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HCI Pluriversal Framework for Ancestral Medicine App in Bogota: Asset-Based Design Case Study

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Abstract: COVID-19 accelerated digital healthcare technology usage in many countries, such as Colombia, whose digital healthcare vision and projects are proof of this. However, with a significant cultural indigenous and Afro-Colombian heritage, only some parts of the country are willing to follow the proposed digital Western approach to health. Our paper presents the national healthcare system's digital narrative, which we contrast with the micro-narrative of an Afro-Colombian ethnomedicine unit in Bogota called Kilombo Yumma. This ethnomedical unit is building its mobile app to safeguard and represent its ancestral medicine practices in local and national healthcare information systems. Kilombo Yumma is keen on promoting their beliefs and practices, which have been passed on through oral traditions and currently exist in the hands of a few elderly. We unraveled their ambition, core beliefs, and practices through asset-based design. These assets outlined pluriversal and decolonizing forms of digital healthcare to increase social justice and connect Western and ancestral medicine digital opportunities through HCI.

Keywords: Asset-based design; Mobile app; Decolonizing HCI; Afro-Colombian ancestral medicine

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Introduction

The COVID-19 pandemic accelerated digital transformation, especially in healthcare. Digital technologies have become the way to deliver care in new ways and transform it worldwide [1]. Moreover, despite its numerous challenges, digital technologies are seen as an ally to achieving more equitable healthcare for underserved communities in Latin America (LATAM) [2]. Such technologies are valuable in healthcare delivery, planning, and policy-making and in tackling pervasive challenges in LATAM, such as staff shortages, limited access and quality of primary healthcare services, and increasing healthcare costs [2].

Also, in Colombia, the COVID-19 pandemic accelerated the implementation of digital technologies in primary care to increase access to healthcare services [3]. Healthcare digitalization studies highlight high mobile phone penetration nationwide, particularly in urban areas, and increased online health information usage [4, 53]. More advanced studies have used mobile technologies to improve patients' mental health access and provide health guidance via a chat box [3, 4, 5]. However, few studies use mobile phones in healthcare involving ethnic minorities such as Afro-Colombians, either in support of health workers or recipients of care [6, 7, 8]. This can be explained as Afro-Colombian populations have suffered historically from systemic segregation, racism, and extreme poverty [9, 10], which

has systematically excluded them from socio-economic opportunities, favorable work conditions, and cutting-edge approaches such as mobile phones enabled healthcare [11]. These issues can be worsened through digital technologies. Although the Ministry of Technology and Communications of Colombia highly profiles the country regarding Internet access and digital transformation at the local and regional levels, the regions with more healthcare inequity have the least Internet connectivity, consequently suffering from asymmetries in digital access, social inclusion, and adoption of these technologies [12, 13]. Furthermore, the Internet's availability does not directly imply that such a digital leap will happen. It is necessary to have the appropriate HCI knowledge to support a systemic transformation for historically segregated populations such as Afro-Colombians. Adding to this, another significant limiting factor emphasized through the COVID-19 pandemic is the lack of cultural competency to meet the rich ethnic diversity of the country, whose minorities, such as Afro-Colombians, suffer from significant health inequities [14, 15]. Women of ethnic origin, despite knowing that they can access healthcare services without cost, chose not to engage with it because of logistical and cultural barriers [16, 17, 18].

This significant cultural gap led a group of Afro-Colombian ancestral midwives to create six ethno-medical units in Bogota, Colombia, called Kilombos. Since 2014, these units have been financially supported and audited by the municipality of Bogota [19, 54]. Currently, Yumma, one of the sixth units, is in the process of designing its mobile app through a grant obtained from Share-net International. The mobile app aims to get visibility of Kilombos' efforts and improve its work conditions, including the extensive, illegible, and redundant paper forms they must complete daily [7]. We use the design of this mobile app creation by Kilmobo Yumma, from now onwards Yumma, as an HCI case study to address the proposition that "a needs-based Human-Computer Interaction" ignores social structures and cannot enable equity, inclusion, and social justice for underserved communities such as Afro-Colombians [20, 21, 22, 23]. Thus, this paper asks: How can HCI enable the health and cultural inclusion of Yumma practices in a mobile phone app? What are the critical structural social and health-cultural pillars of Yumma's medical practice, and how can those be translated into an HCI framework?

