Systemic Design Principles Guiding Perinatal Mobile App for Ethnomedical Midwifery Unit in Bogota

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Systemic Design principles guiding ICT for ethnomedical midwifery unit in Bogota

Enabling plurality in public health surveillance

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In the course of the 20th century public health surveillance systems became pervasive on a global scale, in particular with the establishment of the World Health Organization (WHO) and the boom of Information Communication Technologies (ICT) in healthcare. Data pouring out of the ICT public health surveillance systems became integral to understand, manage, and plan health activities for many national healthcare systems worldwide. However, some populations are regrettably invisible to public health surveillance systems. In Colombia, these are mostly ethnic minorities of Afro-Colombian groups. Their invisibility has negative consequences for both the public healthcare systems and these minorities. Thus, we investigate how systemic design can increase ethnic plurality in ICT public health surveillance. Furthermore, we complement system design approaches with two principles of participation, specifically, the equal opportunity principle from Roemer and the dialogical relations principle from Morin. As a result, we identified opportunities to begin healing systemic fractures, which led to creating a framework to design ICT tools for an ethnomedical unit in Bogota. This framework aims to mitigate systemic issues, such as the lack of visibility and participation of Afro-Colombian communities

within public health surveillance and healthcare systems, while promoting their midwifery practices.

KEYWORDS: systemic design, ICT public health surveillance, ethnic minorities, ancestral midwifery, perinatal care

RSD TOPIC(S): Cases & Practice, Health & Well-Being, Policy & Governance

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Introduction

In the 1990s, public health initiatives worldwide began to focus their efforts on tackling the death of women who died of pregnancy-related causes, known as perinatal maternal mortality (AbouZahr, 2003). This issue affects mostly poor women from developing countries and ethnic minority backgrounds (Geller et al., 2018: de Graaf et al., 2013: Urquia et al., 2015: Serruya, 2017: Alemu et al., 2019).

Following the WHO guidelines, Colombia established a public health surveillance mechanism to tackle maternal mortality (Franco & Balaguera, 2016). This involves the notifications of maternal deaths from health facilities to the Colombian National System of Public Health Surveillance (SIVIGILA) (Martínez Álvarez, 2016: INS-PAHO, 2016).

Geller et al. (2018) argue that a key part of implementing successful strategies to tackle public health issues, such as perinatal maternal mortality, involves robust surveillance mechanisms of data collection, analysis and action. Thus, without public health data, issues cannot be identified or tackled by healthcare systems.

Regrettably, in Colombia, the data from ethnic minorities is incomplete, which affects the national healthcare system's understanding and programs to tackle maternal, perinatal mortality of ethnic minorities (Hilarión-Gaitán et al., 2019: INS-PAHO, 2016).

The seriousness of the above data bottlenecks was recognised by the Ministry of Health of Colombia, which made significant efforts to improve SIVIGILA's ICT system. However, there are greater barriers than technical issues of the ICT tools.

Ethnic minorities such as Afro-Colombian women seek perinatal care from ancestral midwives within their communities, from now on referred to as midwives. The reasons they preferred midwives is because of their:

- Limited familiarity with the national healthcare system and services.
- Logistical and economic challenges such as long travel distances to hospitals and health centres.
- Lack of trust in healthcare professionals (Osorio et al., 2014: Lasso Toro, 2012).

Regrettably, the national healthcare system does not recognise midwives as a valid source of care. Furthermore, it mistreats them by expelling them from hospitals when accompanying pregnant women in labour. Ironically, midwives took pregnant women to hospitals once they noticed the risks involved in labour.

Issues of segregation have created deep fractures between the national healthcare system and Afro-Colombian communities. Unfortunately, this has led over time to increased health inequities due to Afro-Colombian communities' systemic invisibility and lack of participation (INS-PAHO, 2016).

Thus, we ask: how can systemic design increase the visibility and participation of the Afro-Colombian communities in national public health surveillance activities? How can systemic design support plurality within western-centric healthcare ICT to embrace ancestral midwifery? Last but not least, what principles are needed to enable Afro-Colombian midwives' equity and participation?

To tackle the systemic fractures in healthcare ICT, we introduce two principles addressing equity and participation in systems and our systemic design approach.

Theoretical lenses

We selected the two principles promoting equity and participation of actors within systems:

1. "Equal opportunity" from economist and political scientist John E. Roemer (1998)[1]
2. "Dialogical relations" from complex thinker Edgar Morin (Montuori, 2008)

1. Equal opportunity

Roemer (1998) recognised the distinction between legitimate and illegitimate sources of inequality. The factors for which the individual is responsible are considered "legitimate," while those factors beyond the individual's control are considered "illegitimate." He referred to the latter as circumstances, "the set of environmental influences, beyond the individual's control that affect his or her chances of acquiring the objective" (Roemer, 2003, p. 1). In practice, equal opportunity refers to equal access to basic services and productive resources such as education, healthcare, water and sanitation, among others. Policies that guarantee equal access to these opportunities aim to level the playing field, assuring that any remaining inequalities are a consequence of "legitimate" factors (Fleurbaey & Shokkaert, 2011). The principle of equal opportunity is seen as a linear thinking approach since it assumes that providing free access to healthcare by public entities would imply its usage by all populations.

