FIOCRUZ | Brasília

ISSN: 2358-1824

Cadernos Ibero-Americanos de Direito Sanitário
Cuadernos Iberoamericanos de Derecho Sanitario

Article

The protagonism of users in digital health: strategies centered on the riverside population for access to the right to health

O protagonismo dos usuários na saúde digital: estratégias centradas na população ribeirinha para o acesso ao direito à saúde

El protagonismo de los usuarios en la salud digital: estrategias centradas en la población ribereña para el acceso al derecho a la salud

José Ilcleson Mendes Coelho[1]
Instituto Federal de Educação, Ciência e Tecnologia do Amazonas, Manaus, AM.
https://orcid.org/0009-0005-3284-4480
ilcleson.mendes@gmail.com

Fernando José Herkrath[2]
Universidade do Estado do Amazonas, Manaus, AM.
https://orcid.org/0000-0003-4439-0189
fmberrath@uea.edu.br

Roseni Pinheiro[3]
Universidade do Estado do Amazonas, Manaus, AM.
https://orcid.org/0000-0001-8745-9209
rosenip0@gmail.com

Denise Silva dos Santos[4]
Instituto Federal de Educação, Ciência e Tecnologia do Amazonas, Manaus, AM.
https://orcid.org/0009-0008-7558-4609
denisesantos.sds@hotmail.com

Abstract

Objective: to analyze the use of digital health solutions in promoting access to Primary Health Care services for rural riverside populations, considering their territorial and sociocultural specificities. **Methodology:** this is a qualitative study with an exploratory nature, involving field research in the Santa Maria Community, located in the Puranga Conquista Sustainable Development Reserve, in Manaus/Amazonas. Situated in a rural riverside area along the Negro River, the community includes its main settlement and adjacent localities, totaling approximately 423 inhabitants, with access exclusively by river, about 62 kilometers from the capital. Based on a non-probabilistic convenience sample, semi-structured interviews were conducted with 17 health professionals, in addition to a

[1] Master in Collective Health, Universidade do Estado do Amazonas, Manaus, AM, Brazil. Basic, Technical and Technological Education Professor, Instituto Federal de Educação, Ciência e Tecnologia do Amazonas, Manaus, AM, Brazil.
[2] PhD in Collective Health, Instituto de Medicina Social, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil. Adjunct Professor, Universidade do Estado do Amazonas, Manaus, AM, Brazil.
[3] PhD in Collective Health, Instituto de Medicina Social, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil. Professor, Universidade do Estado do Amazonas, Manaus, AM, Brazil.
[4] Master in Social Work and Sustainability in the Amazon, Universidade Federal do Amazonas, Manaus, AM, Brazil. Social Worker, Instituto Federal de Educação, Ciência e Tecnologia do Amazonas, Manaus, AM, Brazil.

CC BY

OPEN ACCESS

workshop attended by 15 residents and local community leaders. **Results:** from the data analysis, four main categories emerged aligned with the study's objective, expressing the perceptions of professionals and residents regarding the use of Digital Health in promoting access to health services, its understanding, potential, and challenges: "Understanding of Digital Health"; "Acceptance"; "Advantages"; and "Barriers". **Conclusion:** the adoption of participatory approaches sensitive to local reality, incorporating the perceptions of residents, professionals, and managers, proves essential to mitigate resistance, foster acceptance, and enable Digital Health alternatives in building a more equitable and inclusive health system within the context of rural riverside populations.
Keywords: Digital Health; Primary Health Care; Rural Health; Rural Population.

Resumo

Objetivo: analisar o uso de soluções de saúde digital na promoção do acesso aos serviços da Atenção Primária à Saúde por populações rurais ribeirinhas, considerando suas especificidades territoriais e socioculturais. **Metodologia:** trata-se de um estudo de abordagem qualitativa, com caráter exploratório, em que se realizou pesquisa de campo na comunidade Santa Maria, localizada na Reserva de Desenvolvimento Sustentável Puranga Conquista, em Manaus, Amazonas. Situada em área rural ribeirinha, à margem do rio Negro, a comunidade abrange sua sede e localidades adjacentes, totalizando aproximadamente 423 habitantes, com acesso exclusivamente por via fluvial, distante cerca de 62 quilômetros em relação à capital. Com base em uma amostra por conveniência, de natureza não-probabilística, foram realizadas entrevistas semiestruturadas, com 17 profissionais de saúde, além da condução de uma oficina que contou com a presença de 15 moradores e lideranças locais da comunidade. **Resultados:** da análise dos dados quatro categorias principais emergiram, alinhadas ao objetivo deste estudo, que expressam as percepções de profissionais e moradores sobre o uso da saúde digital na promoção do acesso aos serviços de saúde, sua compreensão, potencialidades e desafios: “compreensão sobre a saúde digital”; “aceitação”, “vantagens” e “barreiras”. **Conclusão:** a adoção de abordagens participativas e sensíveis à realidade local, que incorporem as percepções de moradores, profissionais e gestores, mostra-se essencial para mitigar resistências, fomentar a aceitação e viabilizar alternativas de saúde digital na construção de um sistema de saúde mais equitativo e inclusivo no contexto das populações rurais ribeirinhas.
Palavras-chave: Saúde Digital; Atenção Primária à Saúde; Saúde Rural; População Rural.

Resumen

Objetivo: analizar el uso de soluciones de salud digital en la promoción del acceso a los servicios de la Atención Primaria de Salud para poblaciones rurales ribereñas, considerando sus especificidades territoriales y socioculturales. **Metodología:** Se trata de un estudio de enfoque cualitativo, de carácter exploratorio, en el que se realizó una investigación de campo en la Comunidad Santa María, ubicada en la Reserva de Desarrollo Sostenible Puranga Conquista, en Manaus/Amazonas. Situada en el área rural ribereña, a orillas del Río Negro, la comunidad comprende su sede y localidades adyacentes, sumando aproximadamente 423 habitantes, con acceso exclusivamente por vía fluvial, a unos 62 kilómetros de la capital. A partir de una muestra por conveniencia, de naturaleza no probabilística, se realizaron entrevistas semiestructuradas con 17 profesionales de la salud, además de un taller que contó con la presencia de 15 residentes y líderes locales de la comunidad. **Resultados:** Del análisis de los datos, surgieron cuatro categorías principales alineadas con el objetivo de este estudio, las cuales expresan las percepciones de profesionales y residentes sobre el uso de la Salud Digital en la promoción del acceso a los servicios de salud, su comprensión, potencialidades y desafíos: "Comprensión sobre la Salud Digital"; "Aceptación"; "Ventajas"; y "Barreras". **Conclusión:** La adopción de enfoques participativos y sensibles a la realidad local, que incorporen las percepciones de residentes, profesionales y gestores, resulta esencial para mitigar resistencias, fomentar la

aceptación y viabilizar alternativas de Salud Digital en la construcción de un sistema de salud más equitativo e inclusivo en el contexto de las poblaciones rurales ribereñas.
Palabras clave: Salud Digital; Atención Primaria de Salud; Salud Rural; Población Rural.

Introduction

Health is a fundamental right of the human being, and the State must provide the conditions indispensable for its full exercise. In addition to the guidelines provided in the Federal Constitution of 1988 (CF/88)[1], the management and operation of public health services of the Unified Health System (SUS) are guided by the principles of universal access to health services and actions at all levels of the care network; comprehensiveness of care; equality of health care, without prejudice or privileges of any kind; community participation, among others[2].

Guaranteeing universal access and the right to health requires public policies that consider territorial specificities and socioeconomic inequalities, grounded in knowledge of local reality and qualified listening to users[3,4]. Enabling this right and reducing inequities are actions that essentially promote social inclusion and human dignity. As health systems are social responses to the population's demands, the organization of the SUS must start from analysis of the needs expressed by citizens, respecting the singularities of each political-administrative division[5]. Thus, the structuring of services must be intentional and directed toward the context in which it is situated.

The SUS symbolizes a social achievement, the fruit of the struggle of social movements. After its creation, provided for in the CF/88, its implementation took shape from the 1990s onward with Law No. 8.080/1990[2]. Since then, it has represented important advances in the pursuit of guaranteeing universal and equitable access to health services, with growing and decisive expansion of health policy coverage, providing developments in health indicators and in the population's living conditions, especially the most vulnerable, highly dependent on public services[6].

The National Primary Care Policy (PNAB), through strengthening Primary Health Care (PHC), seeks social protection and universalization of care through the production of responses to health needs and access to its services in an equitable and comprehensive manner for users, emphasizing the role of PHC as the entry point to the SUS, which must provide care closer to the citizen. Among the actions undertaken to improve and enhance access, the More Doctors Program (PMM) stands out; implemented in 2013, it reduced inequalities in physician distribution by expanding the number of Family Health Strategy (ESF) teams and retaining professionals in remote and vulnerable areas[4,6]. In a study conducted by Fausto and collaborators[7] in remote rural municipalities (MRR), health managers emphasized that the PMM favored expansion of care coverage, contributed to improvements in work processes, increased the provision of health practices, and consolidated Basic Health Units (UBS) as a service regularly sought for care.