Afro-Colombians are descendants of enslaved African populations brought to Colombia during colonial times [24]. European settlers deliberately excluded them from educational, economic, and social opportunities to maintain power and control over valuable lands [25]. In regions with limited public institutions, ancestral medicine and midwifery have remained primary healthcare sources. Despite some modern institutions, their effectiveness could be more robust [26]. Therefore, ancestral medicine has been the primary healthcare source for these deprived populations, and its knowledge has been passed down through generations, mainly by mothers' midwives, using oral traditions and direct experience [25, 9, 27].

The 1991 Carta Magna acknowledged indigenous and Afro-Colombian populations' rights, forming Afro-Colombian associations advocating for institutional recognition of ancestral midwifery. However, their progress has been hindered by mass massacres and systematic killings of community leaders, forcing many to seek a new life in cities such as Bogota [28,

29, 55]. Legitimizing various civil and cultural rights in Afro-Colombian communities has been slower and more challenging than in indigenous communities [30, 31].

Theoretical Framing

Decolonizing Studies and Human-Computer Interaction (HCI)

To situate our work and define opportunities for HCI for Afro-Colombian ancestral medicine, we explored decolonizing studies and decolonizing design and HCI. Decolonizing studies highlight alternative forms of knowledge that differ from the Western Anglo-Eurocentric discourses. These studies elevate alternative forms of knowledge to address the asymmetries between what is often seen as the center, understood as the West, and the periphery, where the center is seen as the benchmark from which a periphery derives and subordinates [22]. This subordination happened through colonization, which displaced and submerged local forms of life and knowledge to Western ones [32]. Knowledge, therefore, has been colonized, and the grand narrative has suppressed situated microstories.

Decolonizing studies rescue the local narratives over the universalizing discourses [33]. It removes Western ontological and epistemological perspectives from a central place. Instead, it invites another human's perspective of understanding the world and life around us and ways of explaining, appropriating, and communicating such forms of life [34]. By opening up to other forms of life, Escobar proposes the "pluriverse," "a world where many worlds fit" [35]. A notion that goes beyond multiculturalism and plurality by incorporating the complexity of other forms of life and knowledge, detached from Western forms. Instead, the pluriverse encompasses many ways of being in the world and many ways to experience reality since reality is a product of intersubjective practices and the situatedness of communities [36, 37]. In the case of Andean (from the Andes) and African cosmovisions, the base of knowledge is emotional and not Western scientifically based, nor rational. Emotions stage spirituality, one of the most elevated forms of conscience; conscience creates the highest form of knowledge [36, 38]. Spirituality is widely present in African-based societies, referred to as "ubuntu," which also involves the role of ancestors in providing wisdom to communities and the importance of collectiveness over the individual in decision-making [39]. Ubuntu involves other forms of knowledge and value schemes that are antagonistically opposed to linear Western ones. These ontological differences raised limitations and skewness in Western-led approaches, including HCI. Thus, to break apart from our "colonized minds" and to achieve a pluriversal perspective, it is necessary to include marginalized perspectives, such as the ones from colonized groups, to unravel other forms of knowledge ultimately [40].

Decolonizing HCI argues that technologies have been designed in the Western world following Western values, which ultimately perpetuate the subordination and colonialist structures when dealing with non-Western communities [41]. Adding to this issue are methods such as user-centered design (UCD), which focus on (Western) human needs and

overlook other forms of knowledge such as the Andean or Ubuntu spiritual, societal base. UCD results in commercial and Western-led digital solutions, such as mobile health apps, creating systemic exclusion [39, 41].

Following decolonizing studies and HCI decolonizing practices, we intend to highlight the local Afro-Colombian narratives and knowledge, such as oral history and the role of spirituality. Our research focuses on identifying and providing a central place for alternative discourses and forms of life-related to health that differ from Western, rational, universalizing ones. By doing this, we aim to support a pluriversal HCI approach. We first share an analysis of similar case studies.

Mobile Apps for Decolonizing Indigenous Communities

To understand previous initiatives involving mobile apps for decolonizing indigenous communities, we searched for papers in the ACM digital library using a combination of keywords such as “decolonize indigenous,” “decolonize HCI mobile phone,” and “prenatal care and digital health.” Five papers were selected out of a dozen found. The papers selected studied the role of digital technologies, such as mobile phones, for indigenous or African communities in the Global South or a critical position towards a Western universalizing form of healthcare. The selection criteria excluded studies carried out outside the Global South. Last but not least, the papers selected are primarily experiments conducted by local universities in the Global South, who collaborate with academics based in European countries and have a European legacy culture. Neither of these studies was conducted entirely in the Global South, depicting the underlying colonial structures despite an HCI decolonial awareness.