2. Dialogical relations

Edgar Morin (Montuori, 2008) approaches participation in systems differently by embracing plurality, which he refers to as the dialogical principle. This principle sees the necessity of antagonist identities and expressions within a system without compromising or finding consensus (Hummels, 2021). Participation then happens when oppositional yet constructive relations are created between antagonistic actors, enabling the co-authoring of outcomes. While these co-authoring processes unfold, Morin notes that all actors have qualities to be producers and receivers, referred to as

[1] https://www.hup.harvard.edu/catalog.php?isbn=9780674004221

organisational recursion. Thus, every actor holds agency and abilities to correspond with each other (Ingold, 2017).

The dialogical principle is seen as having a complex approach since it alludes to a tight network of relations and actors in an open field of mingling opportunities (Jones & Kijima, 2018: Ryan, 2014).

Thus, the dialogical principle promotes

- A plurality of actors without compromising their distinct identities.
- Complementary aspects of antagonistic relationships.
- Mutual and innate agency of actors to engage in co-authoring outcomes.

Dialogical relations differ from equal opportunity by seeing participation as a dynamic quality of systems; instead of a standardised and unilateral solution offered to people, such as equal access to healthcare.

Systemic design

We complemented the selected principles above with a systemic design approach, with the intention to foster change toward plurality in structural and concrete ways.

Systemic design promotes the dynamic and permanently evolving properties of social systems. It recognises diversity as an enabler of new cadences of interactions and the evolution of any system (Jones & Kijima, 2018: Ryan, 2014). It focuses on longer-term societal challenges called wicked problems that are irresolvable by conventional problem-solving approaches, which is found relevant in our case. Furthermore, systemic design seeks the social transformation of complex and unbounded relations supporting policy-making and community design, among others (Jones, 2020: van der Bijl-Brouwer & Malcolm, 2020), areas aligned with our systemic challenge.

Methods

We conducted a literature review analysis, followed by design ethnography. The findings from these activities were further analysed with a systemic design toolkit.

We followed the six steps process of Onwuegbuzie et al. (2012) for the literature review, involving the definition of the research problem, formulation of search keywords, reading relevant secondary sources, and noting and summarising key points.

The keywords used involved: ancestral midwifery in Colombia, urban ancestral midwifery, Afro-Colombian traditions, Colombian national healthcare system, SIVIGILA perinatal, and ICT perinatal mortality. The papers were found via Google Scholar and the library search of the Technology University of Eindhoven. Over 50 papers were reviewed and analysed.

Design ethnography was found relevant since it involves actively intervening in the changing context of the subject area to assess future-oriented decisions (Baskerville & Myers, 2015); in our case, designing an ICT solution to bridge the national healthcare and SIVIGILA systems to ethnic minorities.

Systemic design enriched the analysis by leveraging design competencies such as form and process reasoning supported in visualisation practices, including mappings, to re-purpose systems (Jones, 2020).

Systemic design, however, does not propose clear participation principles as Roemer and Morin do. Thus, we found it relevant to use these principles as complementary lenses. Furthermore, the principles of Roemer and Morin do not provide a clear transformation path, inviting complementary methods such as systemic design.

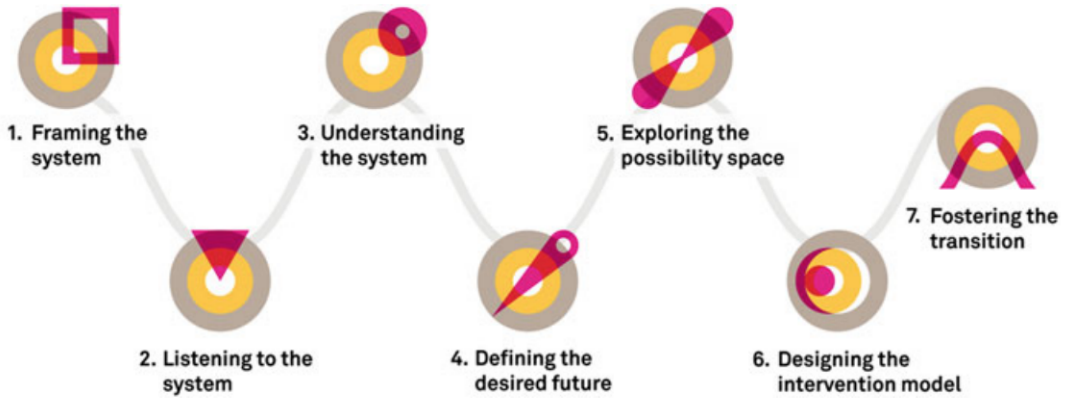


Figure 1. Steps of the systemic design toolkit developed by Van Ael (Jones, 2022). Image credit: Namahn Systemic Design Toolkit.