Specifically regarding riverside populations, PNAB 2011 established riverside teams, the Riverside Family Health Strategy (ESFR), and river teams, the River Family Health Strategy (ESFF), adapting care to the territorial specificities of the Amazon and Pantanal. These models seek to adapt care to individuals' singular demands and the specificities of their territory. Lima *et al.*[4] point out that this arrangement guaranteed access for historically marginalized populations, promoting a new model of care in the region. The work of health teams from River Basic Health Units (UBSF) represents an effort to produce responses to health demands by expanding coverage and access to PHC services for riverside populations, considering greater proximity to their homes, with respect for

comprehensiveness and continuity of care. However, inequities and barriers to universal access to effective and continuous health care planned according to local specificities, as well as difficulties in access to specialized care, persist[4].

Population dispersion in Amazonas and its vast hydrographic network impose severe inequalities in access to health compared with other regions of the country[8]. Riverside populations occupy this territory in a fragmented manner, distributed along extensive waterways in small communities or homes spread along rivers and streams. Like the rural population as a whole, they have low schooling and economic levels. Educational limitations compromise human development and economic growth and restrict access to consumer goods, which, associated with isolation caused by lack of communication and access to information, compromise health prevention actions through possible difficulties in understanding the health-disease process, ways of preventing morbidities, and health promotion, negatively affecting their quality of life[3,7,8].

Social, economic, and health indicators are very disparate: there is an institutional void, and these populations have an insufficient supply of public services in all areas, aggravated by difficulties in communication and transportation infrastructure, scarcity of public facilities, precarious services, a high rate of informality, low development indices, and broadly unfavorable living conditions for most of the population[3,8].

Persistent inequalities in the Amazon, aggravated by regional factors, harm quality of life and access to health, especially in rural areas, resulting in the country's worst rates of service use. This vulnerable population depends on the SUS, especially PHC services, with minimal ties to the private sector. However, regular provision of care is limited by concentration of resources in urban centers and chronic insufficiency of professionals[7,8,9]. Thus, geographical and structural barriers reinforce these communities' health isolation.

A major mismatch is observed in the organization of health care, which uncritically replicates routines adopted in urban health services because a lack of understanding of the particular social settings of the rural Amazon persists, maintaining sociopolitical and economic invisibility and social exclusion from national priorities. This evidences the need for adaptations in this new care model and the process of building public policies for the region[4,7,10].

Thus, promoting accessible and timely health services for a population dispersed across a vast territory requires confronting the different factors that preserve this scenario of social exclusion, depriving citizens of the right to health, and requires a response to difficulties in attracting and retaining professionals, high transportation costs, and lack of service provision[8,9].

The constitutional obligation to guarantee universal, comprehensive, and equitable access to health services will require innovative and complementary solutions, since ensuring access to PHC services is indispensable for realizing its role as entry point and organizer of care throughout the Health Care Network (RAS), without which it will not be possible to realize the other attributes of PHC and SUS principles. It is understood that health actions and services must be planned to reflect the realities of the territories and populations for which they are intended. Beyond improving existing policies directed toward training, attracting, and retaining the workforce for PHC in these territories, Fausto *et al.*,[7] emphasize the need to implement organizational strategies supported by distance solutions through which it is possible to expand resources available to professionals and users and promote timely, effective, and quality care in areas of difficult access. Following their analysis, for these authors[7], it is especially because these are rural and remote territories that solutions supported

by information and communication technology (ICT), such as telehealth, are fundamentally necessary and imperative in promoting access to health.

To reflect the population's characteristics and needs, it is indispensable to create spaces for community participation in the process of formulating alternatives directed toward serving the local population. Thus, regarding the incorporation of digital health alternatives, the need for digital health policies to be grounded in SUS principles, such as constitutionally established decentralization and social participation, is considered[11,12].

The use of ICT can also provide important responses to SUS management needs, involving the automatic generation of indicators, management of health service production, support for participatory management, and social control. This creates arrangements conducive to the creation and implementation of new management models and instruments of federative relations that use digital health in the pursuit of guaranteeing access and participatory management focused on results, social participation, and stable financing[13].

Priority four of the Digital Health Strategy 2020-2028 (ESD) establishes the digital health user as protagonist, reinforcing the need to engage patients and users in adopting digital health tools, as well as support for building systems and services. Its focus is on conceiving initiatives that allow users, citizens, health professionals, and managers active participation in collaborative spaces so they contribute to defining priority initiatives, use models, and identifying priorities for digital health[14]. The SUS Digital program[15] and ESD reflect managers' intention to develop effective digital health strategies, considering user acceptance and system demands. This action aligned with real needs is essential for technologies to act as allies in guaranteeing universal and quality access. Thus, the aim is to overcome inequities and realize the constitutional right to health throughout the territory.

This priority prescribes the need for actions involving citizens to bring the user's focus and needs to the ESD, in addition to facilitating the development of digital health services and use models that are widely used, including actions such as: developing an instructional video channel on the use of applications for citizens; conducting, in partnership with the National Health Council, with emphasis on the Users' Forum and other representatives of civil society, actions to present to social control the benefits of using digital health solutions, among others[14].

This perspective of public authority action, conceiving public policies aligned with the needs of the population, professionals, and services, is essential to make the complementary alternatives of digital health available to the SUS to confront the challenges of offering society universal, accessible, and quality health care closer to citizens, overcoming inequities to realize the constitutionally provided right to health.

In this context, digital health emerges as a promising strategy for confronting access inequities, encouraged by international organizations and incorporated into Brazilian public policies through investments and initiatives directed toward innovation. Advances in ICT have enabled the development of new practices and care models, transforming the organization of health services and expanding coverage, effectiveness, and quality of care, especially in territories of difficult access. Thus, this research aimed to analyze the use of digital health solutions in promoting access to PHC services by rural riverside populations, considering their territorial and sociocultural specificities.

Methodolody

This research adopted a qualitative methodological approach, which, according to Freitas and Prodanov[16], is intended for interpreting phenomena and assigning meanings. Such elements are fundamental in this perspective, which uses the environment as a direct source of data and requires close contect between the researcher and the object of study, demanding intensive fieldwork. According to Minayo[17], the object of qualitative research is the universe of human production, which can be summarized in the world of relationships, representations, and intentionality and can hardly be represented by numbers and quantitative indicators[17].

This was exploratory research. According to Gil[18], such research aims to provide greater familiarity with the problem, with a view to explaining it in analytical dimensions or enabling the construction of hypotheses. Also according to this author, the main purpose of this type of study is the improvement of ideas or perceptions. Field research was conducted to meet the objectives of this research, involving residents and local leaders of the Santa Maria Community and Health Professionals and Managers of the Community Support Unit, who provide fixed-site care to residents, and professionals of the Ney Lacerda UBSF and Manaus Rural Health District, who provide itinerant care to that Community.

The setting of this research is the Santa Maria Community, located on the left bank of the Negro River, in the rural riverside area of the municipality of Manaus/Amazonas. Situated within the Puranga Conquista Sustainable Development Reserve (RDS), the community encompasses its main settlement and adjacent localities, totaling approximately 423 inhabitants, according to data provided by local leaders. Access to the community is exclusively by river, about 62 kilometers from the capital. The journey can be made in about 6 hours by conventional vessel or approximately 2 hours and 30 minutes by express speedboat, departing from the port of Manaus.

PHC services for community residents are provided by the health team of the Support Unit and Dr. Ney Lacerda UBSF, whose team comprises microscopists, a physician, community health workers (ACS), a pharmacist, a dentist, an oral health assistant, nurses, nursing technicians, a nursing assistant, a laboratory assistant, in addition to the unit director and vessel crew. In the main settlement, there is a Support Unit housing the local health services manager and ACS who work in the territory and are responsible for coverage of the assigned population. Once a month, the UBSF travels along the Negro River serving riverside residents of communities linked to it, including Santa Maria.

To achieve the objectives proposed in this study, semistructured interviews were conducted with 17 health professionals, in addition to a workshop attended by 15 residents of the Santa Maria Community. Interviews encompassed professionals and managers linked to the Manaus Rural Health District, Ney Lacerda UBSF, and those working in the Support Unit located in the community.

Interviews with health professionals were conducted based on a convenience sample, of a nonprobabilistic nature, at the headquarters of the Rural Health District, the UBSF itself, and the community Support Unit. Interviews were conducted in person and guided by a semistructured script addressing topics such as participants' understanding, experiences, advantages, challenges, acceptance, and perceptions regarding the use of digital health in care for riverside communities. Throughout this study, participating professionals and managers will be referred to as "Professional."

To mobilize residents and ensure their engagement in the workshop, researchers coordinated with local leaders to hold a meeting presenting the study. On that occasion, the research objectives

were presented and the schedule and location of the activity were defined by consensus with the group. Next, a formal invitation was prepared and sent through a messaging application to those present; simultaneously, community leaders replicated the notice in the community residents' group. The workshop was conducted based on a previously prepared script, structured through dynamics of dialogue and collective expression centered on digital health. Its main objective was to promote active listening to the community's lived experiences, favor understanding of its perspectives, identify shared perceptions, and gather elements enabling analysis of local conditions of acceptance, challenges, and use of technologies applied to health.