The first paper discusses using a mobile app to promote the Wichi language and culture among an indigenous group in Argentina, emphasizing the potential of digital technologies to revive suppressed languages. This example is relevant to our study as it captures the richness of linguistics in digital formats to break up centuries of repression [42].

In the second paper, the initiative by the Institute of Social Informatics and Technological Innovations (ISITI) of the University of Malaysia Sarawak (UNIMAS) to preserve the Oroo jungle sign language of the Penans community through a video game is highlighted, stressing the importance of gestures in sign language and cultural preservation [43].

The third paper explores how Kenyans leverage technology to maintain indigenous knowledge (IK) among diaspora members in Australia, emphasizing the limitations of digital technologies in fully preserving IK, as embodied knowledge is predominantly acquired through face-to-face interactions and oral traditions [44].

The fourth paper examines the inadequacy of healthcare infrastructure in rural Ecuador, proposing the potential of mobile technologies to bridge gaps in perinatal care while recognizing the importance of incorporating indigenous perspectives into healthcare practices to serve local communities better [23].

The last paper critiques the Eurocentric approach to healthcare, advocating for the inclusion of non-hierarchical, communal, and indigenous healing practices, often overlooked in favor of a global colonialist narrative. It underscores the significance of embracing diverse cultural perspectives to promote holistic well-being [45].

In summary, we retrieve the intention to safeguard linguistics and various forms of indigenous knowledge (IK) in digital apps for our case study. This intention acquires increased value when contrasted with the limitations identified in mainstream apps such as social media, voice, and video calls in passing on IK due to their need for more focus on indigenous practices and embodied knowledge. Embodied knowledge is also retrieved as a point of attention moving forward, next to the agency, familiarity, and pervasiveness of mobile phones amongst indigenous communities. Last, we highlight the need and urgency to embrace local and indigenous medicine beliefs and practices in HCI over globalized narratives.

Asset-based Design

We selected asset-based design since it recognizes two core principles involved in our study:

- The growing potential of digital technologies to support social change and equity in societies [22].
- The necessity to tap into the social structure, relations, and culture of underserved communities to carve out successful practices and resources invisible to outsiders [46, 21, 47, 22].

Asset-based design (ABD) aims to counterbalance the limitations of UCD, such as the needs-based approach previously mentioned. Another criticism of UCD is its market relational approach to people, where underserved communities immediately fall short of their limited economic possibilities, which positions them as pariahs with little to offer. Lastly, UCD focuses on empathy, excluding the possibility of understanding the social structures behind multicultural societies. Instead, UCD identifies momentary needs and taps into functional requirements, omitting deeper social and cultural issue [47, 22].

ABD is ideally suited for community design to the extent that it is also called Asset-based-Community Development (ABCD). This method builds on communities' cultural and social capital; it highlights their resilience and ability to connect, share, and thrive despite economic hardship. It distinguishes itself by developing technology solutions out of mimicking the capitals of communities to avoid increasing inequities between underserved groups and technology itself [12, 46].

ABD carves out the inherent assets of a community, which may be invisible to outsiders due to their cultural limitations and bias but are fundamental to the daily functioning of these communities. It particularly taps into "community adaptive strategies and local knowledge" [21], which resonates with the history and existence of Afro-Colombians and Kilombos.

Table 1. Definition, location, and duration of research activities (drawn by the authors)

Research activity	Duration	Location	Date
Content analysis of HIMSS Executive Summit Colombia 2022. Three (3) presentations provided by the Ministry of Health were selected from the Ministers of Communication Technologies and Healthcare and Chief of Digital Healthcare Transformation: Carmen Ligia Valderrama, Fernando Ruiz Gomez, and Constanza Engativa Rodriguez respectively.	One day event	Chamber of Commerce of Bogota headquarters building	July 11, 2022
Focus group with personnel of Yumma	2 hours	Yumma health unit Rafael Uribe Uribe, Bogota	July 12th, 2022
Design ethnography/ context inquiry home visits	3 hours	Neighborhood San Cristobal	July 15th, 2022
Design ethnography/ context inquiry home visits	4 hours	Neighborhood Santa Ines	July 15th, 2022
Design ethnography/ context inquiry home visits	3 hours	Neighborhood La Victoria	July 18th, 2022

To retrieve these assets, ethnographic work is preferred, as it elicits the role of individuals and their interrelations with others while focusing on successful practices and stories [21]. The particular focus on stories, interrelation, and unique aspects of interactions impedes taking these insights into a standardized blueprint. Instead, the goal of ABD is to analyze the reasons and qualities of success, the cooperative problem-solving processes, and the resources used, shared, and passed on, such as spaces, roles, and items, including technology devices and apps. In short, ABD seeks to recognize the robust practices already developed by communities and translate those into interventions such as mobile phone apps that represent and strengthen the communities involved [21].