Mapping Procedure

We implemented the seven steps of the systemic design toolkit (see Figure 1) developed by Van Ael (Jones, 2020) to create our maps.

Step 1: Framing the system

We framed our system by defining the actors. We grouped actors by identity, following boundary delimitations in systems proposed by Latour (1996) and Cumming & Collier (2005). Each group of actors was assigned a random colour, and it was placed in a circle for the purpose of our mapping exercise (see Figure 2). Next, we proceeded to adjust the size and position of each circle according to the presence of the actors in the system and their proximity to each other (See Figure 3).

The actors identified are – community (orange circle), regulator (green circle), health provider (blue circle) and multilateral agency (yellow circle).

Figure 2. Actors identified by colour in the perinatal care system

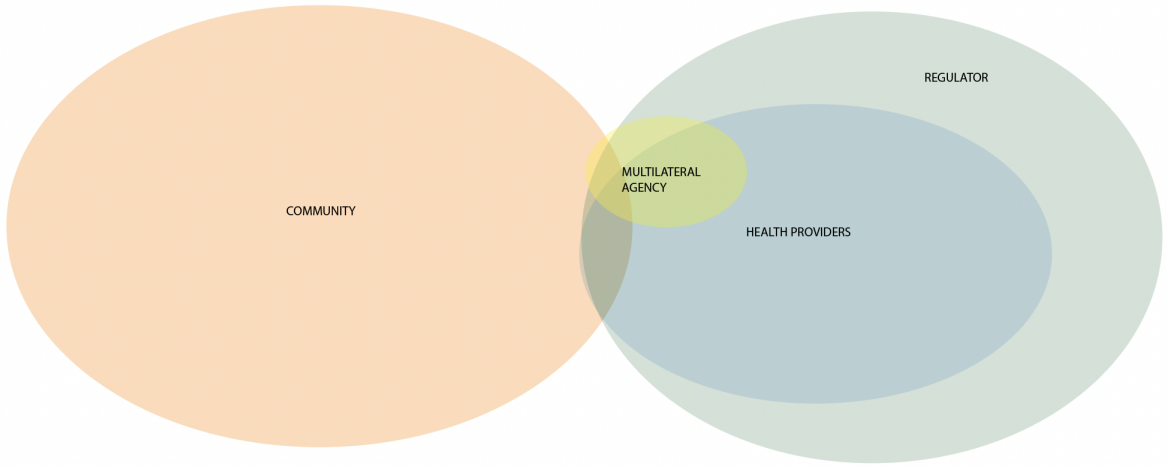


Figure 3. Presence and proximity of actors

Step 2: Listening to the system

We mapped the beliefs, practices and issues of the main actors as a way to echo the system's voice. We summarised it in keywords, which we plotted within the actors' circles. Then, we connected the keywords with lines to shape webs of relations, beliefs and practices. Last was the mapping of the issues, which were distinguished with purple circles (see Figure 4).

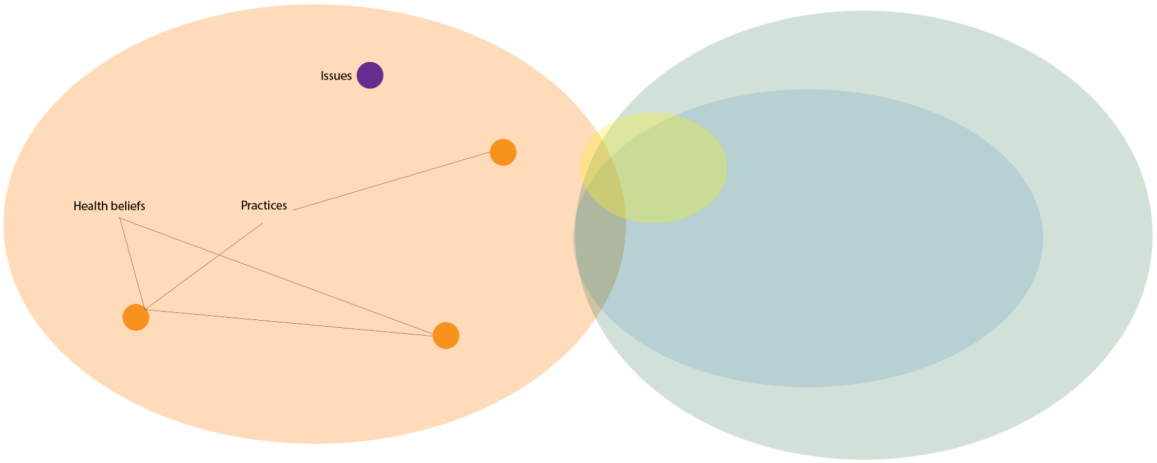


Figure 4. Web of relations, beliefs, practices and issues

Step 3: Understanding the system

Next, we furthered our understanding of the system by identifying the potential causal relationships between key issues with purple arrows. The end of the purple arrow points to the consequences of these issues and tends to denote either stagnation or negative feedback loops (Robertson, 1991).

