance of social isolation and other factors to avoid contagion in the community and favor the identification of people in a state of greater vulnerability<sup>70</sup>.

Although a large rural population is affected by COVID-19 worldwide and in many developing countries rural settlements constitute a large proportion of the population compared to urban cities<sup>61</sup>, the focus tends to be on population risk and disease severity in high-density urban communities. Interestingly, much of the media coverage of case and death counts revolves around urban areas and city hospitals, with limited information on what happens in rural and remote areas, which potentially reflects on the difficulties when coping with the pandemic in these areas<sup>5</sup>.

Considering that the majority of COVID-19 cases will be mild<sup>71</sup>, the essential attributes of PHC<sup>10</sup> reinforce its potential for the exercise of safe and favorable patient care in the context of COVID-19, since the dimensions of care, case monitoring and community articulation constitute important mechanisms for rapid response to the pandemic<sup>72</sup>, especially in rural and remote locations.

Cultural issues deserve to be highlighted, since in remote locations there are specific peoples, such as those living by the water, in the forests and interior, such as riverside populations, Indigenous peoples, maroons (*quilombolas*) and Aboriginal Australians. The geographical aspects and barriers to overcome, as well as environmental adversities<sup>73</sup>, are issues that must integrate the formulation and implementation of public policies. The pandemic has further highlighted this need, considering that central governments must create protocols and regulations that consider local diversities, being inefficient otherwise<sup>62</sup>. The greatest difficulties in accessing and navigating health systems have also become critical in coping with the pandemic. Post-pandemic health needs deserve special attention, particularly regarding mental health and rehabilitation, as well as the pressure exerted on health services due to the pent-up demand during the pandemic<sup>74</sup>.

Socioeconomic vulnerabilities were also exacerbated during the pandemic, given the damage caused to essential workers and their families, who were exposed without adequate protection and lost their lives, given the mistakes made when dealing with the pandemic, especially in its initial phase. Thus, situations of orphaned children, living on the streets and exposed to exploitation, have increased<sup>75</sup>.

Ethnic and racial vulnerabilities have increased, such as delays in caring for people with complications related to COVID-19, which were evidenced to disproportionately affect racial and ethnic minority populations. There were more deaths among black people and three times more hospitalizations of Latino ethnicities than of non-black and non-Latino people at the beginning of the pandemic<sup>63</sup>. Similarly, Logan et al demonstrated that, in rural areas of the US, there are significant disparities between white and black populations, with the latter showing higher mortality rates<sup>64</sup>. These disparities represent a confluence of structural racism with other social and economic factors that increase the risk of COVID-19 exposure and disease-related complications among demographically vulnerable populations.

Ethnic vulnerabilities are also added to migratory vulnerabilities<sup>23,58</sup>. For immigrant communities living in rural areas, issues related to the status of migratory legality have a different impact on access to health care. Latino migrant farm workers show higher rates of health disparities and occupational hazards, with poorer access to care due to a constellation of factors that are legal, financial, cultural and geographic in nature<sup>64</sup>. Other issues, such as social isolation, negatively affect Latino immigrants in US regions and lead to additional barriers to care and a higher incidence of mental health issues. Thus, immigration acts as a social determinant of health, which can negatively affect the wellbeing of these individuals, especially during a global public health crisis such as a pandemic.

Vulnerabilities of gender, ethnicity, capacity and citizenship status also intensified during the pandemic, with higher rates of violence and indifference by society, including in situations of structural racism in health services<sup>65</sup>. The elderly, with chronic diseases, also suffered from difficulties in care and continuity of care, especially those in long-stay institutions<sup>55</sup>.

Such social determinants of health and other structural vulnerabilities in rural areas greatly affect their populations, which results in higher rates of chronic and life-limiting diseases, lack of

access to mental health care, and greater diagnostic and therapeutic difficulties for several clinical conditions, including infectious diseases<sup>64</sup>.

### Limitations

The scoping review, while fully answering the research question, did not allow evidence for the effectiveness of PHC practices; however, the method offers a panoramic analysis of initiatives implemented internationally. From this perspective, we qualitatively evaluated the articles, so that we could provide a more consistent classification to readers.

The fact that we worked with only three languages (English, Spanish and Portuguese) also represents a limiting factor; however, during the pandemic, most articles were published in English, due to the need to share the findings quickly and globally. Less than 1% of the articles found in the first search were written only in other languages.