The semistructured interview script for approaching health professionals and the script for conducting the workshop with residents included questions common to both and specific to each group, thus considering each group's positions of speech, activity, views, and perceptions, allowing correlations between professionals' and residents' perceptions.

Interviews and workshop dialogues were audio-recorded with participants' authorization and subsequently transcribed. The analysis of collected data followed the content analysis method proposed by Bardin[19], opting for thematic analysis. This technique aims to analyze what was said during the investigation, constructing and presenting conceptions around the object of study[19]. It allows organization and analysis of qualitative data, identifying patterns and meanings revealed in participants' speech.

The collected material was analyzed according to the phases of analysis defined by Bardin[19], resulting in systematization of categories, critical reflection, and interpretation based on the theoretical framework regarding the use of digital health solutions in rural settings. Data were organized, systematized, and categorized using the textual data analysis software MAXQDA Analytics Pro (24.10.0). Organization and analysis of material collected in the workshop were complemented by use of the script with analysis procedures proposed in the 'Comprehensiveness Project: practical knowledge in the everyday life of health services,' as previously specified. Regarding ethical and legal aspects, this study formed part of the research project "Community participation in the process of planning, organization, and provision of health services in rural riverside localities of the Amazon," approved by the Human Research Ethics Committee under CAAE number: 59398222.0.0000.0005. The project obtained approval from the Manaus Municipal Health Department, and the Informed Consent Form (TCLE) was signed by all participants.

Results and Discussion

Interviews were conducted between August and December 2024, involving 17 health professionals, including: physician, dentist, pharmacist, biochemist, nursing technician, nurses, community health workers, community endemic disease worker, nursing technician, managers and directors of the UBSF and rural health district. Participants' average age was 46.3 years, ranging from 30 to 59 years, with 52.9% female. Regarding schooling, 52.9% had completed higher education, while 47.1% reported completing secondary education. The average length of work in health services in rural areas was 15.8 years, ranging from 1 to 28 years. The interviewed group was characterized by the diversity of professional categories comprising PHC, encompassing higher-level professionals, technicians, and managers, reflecting the multiprofessional nature of this level of care organization.

The workshop lasted approximately 1 hour and 30 minutes and was attended by 15 community residents, of whom nine were women and six men. Participants' ages ranged from 20 to 82 years, averaging 48.6 years. Regarding schooling, 53.3% had completed secondary education, 33.3% had incomplete elementary education, 6.7% had completed elementary education, and 6.7% were illiterate. Regarding occupational profile, participants included homemakers, fishers, community leaders, public servants, and retirees, reflecting the diversity of occupations in the community.

In the perception of professionals and residents of the interviewed riverside population, digital health constitutes a strategic opportunity to break structural barriers and democratize access to health in historically underserved regions. However, for this potential to materialize, participants emphasize the need to confront critical challenges that may compromise implementation, social acceptance, and sustainable use of these technologies in the territory.

ICT represents a concrete opportunity to overcome structural barriers and expand health service provision in regions historically marked by inequalities and presents the advantages and challenges of its implementation, according to this research's participants, as well as factors affecting its acceptance. Brazil has a consistent trajectory in incorporating digital technologies into its health system, especially within PHC, where these tools have been progressively integrated into care and management processes. Over recent years, adoption of digital health resources has been consolidated as a strategic component for strengthening PHC, contributing to expanded access, enhancement of care, and improved coordination of health services[20].

In Brazil, enhancement and sustainability of the SUS depend on strengthening PHC, recognized as the main entry point and organizer of care. In this context, challenges persist related to expanding access, reducing service fragmentation, coordinating care, and caring for chronic conditions. Overcoming these limitations requires strengthening PHC's capacity to articulate the different points of the health care network, ensuring comprehensiveness and continuity of care[21,22].

In PHC, digital technologies have proven important for enhancing communication between different levels of care and strengthening continuity of care. Furthermore, telehealth services constitute a relevant strategy for expanding access to health services and reducing regional inequalities, especially in areas with a shortage of professionals and specialized consultations, through technology-mediated care modalities[20,23].

Incorporation of digital technologies into PHC has strengthened care coordination and favored greater equity in access to services. By making updated clinical information available, these tools support professionals' decision-making, contribute to preventing health problems, and promote more efficient use of resources. Furthermore, they expand integration between different levels of care, reinforcing PHC's role as a structuring axis of health care networks[24].

In this sense, Celes *et al.*[25], in investigating telehealth policies in different countries, identified health ICT resources being used mainly for the permanent education of health professionals, reducing health costs, expanding access in remote areas, improving and strengthening PHC, integrating health care networks, among others. Following their analysis, they reinforce that telehealth, as a strategy, is an important instrument for expanding and enhancing access to health care and continuing education and promoting quality of life in different localities, and emphasize that rural areas far from urban centers are those most in need of investments and require focused action from health management bodies to implement telehealth projects, contributing to greater access to health services in these areas.

For Santos *et al.*[20], incorporation of telehealth resources in Brazil has been consolidated since 2007, with creation of the National Telehealth Project, primarily directed toward PHC and initially implemented by nine centers linked to the country's main universities. Within integration of ICT into PHC, the National Health Information and Informatics Policy stands out, with the objective of structuring a national e-Health strategy, and subsequent resolutions reinforce this direction, maintaining PHC as the central axis of proposed actions.

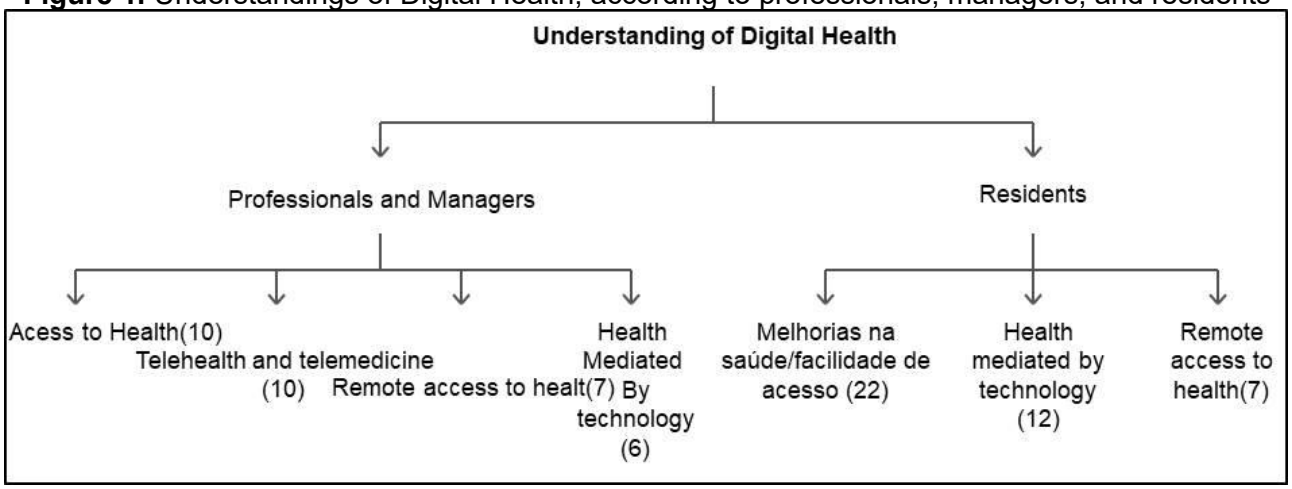
Studies of telehealth incorporation into PHC in Brazil indicate that these technologies' use by health teams is conditioned by factors related to the organization of local systems and services, including the country's region, municipalities' population size, institutional support, and the degree of telehealth implementation in health units. Evidence points to regional inequalities in implementation of the Telehealth Brazil Networks Program, with greater use of resources in the South and Southeast regions. However, small municipalities, especially those with up to 10 thousand inhabitants and in less favored socioeconomic contexts, have shown substantial use of available telehealth tools. Moreover, adoption of ICT in health services may be compromised by policies formulated in a top-down manner, insufficiently sensitive to local specificities and insufficiently articulated with other public policies, limiting their effectiveness and sustainability[22,26].

From the analysis of this research's data, four main categories emerged, aligned with this study's objective, expressing professionals' and residents' perceptions regarding the use of digital health in promoting access to health services, its understanding, potential, and challenges. The first category, "understanding of digital health," explores professionals' and residents' level of knowledge and general perceptions of the concept and use of digital health. The second category, "acceptance," addresses how professionals view digital health acceptance by professionals and users. The third, "advantages," identifies the potential uses of digital health and their implications for health services in rural riverside areas. Finally, the fourth category, "barriers," addresses challenges to be overcome so that appropriation of different digital health solutions and their benefits for professionals and users becomes possible. Each category explores different aspects related to implementation and use of digital health in rural riverside areas, detailed in the topics below.