In addition, we introduced the equal opportunity and dialogical principles to elicit different types of participatory engagements, using a curved red arrow line with one head-end for the equal opportunity principle; and a dark colour line with two head-ends for the dialogical principle, respectively (see Figures 5 & 6).

The map resulting from understanding the system includes a web of actors' beliefs, practices and issues connected with lines. Purple, red and black arrows mapped that defined causality of the issues, equal opportunity and dialogical principles.

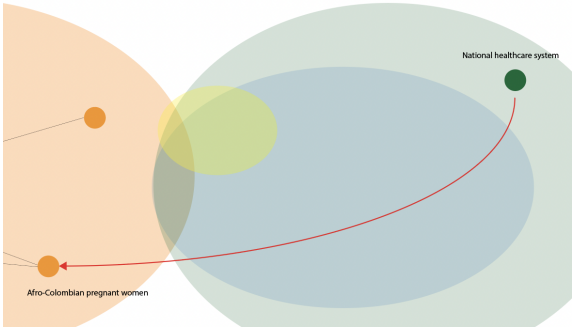


Figure 5. Red arrow: equal opportunity

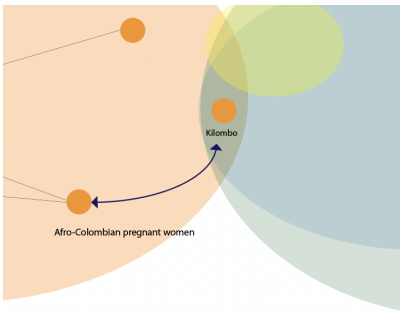


Figure 6. Dark arrow: dialogical principle

Step 4: Identifying the hubs

We proceeded to define key hubs within the system by recognising those actors that have a high amount of connections, thus, strong leverage within the system. These hubs are seen as junctions or critical connectors to the daily functioning of a system (O'Kelly, 2015), thus, funnelling a desired future.

Step 5: Exploring the promising design space

By integrating previous steps, we identified the promising design space, which was crystallised in an ICT framework. This framework is considered to increase ethnic minorities' participation and visibility in public health surveillance systems.

Steps 6 & 7: Designing the ICT intervention and fostering a transition

We combined steps 6 and 7 since the ICT tool is currently under development. Thus, we proceeded to outline the benefits and future challenges of such intervention and transition. Last, Map 4 (see Figure 24) outlines the knock-on effects for actors and issues when implementing the ICT tool following the distilled framework.

Findings

Ancestral Midwifery in Colombia: a bastion of health and community identity

Midwifery is a core practice of Afro-Colombian communities on the Pacific coast of Colombia. In recent years, the country has made ancestral midwifery practice a cultural patrimony to safeguard it.

Today, this practice lies in the hands of older women (Barona et al., 2019). The arrival of a newborn affects not only the mother-to-be but the community at large. Midwifery, therefore, is the reconnaissance of a community's identity and its collective being (Giraldo Duque & López Ramírez, 2019). It unravels the meaning of health, pregnancy and womanhood in these communities.

When a woman gives birth, chants, herbal remedies and massages are involved, and this reflects the spiritual, ceremonial and celebratory nature of the process. Celebratory activities such as singing, dancing and being together for days are trademarks of these communities, as seen in the iconic festival of San Pacho (Gonzalez, 2017: Giraldo Duque & López Ramírez, 2019).

Unarguably, ancestral birthing practices provide safety, bonding and reassurance to Afro-Colombian pregnant women, who call midwives "comadronas" or second mothers (Sarria Viáfara, 2019). However, outsiders often called midwives "witches''. Their bodily, herbal knowledge and powerful role in communities felt threatening to western colonisers (Polo Payares, 2008: Giraldo Salgado, 2020). Furthermore, ancestral midwifery has been seen as a primitive form of health since it lacks written manuscripts and many midwives are illiterate (Sarria Viáfara, 2019).

Midwifery and other African traditions were kept in their dialects, colliding with colonial structures of the western world (Corredor Pérez & Sáenz Cifuentes, 2021). These traditions created a strong sense of ethnic identity. However, their traditional ways of living also isolated them from mainstream modern society and made them highly impoverished communities (Galvis–Aponte, 2016).

To make matters worse, many of these communities had to flee their region to the ruthless civil war in recent decades, and this forced them once again to hold on to their identity as a survival skill (Barona et al., 2019).