We found a relevant set of studies that, although not meeting the inclusion criteria, were very rigorous, and were still read for the discussion, as they showed some important intersections between pairs of the PHC, rural and remote, and COVID-19 triad.

Finally, we are aware of epistemic injustices brought by an imbalance in power relations. Health knowledge and its diffusion are still colonial, with many implicit hierarchical assumptions, sometimes without considering the cultural competences of people from rural and remote regions<sup>76</sup>. Thus, another limitation is that some successful experiences in less developed countries may not be present, due to inequalities in the production of studies and publications.

### Conclusion

The research question was fully answered by the review, having identified public, clinical, intersectoral and, mainly, organizational health initiatives. It is important to point out that remote locations

have great potential for intersectoral activities at the local level, due to the strong articulation that is necessary between the different areas. From the organizational point of view, rural and remote locations showed enormous flexibility to face the pandemic, regarding the different levels of care.

The distance between the different levels of government has been further intensified during the pandemic, in the formulation of policies and protocols that had to be adapted to rural and remote locations for their implementation. It would be very important to articulate the different levels, with the officialization of national public health agencies and plans adapted to each local reality, aiming at assessing their implementation for future crises.

The results highlight and synthesize the knowledge about initiatives and innovations developed to face the COVID-19 pandemic, within the scope of PHC, in rural and remote locations worldwide. Innovations and lessons learned are equally relevant for the strengthening of health services and systems. This issue is still quite limited, so it needs to be further analyzed in new reviews seeking evidence to assess the sustainability and effectiveness of the implemented measures aimed at facing post-pandemic difficulties and other adversities. Moreover, empirical research in rural and remote regions is essential to address health inequities in future health crises.

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### Conflicts of interest

The authors declare no conflicts of interest.

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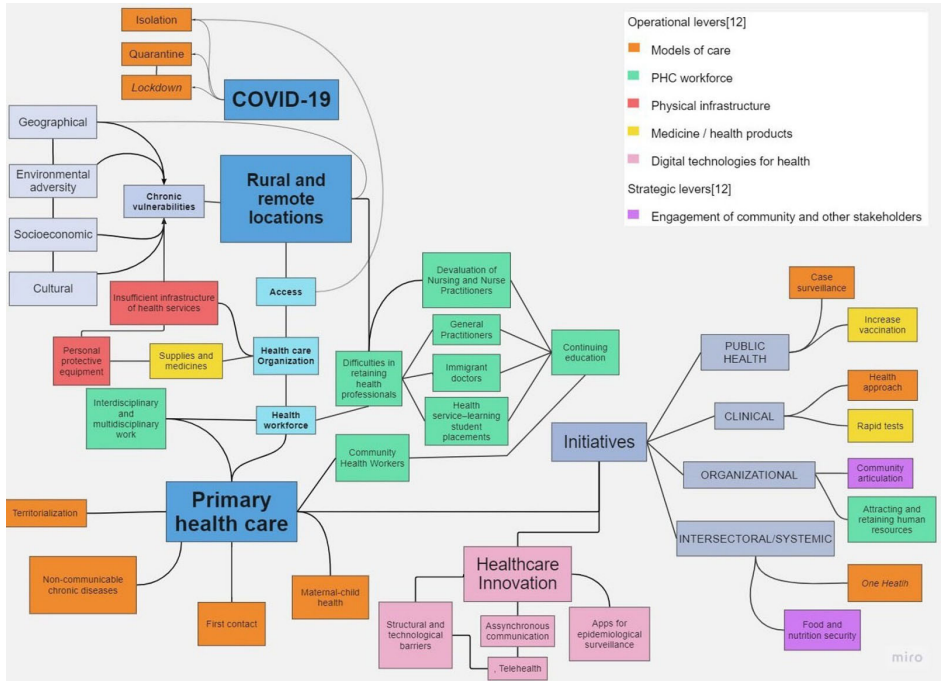
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## Appendix I: List of extracted items

Title
Reference, with DOI
Authors
Type of material
Journal's name
Year
Data base
Countries/institutions (origin)
Countries/institutions (of study)
Objectives
Research problem or question
Type of study
Method
Results
Key Primary Health Care issue
Population
Definition of rurality and/or remoteness
Rural and remote issues
Social vulnerabilities
Is there an adequate response to the problem?
Study gaps and limitations
Proposed initiatives (general)
Proposed initiatives (specific)
Challenges to the implementation of the measures proposed in each scenario
Latent potentialities (including post-COVID)
Exclusion reason

Appendix II: Cognitive map of items extracted



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