Understanding of digital Health

The first category, "understanding of digital health," explores professionals' and users' knowledge and perceptions of the subject. This analysis is crucial for identifying educational gaps, since actors' level of understanding can both drive development of new strategies and compromise acceptance of technology. Professionals' and users' perceptions of different aspects of technology use in health influence its use[27], and knowledge transfer from communities and involvement of professionals can benefit development of solutions aligned with local needs[28,29]. Health professionals and managers presented a multifaceted view, unfolding into the following analytical subcategories, with frequency indicated in parentheses, showing the number of times participants mentioned them in their speech (Figure 1).

Figure 1. Understandings of Digital Health, according to professionals, managers, and residents



Source: Own elaboration.

The analysis conducted revealed that, although some health professionals demonstrate familiarity with the term "digital health," understanding of its scope and potential remains considerably limited. It was observed that some professionals restrict digital health to telemedicine and telehealth resources or merely associate it with the use of Information and Communication Technologies (ICT) in health, characterizing it as a technology-mediated practice, while others are unaware of the various digital health solutions and technologies currently available. "Today, in general, we already imagine digital health just as telehealth, right? But we know there are still other aspects to be addressed, to be identified and worked on in everything that would actually involve digital health, right?" (Professional 1). "We even have telehealth here, right? It is through the computer, we schedule appointments, and people then have the consultation online, right?" (Professional 6).

Residents of the Santa Maria community demonstrated some familiarity with initiatives related to digital health due to teleconsultation services with nursing professionals and psychotherapy sessions by videoconference, offered by a nongovernmental organization in partnership with the local community. Despite this practical exposure, limited understanding of the digital health concept is observed among residents. This context may be influenced largely by scarcity of information and absence of systematic awareness and education actions regarding digital health. Many are unfamiliar with the term and have difficulty understanding how digital technologies can be used to improve access to health services, but clearly see the possibility of benefits to their health, even if they have difficulty elaborating on them in a more technical and detailed manner. "Health improved, because before it was difficult" (Resident 7).

For professionals and managers, as well as residents, perceptions of digital health demonstrated a strong correlation with expected benefits, especially regarding "expanding access and coverage and improvements in health services." There is an understanding that digital health "[...] is good for us riverside residents to have more access to health" (Resident 6). This recurrence and the emphasis assigned to these aspects suggest that expectations of improvements in access to services and the scope of health care offered by different levels of care are relevant factors in constructing professionals', managers', and residents' perceptions of digital technologies applied to health.

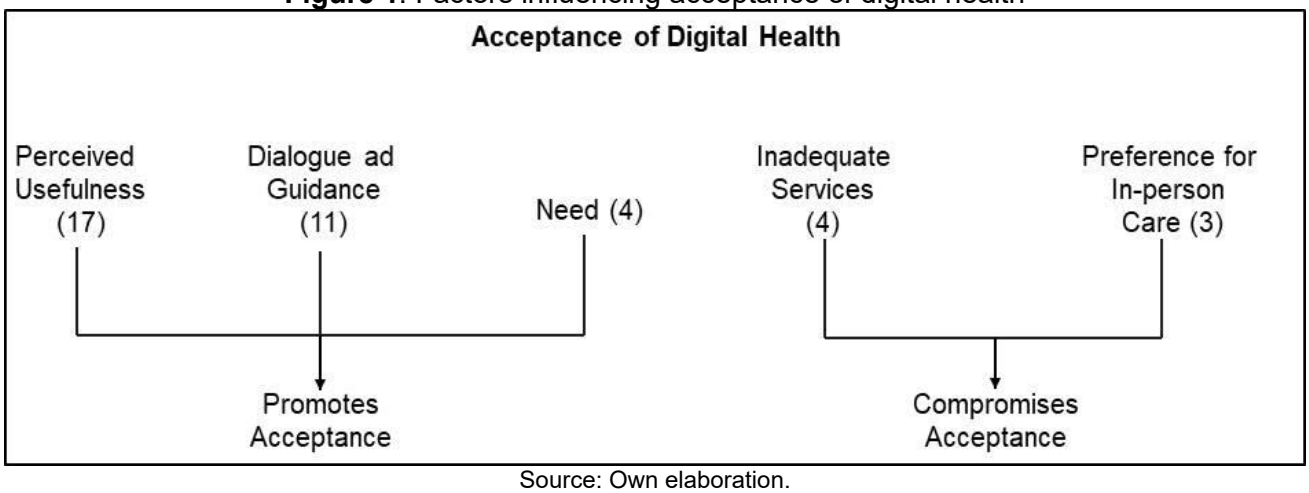
People's positive attitude toward using ICT in health is relevant because it increases their likelihood of adherence to and use of the tools[30].

Factors influencing acceptance of digital health

It is important to emphasize that this study did not aim to analyze acceptance of a particular digital health solution based on specific theoretical models. Instead, results regarding acceptance of digital health by professionals and residents, obtained through interviews and the workshop, were compared in light of existing literature on the subject.

In view of this, in exploring the nuances of digital health acceptance, subcategories emerging from these dialogues reveal factors influencing adoption and use of digital technologies in health, from perceived usefulness and need to challenges imposed by inadequate services and preference for in-person care. Analysis of the dialogues reveals five main subcategories deserving attention: three factors promote it, namely perceived usefulness, dialogue and guidance, and need; and two factors compromise acceptance, namely inadequate services and preference for in-person care (Figure 2).

Figure 1. Factors influencing acceptance of digital health



Source: Own elaboration.

Perceived usefulness is an essential factor in acceptance of new technologies and is linked to performance expectancy, understood as the degree of the user's belief that a new technology will be able to generate concrete benefits in their experience or results[31]. In general, professionals and managers positively assessed acceptability of digital health by themselves and users, especially because of perceived benefits, and mentioned actions to mitigate users' initial resistance and concerns. "[...] it is an alternative to not losing that patient, to not leaving them without care" (Professional 5). "And they like it because they avoid leaving their place to come to the urban area, often to keep going from place to place or waiting longer" (Professional 17). It was also emphasized that "any help for them is already very welcome, because they are people who live far away, have great difficulty with access and even communication" (Professional 15).

Dialogue and guidance stand out as fundamental elements in the process of raising awareness of digital health use, contributing to dissemination of knowledge, attenuating initial resistance, and favoring acceptance by professionals and users. Acceptance "is step by step, it is something that is evolving through the community health workers themselves, who are passing on information slowly, and there has already been an increase, like, in acceptance" (Professional 14). In the study by Ross *et*

al.[32] on feasibility and sustainability of telehealth use in PHC, participants emphasized the need for more investment in education to ensure community awareness, and, faced with some patients' discomfort, professionals began dedicating time at the beginning of care to guide them on what to expect from the tool.

In other circumstances, this need is associated with convenience, exemplified by residents' use of messaging applications to communicate with the local health team and UBSF, seeking guidance and information, consultations and tests, and by the possibility of receiving care in the community, avoiding travel and separation from family. During the workshop, it was stated that "it is much more practical, in these cases, to send a message to ask a question about a medication, or the boy who has something, we send a message. In these situations, it is much easier for us to send a message, and we are always attended to" (Resident 14). In the study by Liu *et al*.[33], convenience perceived by users stood out as one of the main facilitators of adherence to teleophthalmology.

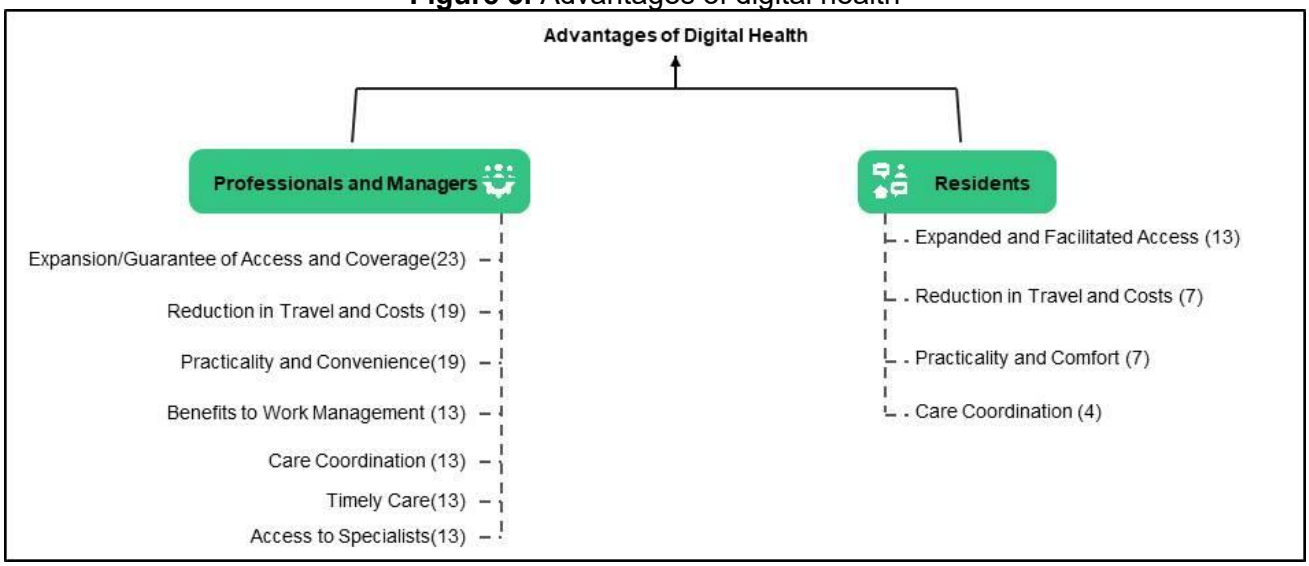
Interview and workshop data show difficulties in residents' acceptance through low demand for services made available by the social organization's project and, for professionals, through issues related to how implementation and adaptation of work processes occurred, in addition to issues related to interoperability of systems used by the UBSF team. Services made available by the social organization "were not very accepted by the community, the nurse, but the psychologist had some consultations, yes" (Professional 8). "Other specialties are missing, such as pediatrics" (Resident 8).