The national healthcare system and its tense relationship with midwifery

Healthcare is a constitutional right; thus, the national healthcare system provides free-of-charge access to health to all Colombians. However, as described above, significant barriers stand between this constitutional right and Afro-Colombian pregnant women. Mediating this fractured relation are midwives, who are currently not recognised as a valid form of complementary health by the national healthcare system. This prevents midwives from actively participating in the national healthcare system and getting financial compensation, which creates ongoing tensions.

To midwives, pregnancy is a form of communal, physical and spiritual care. Whereas the national healthcare system sees pregnancy mostly from a physiological angle, focusing on symptomatology and biometrics collected by healthcare professionals as outlined in the national protocol (Gaviria Uribe, 2017). Such antagonistic views about pregnancy between ancestral midwifery and the national healthcare system pose a significant threat to Afro-Colombian women's health.

In the eyes of midwives, the approach of the national healthcare system should not trump theirs. Instead, they believe both approaches can be complementary and uniquely suited to best serve pregnant women (Quiñones Sánchez et al., 2016).

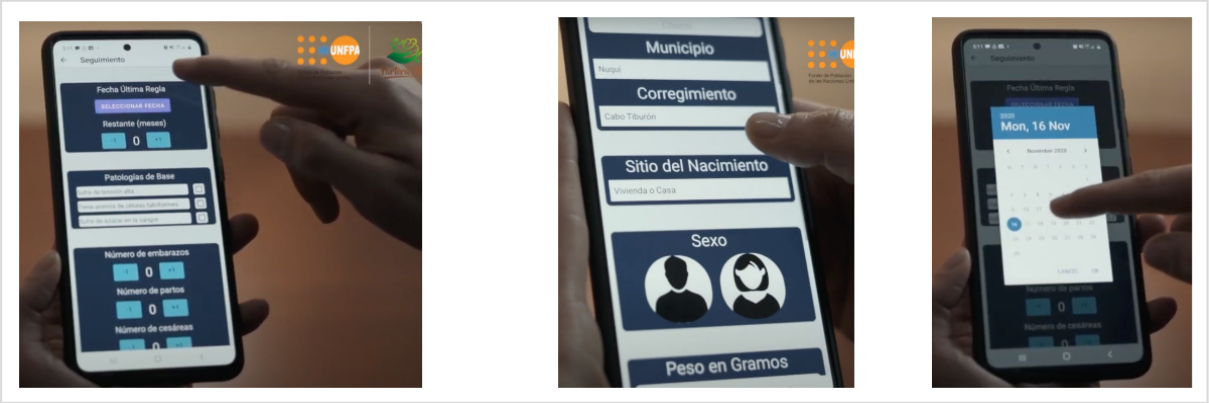
ICT for Midwives: Partera Vital mobile app

In 2020, the United Nations Population Fund (UNFPA) intended to minimise the gap between midwives and the national healthcare system by creating a mobile app (United Nations Population Fund., 2020). Independent from the Colombian national healthcare system, the UNFPA acknowledges the vital role of midwives in Afro-Colombian communities on the Pacific coast. It reports in the introductory video of the mobile app that these communities tragically suffer from three times more perinatal deaths than the rest of the country; and that without the support of midwives, this number could be higher (United Nations Population Fund., 2020).

In partnership with the country's National Administrative Department of Statistics (DANE), the UNFPA created the Partera Vital App, which translates Vital Midwife App. This app aimed at solving the limited lack of data registry of maternal and child deaths and births in faraway rural areas of the country, where ancestral midwifery is the only form of care. Thus, the app, ultimately, aimed at collecting limited or absent data via midwives to assess the perinatal situation of these communities best.

Regrettably, there is no clear evidence about the adoption of the app by rural midwives. Moreover, we observed that Partera Vital app:

- Does not reflect any cultural beliefs of ancestral midwifery traditions. Instead, the user interface (UI) proposes an administrative logic, most likely transferred from the DANE ICT tools (see Figure 7).
- Does not follow ancestral midwifery practices' linguistics. Instead, it requests information about "pathologies of base", following western medical terminology (see Figure 7).
- Does not reflect gestures of ancestral midwifery performative tasks such as massages, chants or touch-based care. Instead, it proposes a prescriptive interaction based on numeric and written languages (see Figures 7 & 8).
- Has icons that do not reflect either the skin colour or iconic curly hair of Afro-Colombians. Instead, it has icons reflecting white complexion (see Figure 8).
- Request information on the weight of the newborn in grams when the population is used to kilos (see Figure 8).
- Data is gathered through digital calendars and dropdown menus, which are unfamiliar interaction parameters for rural midwives (see Figures 7, 8 & 9).
- The app's icon is the only item that refers to the role of midwives in their communities (see Figure 10). However, the logo colours, look and feel are not reflected in the UI.