Method

We followed a two-pronged approach to define and contrast the macro and micro-narratives of healthcare in Colombia, which will be analyzed using an asset-based design framing. To achieve this, we conducted:

A- A content analysis of the presentation transcripts of public officials of the national healthcare at the Healthcare Information and Management Systems Society

B- A Focus group and design ethnography (contextual inquiry) to underpin the micro-narrative.

As mentioned, design ethnography is a highly suited method to be combined with asset-based design. It dives into the context and relations of people to reveal and underpin social structures from which to derive assets. More specifically, design ethnography for human-computer interaction focuses on gathering data to be transposed in creating new technologies [48]. It was found relevant since it involves actively intervening in the changing context of the subject area to assess future-oriented decisions [49]. Through design ethnography, our goal was to understand the roles of individuals and their

interrelations with others while focusing on successful practices and stories and aiming to underpin the resources and ways of doing things, leading to positive outcomes for the community, i.e., Kilombos studied [21]. Last but not least, design ethnography enabled us to bridge the social structures identified in the field with HCI directions.

The research activities are captured in **Table 1**.

HIMSS Executive Summit Colombia 2022, Chamber of Commerce of Bogota

The Executive Summit Colombia 2022 from the Healthcare Information and Management Systems Society (HIMSS) was held at the Chamber of Commerce of Bogota's headquarters. HIMSS is a leading global organization and benchmark for healthcare digital transformation. It supports healthcare entities in achieving the highest interoperability and data integration level, primarily from electronic medical records. Leading private and public healthcare organizations in Colombia were invited and shared their digital agenda and progress due to COVID-19. The events held different presentations from the Ministry of Health and panels with experts (See **Figure 1**).



Figure 1. Panel of experts of the Executive Summit Colombia 2022 HIMSS (provided by the authors)

Yumma, Bogota

Six Kilombo units exist today in Bogota's most deprived low-income communities. These units hold ancestral and Western medicine practices represented in ancestral roles: Afro-Colombian midwives and healers, next to Western nurses, community health workers, and environmental technicians. These five roles exist in every Kilombo, next to a matrona (coordinator, leader, and founder). Kilombos provide health services in a governmental center for war victims located in municipal centers supporting war victims. Since the victims of the war have displaced more than 8 million people since 1985, legislation and facilities are providing systematic support and compensation [50].

Next to seeing people in these units, Kilombo's personnel do weekly home visits in the surrounding neighborhoods. Many Afro-Colombian victims of the war have arrived in Bogota, many of whom are women. Home visits enable Kilombo's personnel to quickly identify women, the elderly, and children in need of healthcare and to do follow-up visits. We joined Yumma's personnel to do home visits. They must wear a blue jacket and backpack from the municipality of Bogota, identifying them as public officials (**Figure 2**).



Figure 2. Photo collage of Yumma's personnel backpacks and uniforms outside the unit (provided by the authors)

Data Formats and Analysis

The research activities produced data collected in audio, photos, videos, and written notes. The audio files were transcribed and translated from Spanish to English using digital software tools. All the data was plotted in an Excel sheet. Different tabs were created to analyze the photo material, the audio transcripts, and the home visit sequence of events and activities.

For our data analysis, we selected an Inductive Content Analysis (ICA), i.e., a more open thematic analysis that understands the breadth of the data formats in an iterative approach. The method abstracts the data, thus allowing for data grouping to answer the research questions using concepts, categories, or themes. ICA is generally used when the data collection process is open and follows loosely defined themes [51]. ICA involves an iterative process in which coding is refined over time using different data sources. This way, the method avoids missing out on data that may appear later in the process [52]. ICA is highly suitable for our pronged approach.

Results

Assets Framing and Building the Grand Narrative

The assets identified at the core of the grand narrative of the transcripts of the HIMSS event include:

- The central role of digital technologies in advancing the healthcare sector and achieving increased competitiveness.
- A technocracy-enabled healthcare system.

- A collaborative attitude within the healthcare sectors and implicit high trust to share data at a sector level.
- The opportunity to manage and control health outcomes through data tools.
- The central role of the electronic medical record is as a data gateway, and the patients' and organizations' roles are to supply volunteer data.
- The central role of facilitation and orchestration that digital technologies acquire.
- A united, competitive, connected, thriving healthcare system through digital technologies.
- Digital literacy as a means to health inequity.