In turn, preference for a traditional, in-person care relationship with the physician remains a central aspect in acceptance of new health technologies, being the second factor mentioned as compromising user acceptance. The study by Kruse et al.[27] reinforces this idea by demonstrating providers' view that telemedicine could compromise the personal nature of care, finding resonance in patients' preferences for more direct and personal communication. In the same sense, a study conducted by Beks *et al*.[34] showed that, although telehealth consultations were generally acceptable, users and professionals demonstrated a strong preference for in-person care.

Advantages of digital health

The third analytical category encompasses potential advantages attributed to digital health, according to the perceptions of professionals, managers, and community residents. Among the most recurrent aspects, expansion of coverage and access to health services, including access to specialized care; reduction in travel and associated costs, both for users and the health system; and practicality, convenience, and provision of timely care stood out. Additionally, professionals and managers emphasized benefits related to care coordination and improved management of work processes (Figure 3). Telehealth has been recognized as a strategic tool for promoting equity in access to health services, with potential to enhance care provided and optimize resources, directly benefiting users, professionals, and system managers[35].

Figure 3. Advantages of digital health



Source: Own elaboration.

Results of this study, highlighting perceived advantages of digital health, converge with findings from previous studies assessing use of solutions such as telemedicine and telehealth in rural and remote contexts. Such findings point to increased coverage of the population in the territory and expanded access to primary and specialized care for different patient groups and health conditions[36,37,38,39], as well as access to timely care, allowing timely diagnosis and treatment, as participants in the study by Boman *et al.*[40] emphasized, declaring that because of timely care, early treatment was possible.

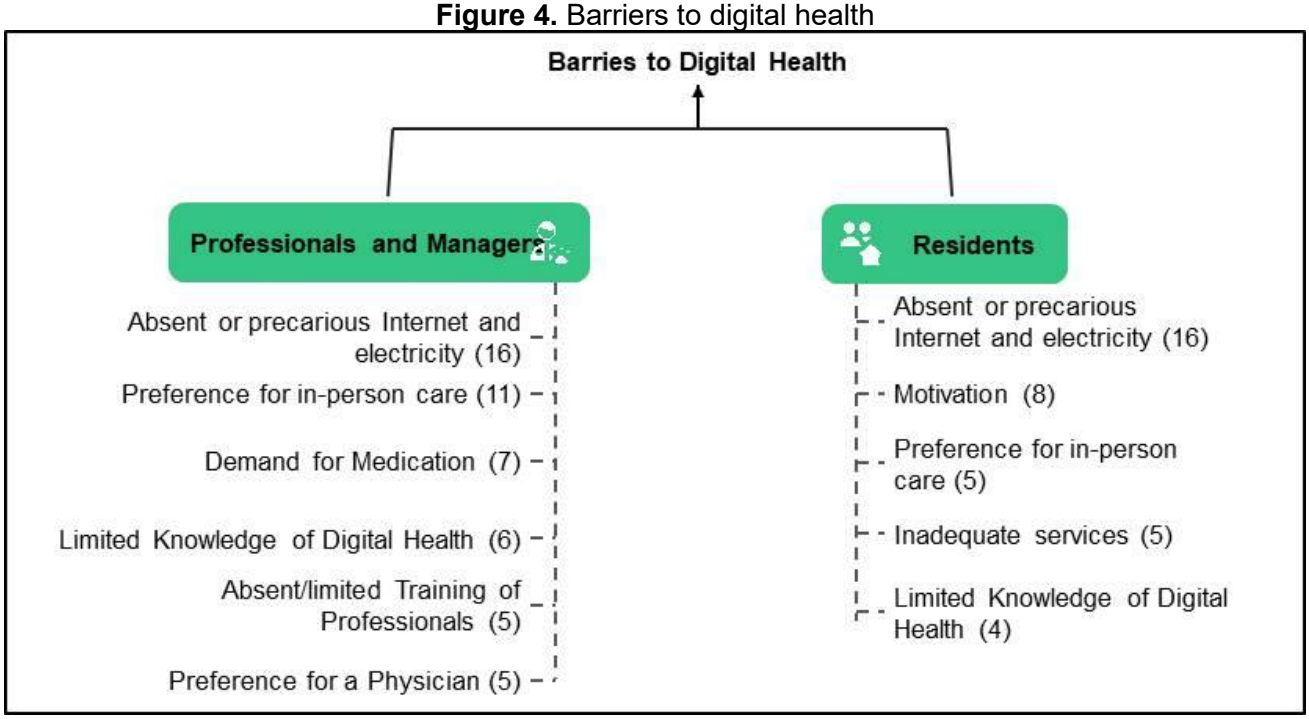
Residents said it was beneficial for them "not to need to go to Manaus to receive care," "not to face a line," and "not to need to spend money on travel" (Residents 3, 4, and 5). Convenience and comfort are also evidenced, resulting from shorter lines and reduced travel, which, in turn, minimizes time away from family and financial burden.

Professionals and managers emphasized benefits of digital health in management of work processes and care coordination. This positive perception is probably influenced by prior experience using digital technologies, such as the application used by ACS for home visits, data collection, and territorial coverage; the electronic medical record used by UBSF professionals; and medication and information management systems employed by the interviewed professionals and managers. Digital health tools can assist in standardizing workflows, supporting more assertive clinical decision-making, and improving the quality and management of the user referral process[41,42,43]. In the study by Venkataraghavan *et al.*[44], use of mobile devices improved ACS communication with the system and other professionals, facilitating information exchange and quick consultations.

Barriers to implementing digital health

In this study, different barriers to adoption of digital health solutions were identified from the perspectives of health professionals, managers, and residents, revealing common and specific challenges according to each group, as illustrated in Figure 4.

Figure 4. Barriers to digital health



Source: Ow elaboration

From the perspective of professionals and managers, the main barriers concern absence/limitation of internet and electricity, preference for in-person care, demand for medication, users' limited exposure/knowledge of digital health, absent/limited training of professionals, and preference for a physician. In residents' perceptions, the following barrier-related subcategories stood out: absence/limitation of internet and electricity, motivation, preference for in-person care, inadequate services, and users' limited exposure/knowledge of digital health.

Convergence of perceptions is observed among professionals, managers, and residents regarding barriers preventing digital health adoption, notably absent or precarious connectivity and electricity services, patients' preference for in-person care, and limited knowledge of digital technologies directed toward health. Concerns are evidenced regarding challenges imposed by use of still little-known technologies, as well as connectivity limitations in rural communities, where internet access is limited[45]. Technological barriers and lack of computer proficiency are predominant factors negatively affecting successful telemedicine implementation[27]. Lack of broadband internet was the main reason for nonuse of digital health resources by PHC physicians in the study by Waschkau *et al.*[46].

Regarding ICT infrastructure available to enable digital health services, this study's findings suggest that remote rural settings may concentrate establishments with the worst infrastructure conditions and greater digital exclusion. The ICT Health 2025 Survey, conducted by the Brazilian Internet Steering Committee (CGI.br), showed that 99% of Brazilian health establishments used computers with internet connections, with this percentage being 97% for the North region, but there was no specific breakdown for rural areas. Adequacy of this infrastructure was also assessed, with 53% of establishments reporting that equipment was up to date and 65% that the internet connection was adequate for service needs. This percentage was lower when considering only public establishments, of which 35% reported equipment to be new and up to date. The survey also indicated that, despite initiatives directed toward training, systematic training in health informatics

was insufficient among managers responsible for conducting and implementing digital transformation processes in health units[47].

It is important to emphasize that effective implementation of digital health depends on technological conditions supporting its operation in health services. Among these conditions, availability of equipment, provision of stable internet connections, and use of information systems capable of integrating, storing, and sharing clinical data securely and efficiently, in addition to professionals' training, stand out[47]. These resources, more limited in remote rural areas, are necessary to enable adoption of different digital solutions, such as electronic health records, teleconsultations, and telemonitoring, in addition to favoring communication between health establishments and support for professionals' activities. Consequently, strengthening technological infrastructure represents a strategic factor for expanding digital service provision, improving service management, and enhancing care coordination in the health care network[48].