Figures 7, 8 & 9. Missing cultural representation in the UI and approach behind the app. Image credit: https://colombia.unfpa.org/

Figure 10. Icon of the app. Image credit: https://colombia.unfpa.org/

Figure 11. Kilombo Yumma personnel and environment

Kilombos: ancestral and western medicine units in Bogota

Kilombos are an ethnomedical organisation based in Bogota, the capital city of Colombia. The word means resilience, pride, breaking apart from imposed structures and collective force (Gutiérrez Paez et al., 2017). Kilombos were created by misplaced Afro-Colombian midwives, healers, community leaders and western nurses who were deprived of their forms of care in Bogota. They established eight centres that bring together ancestral and western health practices to serve their peer migrant communities. Currently, all Kilombos are funded and regulated by the municipality of Bogota (Alvarado Suescún, 2020: Giraldo Salgado, 2020).

We visited Kilombo Yumma, in the locality of Kennedy, where many migrant settlements are found. Yumma is housed in an official centre that supports victims of the war in Colombia. Despite being housed in a governmental building, Yumma, like other Kilombos, keep their spirits and identity highly present with wooden furniture from their regions, decoration items and colourfulness (Figure 11).

Kilombos serve approximately one million people monthly, mostly Afro-Colombians. Their unique approach to health involves ancestral and western medicine combined under one roof. With this approach, they can easily perform ancestral midwifery practices, such as chants, massages, and beverages, next to perinatal checkups, identify risks, and refer to and accompany women to hospitals if needed.

Kilombos' midwives follow a more western approach than rural midwives. They wear sterilised gowns and gloves in their practices (see Figure 12). The combined medicines allow pregnant women to feel reassured and supported. The personnel who collect the data are certified nurses and community health workers. In addition to their familiarity with ancestral medicine, these nurses and community health workers are also trained in western auxiliary medicine, which makes them more familiar with the language and logic behind medical and administrative paperwork than midwives (Image 13). To their regret, however, they only collect demographic and western medicine data required by the municipality, the entity that funds them. Most of the care services Kilombo offers, such as chants, massages, and consultations, go unnoticed by the central governmental

system since the data collected does not adequately reflect their work. As a result, Kilombos suffer from institutional invisibility.

Another challenge includes the lack of a digital tool to capture data. Instead, they use pen and paper. During the Covid-19 pandemic, getting a centralised registry of their work became very difficult since Kilombos centres were forbidden to open. Thus, they served their communities by visiting them at home. Handwritten data was often lengthy and difficult to manage and consolidate. Proving their work to the municipality became more difficult with an increased number of home visits. The lack of clarity about the number and type of interventions for pregnant women put Kilombos' financial survival at risk.

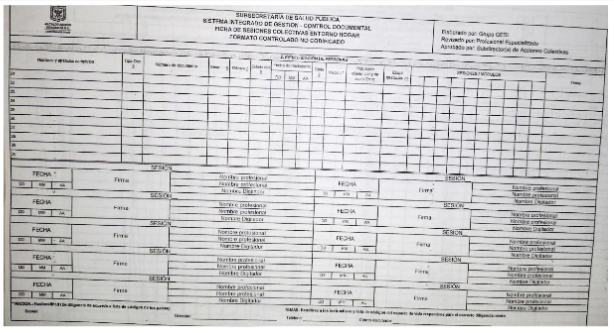


Figure 12. Kilombo's midwife carrying out an examination. Figure13. Kilombo's paperwork

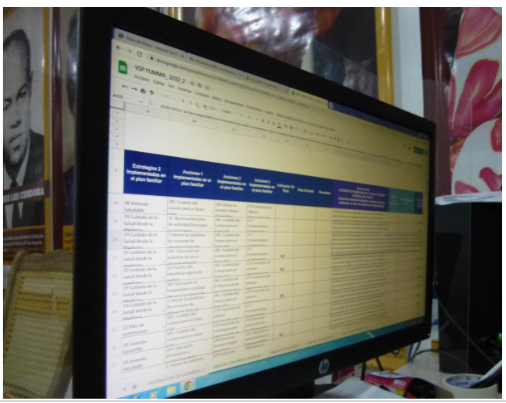


Figure 14. Desktop provided by the municipality to Kilombo Yumma. Figure 15. Home visits are where most data registry happens.

The data collection limitations were known by the municipality, which provided Kilombos with desktop computers once the pandemic resumed. Desktop computers, however, do not fully support their practices: “We were provided a desktop, but our data registry happens mostly at the home visits” (see Figures 14 & 15), claimed the nurse. She elaborated: “We are very familiar with using mobile phones, which are handy for our performative work and home visits. Instead, we were provided with a desktop, which creates two systems of data collection: paper and pen and a digital excel sheet argues Kilombo Yumma’s coordinator (see Figure 14).

The inconvenience of duplication of data formats and mistrust in the central government, stemming from deeper historical attacks on midwifery, motivated Kilombo Yumma to develop their own mobile app. Yumma obtained a grant from Share-net International for this endeavour. Its personnel are highly positive toward the incorporation of digital means to collect combined ancestral and western medicines’ data. Its coordinator affirms: “data can capture some of our ancestral knowledge. In the past, outsiders have called our midwifery practice inferior since we lacked written manuscripts. A mobile app can be a modern way to capture our traditions.” To further assess Kilombo Yumma’s interest in developing a new mobile app, we continue by filtering our findings using the two principles of participation.