The assets identified create a narrative of unreserved faith in the significant potential of digital technologies to modernize the country's healthcare sector and to join new global economic models, collaboration, equity, and prosperity. These assets define a technocracy with high pragmatism that will enable healthcare organizations to work in more integrated ways and to use a programmed approach to health or sickness. These assets present health as a good to be managed, tainted, controlled, and monetized at a sector level through digital technologies. This digital paradigm enables the transformation of the healthcare sector, creates a more robust and resilient system, and improves people's health overall. Last, the patient will become the center and epitome of care.

In the following paragraphs, we unpack the asset identified in the grand narrative by defining critical concepts obtained through inductive analysis.

The asset of technology to reach progress: the modernization of the country was framed within the paradox of current times for Colombia: on the one hand, the government is a leading example of digitization in the LATAM, and on the other hand, it is suffering from its challenging geographical landscape of jungles and mighty mountains of the Andes. This challenging landscape prevents the country from being fully connected to the Internet. It was mentioned that all efforts are focused on Internet connectivity, which will create more access to healthcare through digital means for those populations living in remote areas.

The country's modernization was also framed from an international perspective and community, and this HIMSS event became proof of Colombia's understanding of world-class digital parameters and its aim to be a regional leader in that arena. The modernization of the healthcare sector was coined as "transformation," a term included in the slogan of the HIMSS event (**Figure 1**). The country aims to move from a precarious healthcare sector to a highly integrated, collaborative, efficient, and competitive region.

The asset of digital literacy: despite the opportunities, the lack of digital literacy was also named in the presentations as a significant challenge for the country. The solution proposed to this challenge was to educate all Colombians on how to use digital technologies for health purposes. The country's digital illiteracy is assumed to be overcome by teaching the functionalities of digital tools, believing that health equity happens through digital literacy.

The asset of health transactionality: a highly pragmatic approach to digital healthcare was suggested based on effective transactional and hyper-integrated healthcare delivery and

management for organizations and patients. Argued insistently by the presenters, this streamlined form of healthcare would be enabled by various technologies: Internet, artificial intelligence, interoperability, electronic medical records, eHealth, data, and analytics. The national healthcare system must set up a legal framework for this work.

The asset of led-technocracy health: the recurrent use of terms alluding to digital technologies in the presentations provided a secondary place to health and medicine and a leading one to technology. Within this led-technocracy health, there are expected roles, attitudes, and digital enablements, such as

- **Interoperability:** next to a software development language such as FHIR R4, it also refers to an open attitude and willingness to enable all “agents” of the healthcare system of the country to exchange data, collaborate, and benefit from aggregated effects. Interoperability is expected and requested by the public officials of the national healthcare system to the audience. To encourage public and private healthcare organizations, one example is provided from a leading healthcare and economic region of the country: Cundinamarca, where private entities use a cloud-based system as a repository for some of their data. Security is ensured through the proper articulation between the entities and safe software apps. Internet and interoperability are transversal digital technologies that enable many other benefits.
- **Electronic Medical Records:** this was explained as a crucial repository of patients’ data as health events occur. This consistent data collection enables the mathematical modeling through analytics software tools of health issues to anticipate and manage the effects of health pandemics. Healthcare professionals can achieve effective health management based on patient information through interoperability and electronic medical records. There is high praise for developing and applying healthcare software apps to identify and measure health conditions, where data becomes an important asset moving forward to seize a more effective and programmed healthcare. The government emphasized its assertive decision not to build a national public electronic medical record but to let every organization do it. This implies each organization’s duty and economic responsibility to leap and benefit from this digital healthcare paradigm digitally.
- **Data:** the aggregate information created through patients’ encounters and events, captured in the electronic medical records, and through interoperability, which can be exchanged between insurance and providers and will also be available to citizens or patients. Data becomes the currency and evidence of the country’s healthcare transformation.
- **eHealth:** elemedicine and related forms of healthcare delivery through digital technologies can support patients in remote ways. This approach is successfully implemented in different parts of the country.

The asset defined at the HIMSS Summit was an invitation for the healthcare sector to invest in digital technologies to transform healthcare delivery, access, and management. The focus, therefore, shifts from a physiological examination approach to a physically removed

(hands-off) and data-driven one. This proposes new roles for healthcare professionals, a new way to understand and carry out their profession, where direct contact with humans and their physiologists is removed to give place to one provided through indirect input such as data. Human contact and interactions are diluted in this new paradigm without explicitly being mentioned. Instead, multiple economic benefits are highlighted during the Summit, such as information aggregation through various sources collected and stored in joint digital repositories. Following the narrative defined by macro narrative assets, HCI design would support unleashing this digital healthcare paradigm, which may fit certain society groups but certainly not everyone, as presented next.