Professionals and managers identified two user-related barriers strongly linked to the local context. The first concerns the expectation that the consultation results in a medication prescription and the possibility of obtaining medicines immediately at the end of care. The second barrier concerns users' preference for care provided by physicians, evidencing the centrality attributed to this professional in the care process. This appreciation ends up generating community resistance to reception by other health professionals, such as nurses and psychologists, through digital health. "Their focus is the doctor. They think the doctor solves everything. It is the doctor, not the nurse" (Professional). The study by Schierhout *et al.*[49] on a digital health strategy to strengthen PHC revealed that referral success depended directly on accessibility of the destination unit and medication availability, among other aspects.

A significant barrier identified in the workshop with residents was lack of motivation to use digital health tools. This finding is corroborated by the systematic review conducted by Schreiweis *et al.*[50], in which motivation appears among the ten main barriers to adoption of digital technologies in health, according to the literature analyzed. According to this study, motivation belongs to the group of individual barriers. Patients' characteristics, including motivation, were identified as potential barriers to use of remote monitoring technologies in PHC services in rural settings[41]. According to one resident, the community needs to have "interest, motivation. Yes, all of that. To really have willpower and get involved. Participate more. Have more clarity. Things only flow if you get involved, right? If you do not get involved, they do not flow" (Resident 2).

Finally, the perception that "people only want to demand, demand, but do not want to participate. But it is she who does not want to participate to be able to learn. It is very good to participate in workshops" (Resident 3) was also emphasized. Successful implementation of digital health solutions in PHC goes beyond technological design and information technology (IT) infrastructure. Although interoperability, privacy, and security are crucial, success ultimately depends on users' acceptance and motivation to be successful. Motivation for use, which can be driven by clear communication of benefits and convenience, is essential for digital health to become a true facilitator in providing integrated services centered on users' needs.

Final Considerations

Digital health presents significant potential for expanding rural riverside populations' access to health services provided by PHC, constituting a complementary strategy to traditional care models,

capable of expanding service provision within PHC and specialized care and improving health care quality for these populations, whose territorial and socioeconomic conditions impose barriers to universal access to services, contradicting constitutional precepts of universal access to SUS services.

This study's findings show that the main potential of digital health for rural riverside populations concentrates on expanding access and coverage of health services, reducing travel and care-related costs, providing timely care, and facilitating access to specialized consultations. Furthermore, professionals and managers emphasized benefits related to care coordination, enhancement of work processes, and strengthening communication between different points of the care network.

By acting as a complement to traditional services, digital health strategies such as telehealth and telemedicine have the potential to connect these rural communities to a broader range of professionals and quality services, alleviating isolation of communities and health teams. By expanding PHC's capacity for action and care, it contributes to reducing access inequalities, strengthening SUS principles such as universality, equity, and comprehensiveness, and expanding PHC's effectiveness in territories of difficult access, improving these populations' quality of life. And in view of the broad spectrum of possibilities and access barriers faced daily, both by professionals providing services and residents seeking care, both groups demonstrate broad willingness to adopt these technologies.

However, realization of these benefits encounters important limitations, especially precarious internet and electricity infrastructure, restricted knowledge of digital health among users and professionals, insufficient training, preference for in-person care and the physician as the main reference for care, and difficulties related to users' motivation and adequacy of services offered. These results demonstrate that successful digital health strategies in rural riverside contexts depend not only on making technologies available, but also on investments in infrastructure, digital education, community participation, and adaptation of solutions to local needs and expectations.

Thus, for this potential to be realized and communities and professionals to sustainably and efficiently enjoy digital health benefits, it is necessary to recognize and confront multiple challenges, mainly related to infrastructure limitations, connectivity, training, limited knowledge, and encouragement of use. In this sense, proactive confrontation of such challenges requires construction of participatory strategies actively involving residents and health workers in the development, implementation, and assessment of digital solutions, ensuring alignment with communities' territorial and cultural specificities and meeting their needs.

Adoption of participatory approaches sensitive to local reality proves fundamental to mitigating resistance, fostering acceptance, and enabling construction of a more equitable and inclusive health system. By incorporating residents', professionals', and managers' perceptions, this study contributes to advancing understanding of digital health's potential and limitations in the context of rural riverside populations. It is thus hoped that findings can support development of strategies aligned with these groups' territorial and sociocultural specificities, promoting access to quality health services and reaffirming commitment to constitutional SUS principles, mainly universal and equitable access to timely services.

References

1. Brasil. Constituição (1988). Constituição da República Federativa do Brasil [Internet]. Brasília: Presidência da República; 1988 [cited Set 6, 2025]. Available from: https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm

2. Brasil. Lei nº 8.080, de 19 de setembro de 1990. Dispõe sobre as condições para promoção, proteção e recuperação da saúde, a organização e o funcionamento dos serviços correspondentes e dá outras providências [Internet]. Diário Oficial da União, Brasília, DF, 20 set. 1990 [cited Dez 15, 2025]. Available from: https://legislacao.presidencia.gov.br/atos/?tipo=LEI&numero=8080&ano=1990&ato=9f7gXSq1keFpWT905

3. Garnelo L. Especificidades e desafios das políticas públicas de saúde na Amazônia. Cad Saúde Pública [Internet]. 2019 [cited Set 6, 2025];35(12):e00220519. Available from: https://www.scielo.br/j/csp/a/vb3KBsxsHwPFM3kd3JfwDpN/?format=html&lang=pt doi:10.1590/0102-311X00220519

4. Lima RTS, Fernandes TG, Martins Júnior PJA, Portela CS, Santos Junior JDO, Schweickardt JC. Saúde em vista: uma análise da Atenção Primária à Saúde em áreas ribeirinhas e rurais amazônicas. Ciênc saúde coletiva [Internet]. 30 jun. 2021 [cited Jul 9, 2025];26(6):2053-64. Available from: https://www.scielo.br/j/csc/a/PvFjywqqXgsPy5Phds5XyRq/?format=html&lang=pt doi:10.1590/1413-81232021266.02672021

5. Mendes EV. As redes de atenção à saúde. Ciênc saúde coletiva [Internet]. ago. 2010 [cited Abr 23, 2024];15(5):2297-305. Available from: https://www.scielo.br/j/csc/a/VRzN6vF5MRYdKGMBYgksFwc/?format=html&lang=pt doi:10.1590/S1413-81232010000500005

6. Castro MC, Massuda A, Almeida G, Menezes-Filho NA, Andrade MV, Noronha KVMS, et al. Brazil's unified health system: the first 30 years and prospects for the future. Lancet [Internet]. 27 jul. 2019 [cited Dez 15, 2025];394(10195):345-56. Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)31243-7/fulltext doi:10.1016/S0140-6736(19)31243-7

7. Fausto MCR, Almeida PF, Bousquat AEM, Lima JG, Santos AM dos, Seidl H, et al. Atenção Primária à Saúde em municípios rurais remotos brasileiros: contexto, organização e acesso à atenção integral no Sistema Único de Saúde. Saude soc [Internet]. 2023 [cited Set 10, 2025];32:e220382pt. Available from: https://www.scielo.br/j/sausoc/a/zYVYZqBBG8w3XqTh8NNVqJj/?lang=pt doi:10.1590/S0104-12902023220382pt

8. Guimarães AF, Barbosa VLM, Silva MP, Portugal JKA, Reis MHS, Gama ASM. Acesso a serviços de saúde por ribeirinhos de um município no interior do estado do Amazonas, Brasil. Rev. Pan-Amaz. Saude [Internet]. 2020 [cited Set 6, 2025];11:e202000178. Available from: http://scielo.iec.gov.br/scielo.php?script=sci_abstract&pid=S2176-62232020000100012&lng=pt&nrm=iso&tlng=pt doi:10.5123/S2176-6223202000178

9. Garnelo L, Lima JG, Rocha ESC, Herkrath FJ. Acesso e cobertura da Atenção Primária à Saúde para populações rurais e urbanas na região norte do Brasil. Saúde debate [Internet]. 2018 [cited Jan 19, 2026];42(spe1):81-99. Available from: https://www.scielo.br/j/sdeb/a/3tZ6QRxxTsPJNj9XwDftbgS/?lang=pt doi:10.1590/0103-11042018S106

10. Garnelo L, Parente RCP, Puchiarelli MLR, Correia PC, Torres MV, Herkrath FJ. Barriers to access and organization of primary health care services for rural riverside populations in the Amazon [Internet]. Int J Equity Health. 31 jul. 2020 [cited Dez 15, 2025];19(1):54. Available from: https://equityhealthj.biomedcentral.com/articles/10.1186/s12939-020-01171-x doi:10.1186/s12939-020-01171-x

11. Rachid R, Fornazin M, Castro LC, Gonçalves LHN, Penteado BE. Saúde digital e a plataformização do Estado brasileiro. Ciênc saúde coletiva [Internet]. 2023 [cited Jan 19, 2026];28(7):2143-53. Available from: https://www.scielo.br/j/csc/a/sDNmTKLRvW3j3NhqdNdfHbN/?lang=pt doi:10.1590/1413-81232023287.14302022

12. Gonçalves LHN, Castro LC, Rachid RR, Penteado BE, Fornazin M. Dimensões subjetivas na Saúde Digital. Liinc em Revista [Internet]. 2 nov. 2022 [cited Jan 19, 2026];18(2):e6053. Available from: https://revista.ibict.br/liinc/article/view/6053 doi:10.18617/liinc.v18i2.6053