Equal opportunity and dialogical relations findings

A. The principle of equal opportunity provides all Colombians with free access to healthcare. Yet, many Afro-Colombian pregnant women choose midwives over hospitals. Thus, this principle is found insufficient to increase participation from Afro-Colombian communities in public healthcare and surveillance.
B. The principle of equal opportunity was exercised by the UNFPA and DANE by developing the Partera Vital app. Regrettably, the app fails to include midwifery beliefs and practices. Instead, it proposes unfamiliar administrative formats to rural midwives.
C. The municipality of Bogota has also exercised the principle of equal opportunity by funding and running Kilombos. However, we noted that the dialogical principle is still largely missing since Kilombos’ ancestral practices are not being captured in data collection.

D. Overall, regulators such as the healthcare system and the municipality lack dialogical relations with midwives since they are not recognised nor financially compensated, nor are their practices acknowledged in data collection. This lack of participation and representation motivated Kilombo to pursue its own initiatives to design a new mobile app.

Systemic design mapping findings

NOTE: All maps can be found in their original form in the appendix. For readability, we included snapshots of each map in this section.

Insights from framing, listening and understanding the system

We observed two worlds living side by side, yet hardly connected to each other (see Map 1 in Figure 16). These are the Afro-Colombian communities in the orange circle and the national healthcare system's actors in the green and blue circles. Bridging these two worlds are Kilombos, which follow a combined ancestral and western medicine approach.

In Map 1 (Figure 16), the differences in practices and beliefs of these two contrasting health perspectives are highlighted in different font colours. A key insight is that Kilombos hold both beliefs and practices of ancestral and western medicine, as shown in the connecting lines, confirming its bridging position. Next, we plotted the key issues related to the regulators, healthcare providers and UNFPA, such as:

- Unknown total deaths of Afro-Colombian pregnant women
- Lack of ability to tackle perinatal mortality in affected communities
- Lack of engagement of these affected minorities with healthcare providers
- Mistrust from affected communities toward western medicine
- Unknown adoption of the Partera Vital app

Mapped issues belonging to the Afro-Colombian community include:

- Historical segregation
- Rejection of midwives joining births in hospitals
- Economic and logistical barriers to reaching health facilities

- Duplication of data collection formats imposed on Kilombos
- Lack of representation of ancestral midwifery in data collection
- Lack of relevant ICT tools that support Kilombos practices

Causality issues

The root cause of these issues (causality) is found to be the clash of health perspectives between Afro-Colombian midwifery and the national healthcare system. In particular, the inability of the national healthcare system to encompass a more pluralistic approach to health has negative consequences such as:

- Lack of engagement of pregnant women with the healthcare system
- Unclear adoption of the Partera Vital app
- Imposition of data forms from the municipality
- Disregarding ancestral practices

Enriching our current systemic analysis, we continued by mapping equal opportunity and dialogical principles.