Assets Framing and Building the Situated Micro-narrative

Focus group findings from Yumma

Assets identified for Yumma include:

- Connection to ancestral traditions to cope with forced disrooting (diasporas) in previous and current generations.
- Embodied and planted knowledge to heal and care for the community and to provide agency and resilience.
- Women's leadership, safeguarding, passing on traditions, and pioneering and crafting new futures.
- The warmth and hope-bringing of Yumma contrasts with the mechanical, bureaucratic logic of macro systems.
- Care is an intrinsic form of community life and cultural expression Yumma represents.
- Midwifery as a network of care and broader reach.
- The power of the pack in the complementary roles of Yumma alludes to pluriversal forms of health.
- Adaptive abilities open to incorporate new forms of medicine and technology in their daily lives.
- Mobile technologies and apps support their daily needs and provide an outlook into the future with less subordination from macrosystems.

The assets carving out the situated micro-narrative from Yumma do not involve such significant praise for technology but instead, cherish and protect their ancestral traditions. Although technology is included in their ambition and might develop further, diaspora wounds of Afro-Colombians keep significant attention to their past and culture. Most personnel of Yumma have been victims of the civil war and forced to leave their homes. The diasporas are open wounds for these communities, who believe that ancestral medicine is a cultural thread in these painful events. Ancestral medicine has connected them as a community throughout the centuries and through displacement events. It particularly

empowers women, through practical and social skills and assets, to keep their communities alive. After so many threats and pain inflicted on these communities, ancestral medicine is a healing practice, literally and figuratively. The only permanent element that they have is a series of forced movements and denial of their culture and identity by Western colonizers and modern ways of life, who undermine Afro-Colombians. Thus, their importance lies in recognizing and implementing significant cultural diversity and the need for respect for various dialects and traditions. This recognition needs to be embraced symbolically at the constitutional level and practically through national healthcare policy of inclusion of Kilombos as a valid source of healthcare for their communities.

The overall situated micro-narrative involves the need for recognition, unity, and preservation of ethnic cultures and knowledge while highlighting the challenges they face, next to the importance of community support and public policies to address these issues. Thus, the situated micro-narrative highlighted the following:

The asset of orality to connect and preserve ancestral medicine and project it forward: Afro-Colombian populations feel forgotten, undermined, and invisible. Therefore, they have joined forces with indigenous communities in their political fight to recognize and implement their constitutional rights. Historical memory and oral traditions are essential in passing down wisdom and cultural heritage. Historical memory is believed to live in older generations, such as midwives and healers. They are the cultural bastions of their communities and have lived in circumstances where the oral traditions enabled them to pass on knowledge from generation to generation. Due to new circumstances, such as living in the capital of the country instead of a remote area, plus its hostility towards women of color, among others, there is fear of their ancestral medicine practices getting lost and vanishing for good. Therefore, the mobile app is seen as a way to keep and adapt their traditions to new knowledge formats, which makes them feel hopeful and as pioneers in safeguarding their traditions. The word “pioneers” was used by the matrona of Yumma explicitly to describe the mobile app and its traditions.

The asset of women’s leadership: women’s unique role includes the ability to heal and lead. The role of women is seen as providers of life and care and keepers of knowledge of ancestral medicine and practices. Female leadership involves the “we” versus the Western “I.” The “we” involves a long-term vision and care for their communities. Only as a collective can they be recognized and valued. Female leadership consists of the importance of the family and community and understanding their place and moment. This helps them contextualize Western healthcare within ancestral medicine and create bridges between these worlds to support their communities best.

The asset of the midwifery network and wish for more in the future, there is a desire for Kilombos to be a more robust and extended service than the current ones. To reach and exchange knowledge with other ancestral practices. Thus, Kilombos hold a shared asset with other Afro-Colombian and indigenous communities with whom they can collaborate.

Design Ethnography Findings

Next, to focus groups, we also conducted a design ethnography and context inquiry during three home visits, resulting in the following four additional assets:

The asset of pluriversal choreographed health: When the visits took place, all personnel of Yumma joined to support beneficiaries from their complementaries' medicine. This choreography of pluriversal care happened by the personnel taking turns to see the beneficiary. Thus, at the end of the home visit, the beneficiary had a medical specialist referral if necessary or a drug prescription, a request for a wheelchair, herbs, balms, and a warm feeling of care and community support. In **Figure 3**, the nurse examines the leg of the beneficiary, the healer provides herbs to soothe the leg inflammation, and the community health worker goes through the paperwork. This complementary approach elicits the ability to integrate multiple approaches into a pluriversal health of ancestral, Western, and bureaucratic practices.