13. Dall'Alba R, Neto GC, Ferla AA. Visão de e-saúde para o Brasil: uma discussão conceitual necessária. In: Anais do XV Congresso Brasileiro de Informática em Saúde [Internet]; 27-30 nov. 2016; Goiânia. Goiânia: SBIS; 2016 [cited Jul 6, 2023];509-520. Available from: https://docs.bvsalud.org/biblioref/2018/07/906389/anais_cbis_2016_artigos_completos-509-520.pdf

14. Brasil. Ministério da Saúde. Estratégia de Saúde Digital para o Brasil 2020-2028 é publicada [Internet]. Brasília: UNA-SUS; 2020 [cited Jan 19, 2026]. Available from: https://www.unasus.gov.br/noticia/estrategia-de-saude-digital-para-o-brasil-2020-2028-e-publicada

15. Brasil. Ministério da Saúde. Portaria GM/MS nº 3.232, de 1º de março de 2024. Altera a Portaria de Consolidação GM/MS nº 5, de 28 de setembro de 2017, para instituir o Programa SUS Digital [Internet]. Diário

Oficial da União, 4 mar. 2024 [cited Dez 15, 2025]. Available from: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2024/prt3232_04_03_2024.html

16. Prodanov CC, Freitas EC. Metodologia do trabalho científico: métodos e técnicas da pesquisa e do trabalho acadêmico. 2ª ed. Novo Hamburgo: Feevale; 2013. 276 p.

17. Minayo MCS, Deslandes SF, Gomes R. Pesquisa social: teoria, método e criatividade. 28ª ed. Rio de Janeiro: Vozes; 2009. 108 p.

18. Gil AC. Como elaborar projetos de pesquisa. 4. ed. São Paulo: Atlas; 2002. 175 p.

19. Bardin L. Análise de conteúdo. Reto LA, Pinheiro A, tradutores. Ed. rev. ampl. São Paulo: Edições 70; 2016. 279 p.

20. Santos AF, Torres RM, Melo MCB, Freitas MAC, Cancela G, Perillo RD, et al. A estruturação da Saúde digital no âmbito da APS no Brasil e a produção de informações para seu desenvolvimento. Latin American Journal of Telehealth [Internet]. 2023 [cited Jun 19, 2026];10(1). Available from: http://cetes.medicina.ufmg.br/revista/index.php/rlat/article/view/448 doi:10.32443/2175-2990(2023)448

21. Giovanella L. Atenção básica ou atenção primária à saúde? Cad Saúde Pública [Internet]. 2018 [cited Jun 19, 2026];34(8):e00029818. Available from: https://www.scielo.br/j/csp/a/rxLJRM8CWzfDPqz438z8JNr/?format=html&lang=pt doi:10.1590/0102-311X00029818

22. Sarti TD, Almeida APSC. Incorporação de telessaúde na atenção primária à saúde no Brasil e fatores associados. Cad Saúde Pública [Internet]. 2022 [cited Jun 19, 2026];38(4):PT252221. Available from: https://www.scielo.br/j/csp/a/tVcMcH4ZvL95vYLw6HD4S5M/?lang=pt doi:10.1590/0102-311XPT252221

23. Silva ÍdS, Silva CRDV, Martiniano CS, Araújo AJd, Figueirêdo RCd, Lapão LV, et al. Digital health and quality of care in Primary Health Care: an evaluation model [Internet]. Front Public Health. 29 out. 2024 [cited Jun 19, 2026];12:1443862. Available from: https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2024.1443862/full doi:10.3389/fpubh.2024.1443862

24. Araújo AJ, Silva ÍS, Figueirêdo RC, Lopes RH, Silva CRDV, Goes Bay O Junior, et al. Alignment and specifics of Brazilian health agencies in relation to the international premises for the implementation of digital health in primary health care: a rhetorical analysis [Internet]. Frontiers in Sociology. 2024 [cited Jun 19, 2026];9:1303295. Available from: https://www.frontiersin.org/journals/sociology/articles/10.3389/fsoc.2024.1303295/full doi:10.3389/fsoc.2024.1303295

25. Celes RS, Rossi TRA, Barros SG, Santos CML, Cardoso C. A telessaúde como estratégia de resposta do Estado: revisão sistemática. Rev Panam Salud Publica [Internet]. 10 ago. 2018 [cited Jun 19, 2026];42:e84. Available from: https://www.scielosp.org/article/rpsp/2018.v42/e84/ doi:10.26633/RPSP.2018.84

26. Santos AF, Mata-Machado ATG, Melo MCB, Fonseca Sobrinho D, Araújo LL, Silva ÉA, et al. Implementation of Telehealth Resources in Primary Care in Brazil and Its Association with Quality of Care. Telemed J E Health [Internet]. outubro de 2019 [cited Jun 19, 2026];25(10):996-1004. Available from: https://www.liebertpub.com/doi/10.1089/tmj.2018.0166 doi:10.1089/tmj.2018.0166

27. Scott Kruse C, Karem P, Shifflett K, Vegi L, Ravi K, Brooks M. Evaluating barriers to adopting telemedicine worldwide: a systematic review. J Telemed Telecare [Internet]. janeiro de 2018 [cited Jun 29, 2025];24(1):4-12. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5768250/ doi:10.1177/1357633X16674087

28. Lestari HM, Miranda AV, Fuady A. Barriers to telemedicine adoption among rural communities in developing countries: a systematic review and proposed framework. Clinical Epidemiology and Global Health [Internet]. 11 jun. 2024 [cited Jun 29, 2025];28:101684. Available from: https://www.sciencedirect.com/science/article/pii/S2213398424001805 doi:10.1016/j.cegh.2024.101684

29. Sachett JAG, Gonçalves ICM, Santos WOM. Relato de experiência das contribuições da telessaúde em comunidades ribeirinhas do Amazonas na pandemia. Rev Bras Enferm [Internet]. 18 jul. 2022 [cited Jun 29, 2025];75(Suppl 2):e20210820. Available from: https://www.scielo.br/j/reben/a/fNxbbSFZQ5qR5szHkdgs8gP/?lang=pt doi:10.1590/0034-7167-2021-0820pt

30. Hossain N, Yokota F, Sultana N, Ahmed A. Factors Influencing Rural End-Users' Acceptance of e-Health in Developing Countries: A Study on Portable Health Clinic in Bangladesh. Telemed J E Health [Internet]. 18 mar. 2019 [cited Jul 22, 2025];25(3):221-9. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6441281/ doi:10.1089/tmj.2018.0039

31. Li J, Talaei-Khoei A, Seale H, Ray P, MacIntyre CR. Health Care Provider Adoption of eHealth: Systematic Literature Review [Internet]. Interact J Med Res. 16 abr. 2013 [cited Jul 22, 2025];2(1):e7. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3628149/ doi:10.2196/ijmr.2468 PubMed

32. Ross AA, Yap TL, Nest JVD, Martin K, Edie AH. Increasing Primary Care Access Close to Home for Residents of Remote Communities in Northern Alberta. Healthc Q [Internet]. 2016 [cited Jan 19,

2026];19(3):61-6. Available from: https://www.longwoods.com/content/24863/healthcare-quarterly/increasing-primary-care-access-close-to-home-for-residents-of-remote-communities-in-northern-alberta doi:10.12927/hcq.2016.24863

33. Liu Y, Zupan NJ, Swearingen R, Jacobson N, Carlson JN, Mahoney JE, et al. Identification of barriers, facilitators and system-based implementation strategies to increase teleophthalmology use for diabetic eye screening in a rural US primary care clinic: a qualitative study. BMJ Open [Internet]. 18 fev. 2019 [cited Jan 19, 2026];9(2):e022594. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6398662/ doi:10.1136/bmjopen-2018-022594

34. Beks H, Mitchell F, Charles J, Wong Shee A, Mc Namara K, Versace VL. Implementation of telehealth primary health care services in a rural Aboriginal Community-Controlled Health Organisation during the COVID-19 pandemic: a mixed-methods study. Rural Remote Health [Internet]. agosto de 2023 [cited Jan 19, 2026];23(3):7521. Available from: https://www.rrh.org.au/journal/article/7521 doi:10.22605/RRH7521

35. Lima AM, Faria MGA, Pacheco FC, Silva ÍR, David HMSL, Paula HC, et al. Telessaúde na efetivação do cuidado primário da população ribeirinha brasileira: uma revisão de escopo. Cuadernos de Educación y Desarrollo [Internet]. 8 ago. 2024 [cited Jun 29, 2025];16(8):e5098. Available from: https://ojs.cuadernoseducacion.com/ojs/index.php/ced/article/view/5098 doi:10.55905/cuadv16n8-040

36. Iqbal A, Anil G, Bhandari P, Crockett ED, Hanson VM, Pendse BS, et al. A Digitally Capable Mobile Health Clinic to Improve Rural Health Care in America: A Pilot Quality Improvement Study. Mayo Clin Proc Innov Qual Outcomes [Internet]. 22 set. 2022 [cited Jan 20, 2026];6(5):475-83. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC9500515/ doi:10.1016/j.mayocpiqo.2022.08.002