Figure 3. Photo collage of nurse, healer, and community health worker supporting a beneficiary (provided by the authors)

The asset of embodied and plants' knowledge and catalyzer of individual agency: the healer and the midwife hold a special place in the community and Yumma. Their leadership and expertise are recognized through intangible forms of healing with plants and massages. The healer is the person who takes the lead in connecting to the beneficiary once the nurse has done the examination and complements it with a warm dialogue about plants' usage and benefits. The healer explained the plants' treatment as giving agency to the beneficiary. The plant can be used for an herbal infusion or to rub around a specific area to improve its condition. The healer, therefore, sought to provide ownership of the healing process to the beneficiary. Where he/she can use the plants and their benefits to improve his/her health needs. Explaining the name of the plant, its use, and its benefits demystifies the healing process to the beneficiary. This significantly opposes the Western pharmaceutical approach, where the ingredients mentioned in the packaging are unclear to people as the language is of the industrial chemical procedure. Thus, the healer becomes a facilitator, educator, and promoter of health agency to the beneficiary through familiar plants and rituals that can be easily implemented at home.

The midwife exercises her knowledge differently. The midwife's knowledge is embodied and carried out through engaging with the mother and baby in parallel. The midwife asks the first-time mother to share how she is breastfeeding to help her and show her how she is swaddling the baby and carrying out different routines. Through practical one-on-one teaching and guidance, the midwife coaches the mother with tips and practices to promote her agency. The midwife helps the mother gain trust and grow in her role. For example, the mother posed the question to the midwife about whether her baby was underweight. She mentioned that at the public healthcare unit, the nurse told her that the baby was underweight. The midwife stood up and calibrated the baby's weight using her arms. She then said the baby's weight was fine. This gave the young mother a smile and comfort. The midwife, age 86, has brought many babies to the world and has supported many others caring for their babies. By gazing at the baby, using her arms and embodied knowledge accumulated over 60 years of ancestral midwifery practice, she is comfortable assessing the baby's weight as expected (**Figure 4**).



Figure 4. Photo collage of midwife examining baby (provided by the authors)

The asset of warmth and hope to their people: As the personnel of Yumma visit beneficiaries at their homes, their ability to care for and go beyond health issues becomes clearer. They support their communities with both complex and simple things in their life. They are a welcoming presence and connection to their culture and ancestral practices that comfort the people. They naturally approach the complexity of the bureaucratic public system, which the community is constantly faced with, to obtain subsidies, wheelchairs, etc. They are skilled at soothing, sorting out, healing, listening, and bringing people to a place of assertiveness and protection. They are a warming force and presence, a lighthouse in the darkness of their history, and a dependable element that nourishes and supports these left-behind communities.

Paper forms and useless data vs. app wishes to materialize freedom: The municipality of Bogota wants Yumma's personnel to implement eight forms per beneficiary about their encounters. The forms are redundant, cumbersome, and illegible, and they do not follow ancestral values and practices or gather ancestral medical information. They are a prerequisite that shifts the focus from the beneficiary to the form. As the healer and midwife completed their tasks, the rest of the team filled in forms. The forms ultimately obstruct the dynamics and principles of ancestral medicine, disregarding their performative practices

and collecting data that does not reflect nor represent them. Regrettably, the personnel had no voice in this matter. Their frustration led them to seek a grant to develop their mobile app to break free from the current paper form setup and create a new memory and representation format. During the ethnography, the wide use of mobile phones among the personnel of Yumma and the beneficiaries and their skillful abilities were noticed (**Figure 5**).



Figure 5. Photo collage of skillful use of mobile phones of Yumma's personnel and beneficiaries (provided by the authors)