37. Rodríguez Villa S, Alonso Álvarez C, de Dios del Valle R, Salazar Méndez R, Cuesta García M, Ruiz García MJ, et al. Análisis de un programa de teleoftalmología para el cribado de retinopatía diabética en área rural tras cinco años. Archivos de la Sociedad Española de Oftalmología [Internet]. set. 2016 [cited Jan 20, 2026];91(9):426-30. Available from: https://www.sciencedirect.com/science/article/pii/S0365669116000563 doi:10.1016/j.oftal.2016.01.023

38. Schuttner L, Sindano N, Theis M, Zue C, Joseph J, Chilengi R, et al. A mobile phone-based, community health worker program for referral, follow-up, and service outreach in rural Zambia: outcomes and overview. Telemed J E Health [Internet]. agosto de 2014 [cited Jan 20, 2026];20(8):721-8. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC4106387/ doi:10.1089/tmj.2013.0240

39. Shaikh U, Nettiksimmons J, Joseph JG, Tancredi D, Romano PS. Collaborative practice improvement for childhood obesity in rural clinics: the Healthy Eating Active Living Telehealth Community of Practice (HEALTH COP). Am J Med Qual [Internet]. 2014 [cited Jan 20, 2026];29(6):467-75. Available from: https://journals.sagepub.com/doi/10.1177/1062860613506252 doi:10.1177/1062860613506252

40. Boman K, Olofsson M, Berggren P, Sengupta PP, Narula J. Robot-assisted remote echocardiographic examination and teleconsultation: a randomized comparison of time to diagnosis with standard of care referral approach. JACC Cardiovasc Imaging [Internet]. agosto de 2014 [cited Jan 20, 2026];7(8):799-803. Available from: https://www.jacc.org/doi/10.1016/j.jcmg.2014.05.006 doi:10.1016/j.jcmg.2014.05.006

41. Davis MM, Currey JM, Howk S, DeSordi MR, Boise L, Fagnan LJ, et al. A qualitative study of rural primary care clinician views on remote monitoring technologies. J Rural Health [Internet]. 2014 Winter [cited Jan 20, 2026];30(1):69-78. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC3882331/ doi:10.1111/jrh.12027

42. Reeve C, Thomas A, Mossenson A, Reeve D, Davis S. Evaluation of an ear health pathway in remote communities: improvements in ear health access. Aust J Rural Health [Internet]. junho de 2014 [cited Jan 19, 2026];22(3):127-32. Available from: https://onlinelibrary.wiley.com/doi/10.1111/ajr.12098 doi:10.1111/ajr.12098

43. Wu N, Gong E, Wang B, Gu W, Ding N, Zhang Z, et al. A Smart and Multifaceted Mobile Health System for Delivering Evidence-Based Secondary Prevention of Stroke in Rural China: Design, Development, and Feasibility Study. JMIR Mhealth Uhealth [Internet]. 19 jul. 2019 [cited Jan 19, 2026];7(7):e13503. Available from: https://mhealth.jmir.org/2019/7/e13503/ doi:10.2196/13503

44. Venkataraghavan M, Rani P, Ashok L, Rao CR, Chandra Sekaran V, Krishnapriya TK. "Through their eyes, I can work" – rural physicians' perceptions about mobile phone use among community health workers – a qualitative analysis. Health Education [Internet]. 10 set. 2021 [cited Jan 20, 2026];122(2):180-201. Available from: https://doi.org/10.1108/HE-12-2020-0123 doi:10.1108/HE-12-2020-0123

45. Rush KL, Burton L, Van Der Merwe F, Hatt L, Galloway C. Atrial fibrillation care in rural communities: a mixed methods study of physician and patient perspectives. BMC Fam Pract [Internet]. 24 out. 2019 [cited Jan 19, 2026];20(1):144. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6813979/ doi:10.1186/s12875-019-1029-1

46. Waschkau A, Traulsen P, Steinhäuser J. Evaluation of Synchronous and Asynchronous Telemedical

Applications in Primary Care in Rural Regions of Northern Germany-Results and Lessons Learned from a Pilot Study. Int J Environ Res Public Health [Internet]. 11 nov. 2022 [cited Jan 19, 2026];19(22):14860. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC9690306/ doi:10.3390/ijerph192214860

47. Núcleo de Informação e Coordenação do Ponto BR, editor. Pesquisa sobre o uso das tecnologias de informação e comunicação nos estabelecimentos de saúde brasileiros: TIC Saúde 2025 [Internet]. São Paulo: CGI.br; 2026 [cited Jul 7, 2026]. Available from: https://cetic.br/pt/publicacao/pesquisa-sobre-o-uso-das-tecnologias-de-informacao-e-comunicacao-nos-estabelecimentos-de-saude-brasileiros-tic-saude-2025/

48. Farias MA, Badino M, Marti M, Báscolo E, García Saisó S, D'Agostino M. La transformación digital como estrategia para el fortalecimiento de las funciones esenciales de salud pública en las Américas. Revista Panamericana de Salud Pública [Internet]. 8 dez. 2023 [cited Jul 4, 2026];47:e150. Available from: https://www.scielosp.org/article/rpsp/2023.v47/e150/ doi:10.26633/RPSP.2023.150

49. Schierhout G, Praveen D, Patel B, Li Q, Mogulluru K, Ameer MA, et al. Why do strategies to strengthen primary health care succeed in some places and fail in others? Exploring local variation in the effectiveness of a community health worker managed digital health intervention in rural India. BMJ Glob Health [Internet]. julho de 2021 [cited Jul 12, 2025];6(Suppl 5):e005003. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8314716/ doi:10.1136/bmjgh-2021-005003

50. Schreiweis B, Pobiruchin M, Strotbaum V, Suleder J, Wiesner M, Bergh B. Barriers and Facilitators to the Implementation of eHealth Services: Systematic Literature Analysis. J Med Internet Res [Internet]. 22 nov. 2019 [cited Jul 12, 2025];21(11):e14197. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6898891/ doi:10.2196/14197

Editorial information

History

Received: January 20, 2026
Revised: Jun 24, 2026
Accepted: July 22, 2026

Review Process

Double-blind peer review.

Open peer review

Two ad hoc reviewers evaluated this manuscript. The authors agreed to interaction, if necessary, and publication of the review. Only one reviewer agreed to interaction; both authorized publication of the review, if indicated by the journal.

Preprint

The manuscript is not a preprint.

Similarity check

This article was submitted to textual similarity checking with CopySpider software.

Authors' contributions

J.I.M. Coelho: conception/design, data analysis and interpretation, writing of the article, critical review of its content and approval of the final version of the article.
F.J. Herkrath: conception/design, data analysis and interpretation, writing of the article, critical review of its content and approval of the final version of the article.
R. Pinheiro: conception/design, data analysis and interpretation, writing of the article, critical review of its content and approval of the final version of the article.
D.S. dos Santos: conception/design, data analysis and interpretation, writing of the article, critical review of its content and approval of the final version of the article.

Conflict of interest

The authors declared no personal, commercial, academic, political, or financial conflict of interest concerning this article.

Funding

Not applicable.

Ethical Approval of the Research

Study approved by the Research Ethics Committee (CAAE No. 59398222.0.0000.0005), with approval of the Manaus Municipal Health Department. The Informed Consent Form (TCLE) was signed by all participants.

Research data availability

The contents underlying the research text are contained in the manuscript.

Declaration of use of Artificial Intelligence (AI) tools

The authors declare that no artificial intelligence tool was used in the preparation of this manuscript or in the research described in it.

Editorial team

Editor-in-Chief: Sandra Mara Campos Alves
Guest Editors (dossier): Eliana Franco, Krishina Day Ribeiro
Assistant Editor: Amanda Nunes Lopes Espiñeira Lemos
Editorial Assistants: Danilo Silva Santos Rocha, Daphne Sarah Gomes Jacob Mendes, Maria Ester Simões Nogueira
Copy Editor: Mirna Barcelos
Translator: David Elias Cardoso Câmara

Publisher

Fundação Oswaldo Cruz, Fiocruz, Health Law Program, Brasília, Federal District, Brazil.

Copyright

The authors retain copyright over their works and grant Cadernos Ibero-Americanos de Direito Sanitário (CIADS) the right of first publication.

Open Access

This article is published under an Open Access model, providing immediate, free, and permanent access to its content, with no fees charged for reading, downloading, or sharing.

License Of Use

Copyright © 2026 José Ilcleson Mendes Coelho, Fernando José Herkrath, Roseni Pinheiro, Denise Silva dos Santos. This article is licensed under the Creative Commons Atribuição 4.0 Internacional (CC BY 4.0), license, which permits use, distribution, and reproduction in any medium, provided that the original authorship and source of publication are properly cited



How to Cite (Vancouver)

Coelho JIM, Herkrath FJ, Pinheiro R, dos Santos DS. The protagonism of users in digital health: strategies centered on the riverside population for access to the right to health. Cad. Ibero-Am. Direito Sanit. 2026;15:e2026034. doi: 10.17566/ciads.e2026034