Discussion: HCI Pluriversal Framework

Identifying and defining assets in macro and micro-narratives of the Colombian National healthcare system and Yumma ethnomedical unit taught us about digitalization positionality, which helped us determine the HCI pluriversal framework for Yumma. The distinctive assets elicit the roles and value provided to digital technology and human engagement. The macro narrative portrays technology as the primary carrier of progress and value through data exchange between individuals and the system. In contrast, in the micro-situated one, digital technology is seen as a complementary tool to seek increased representation and lessen subordination and segregation of Afro-Colombians from macrosystems. Based on the assets identified in Yumma, the micro-narrative, health, care, and reassurance are provided through human touch, plant-based knowledge, and ancestral traditions, which support healing diasporas wounds in Afro-Colombian communities. Thus, aiming to deploy a swiping digitalization of health macro-assets to Afro-Colombians and Yumma would be heavily detrimental to them. Deploying macro-asset digitization would remove the agency provided to beneficiaries through plants and remove the human touch and collective and complementary pluriversal forms of care. Thus, the digitization-limited opportunities identified are outside their Yumma-beneficiary direct interactions and involve data collection of their general practices, most likely by the community health worker, who does most of the data collection now. Thus, the digitization processes of the HCI framework involve capturing leading performative oral practices into digital features and fields of data. Since they also have a nurse at Yumma, the mobile app can also capture the Western medicine aspects and items carried out by this role. The HCI should enable this joint approach and choreography of medicines to be displayed. Thus, the pluriversal health practices at Yumma need to be depicted and articulated in the mobile app. By gathering

these pluriversal health practices, other ancestral medicine communities beyond Kilombos can see themselves reflected beyond their communities, asserting the wish for a more comprehensive network and more excellent ethnic representation at a national level.

Thus, the Yumma app's HCI framework enables digital healthcare based on the micro-assets of this Afro-Colombian community. This creates an initial awareness and understanding of a different health narrative and assets within larger systems. As the Yumma mobile app is connected to larger digital systems, such as health public surveillance data basis, these micro-narratives, over time, can seek a place and role in complementing and enriching new forms of digital healthcare to bring the notion of community, self-resilience, and care, while challenging the homogenizing and transactional healthcare current approaches. Due to their historically poor systemic position, this will take significant time. Nevertheless, Yumma is ready to kick-start this process.

Our HCI pluriversal framework gives Yumma a digital presentation of limits and opportunities by highlighting the need to protect and enhance human interactions, plant knowledge, and agency. Through the HCI pluriversal framework, oral ancestral practices can be captured in a mobile app while seeking representation in macrosystems. By joining the digital healthcare paradigm in Yumma's term, they propose inclusive digitalization while safeguarding and balancing out complementary forms of care. As COVID-19 accelerated digital transformation in the healthcare sector, it has swiped off caring forms of health by increasing a transactional data focus. Opportuntelly, this is being reminded of by micro-assets of Afro-Colombian ancestral medicine. Those undermined forms of care are helping us today to shape novel, caring, and transcendental forms of care beyond the current health technocracy, such as the Yumma mobile app's HCI framework proposes.

Designers working in healthcare HCI practices should be mindful of communities' local and different assets, especially ethnic minorities living in urban centers, whose beliefs and logic may be hampered by the macro dominant asset approach to digital healthcare. A macro asset approach to HCI can increase health disparity over time for these ethnic minorities and other vulnerable populations.

Future Research

Future research should focus on more UX and UI aspects of Yumma's mobile app. Additional research should also explore the implications of incorporating digital technologies, such as mobile apps, into community organizations such as Kilombos. What are the consequences for such organizations and the benefits, opportunities, and potential losses that can occur? Last but not least, data implications and meaning for community organizations such as Kilombos should also be thoroughly explored in future research activities.

Conclusion

Digital healthcare is gaining significant momentum worldwide, including in Colombia, positioning itself as highly aware and ripe for the healthcare digital paradigm to unfold.

However, this digital healthcare paradigm is omitting its rich ethnic diversity and has a colonist-swiping approach that ignores and clashes with current pluriversal approaches and opportunities within HCI. Digital healthcare and, more concretely, the Yumma mobile app's pluriversal HCI framework allows to connect these antagonist narratives and evolve with each other with a pluriversal understanding of healthcare. Our case study goes beyond Colombia and can apply to any country with a diverse and culturally rich society.

Author Contributions:

L.N. Niño Cáceres conceived and presented the idea. D.Y. Yoo proposed decolonizing HCI theories and asset-based design methods. L.N. Niño Cáceres complemented the proposed methods. L.N. Niño Cáceres designed, organized, and conducted the fieldwork research activities. D.Y. Yoo defined the analysis methods and tools. L.N. Niño Cáceres analyzed the data. D.Y. Yoo supervised and contributed to the analysis of the data. L.N. Niño Cáceres took the lead in writing the manuscript. D.Y. Yoo and C.H. Hummels reviewed the manuscript and provided critical feedback. L.N. Niño Cáceres Integrated all feedback and finalized the manuscript.

Conflicts of Interest:

The authors declare no conflicts of interest.

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