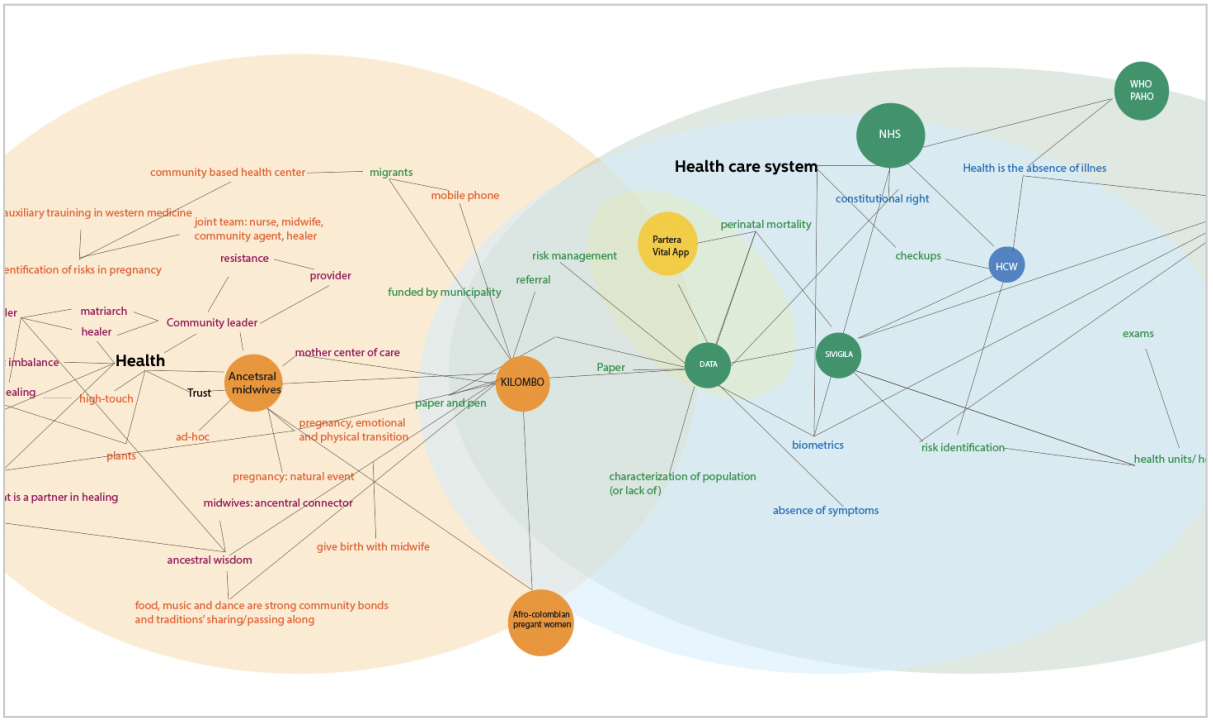


Figure 16. Map 1: Two colliding worlds living side by side, Afro-Colombian and national healthcare actors.

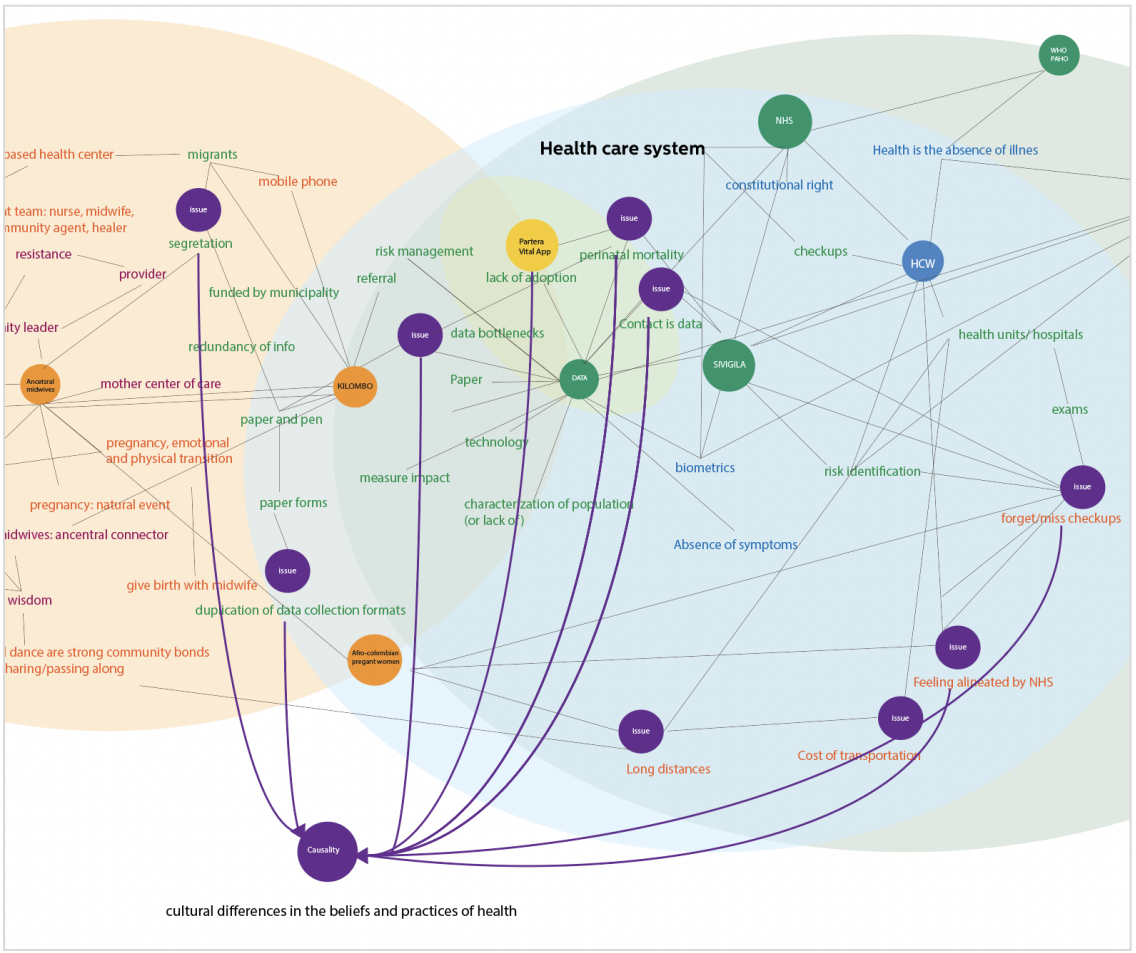


Figure 16. Plotted issues and causality

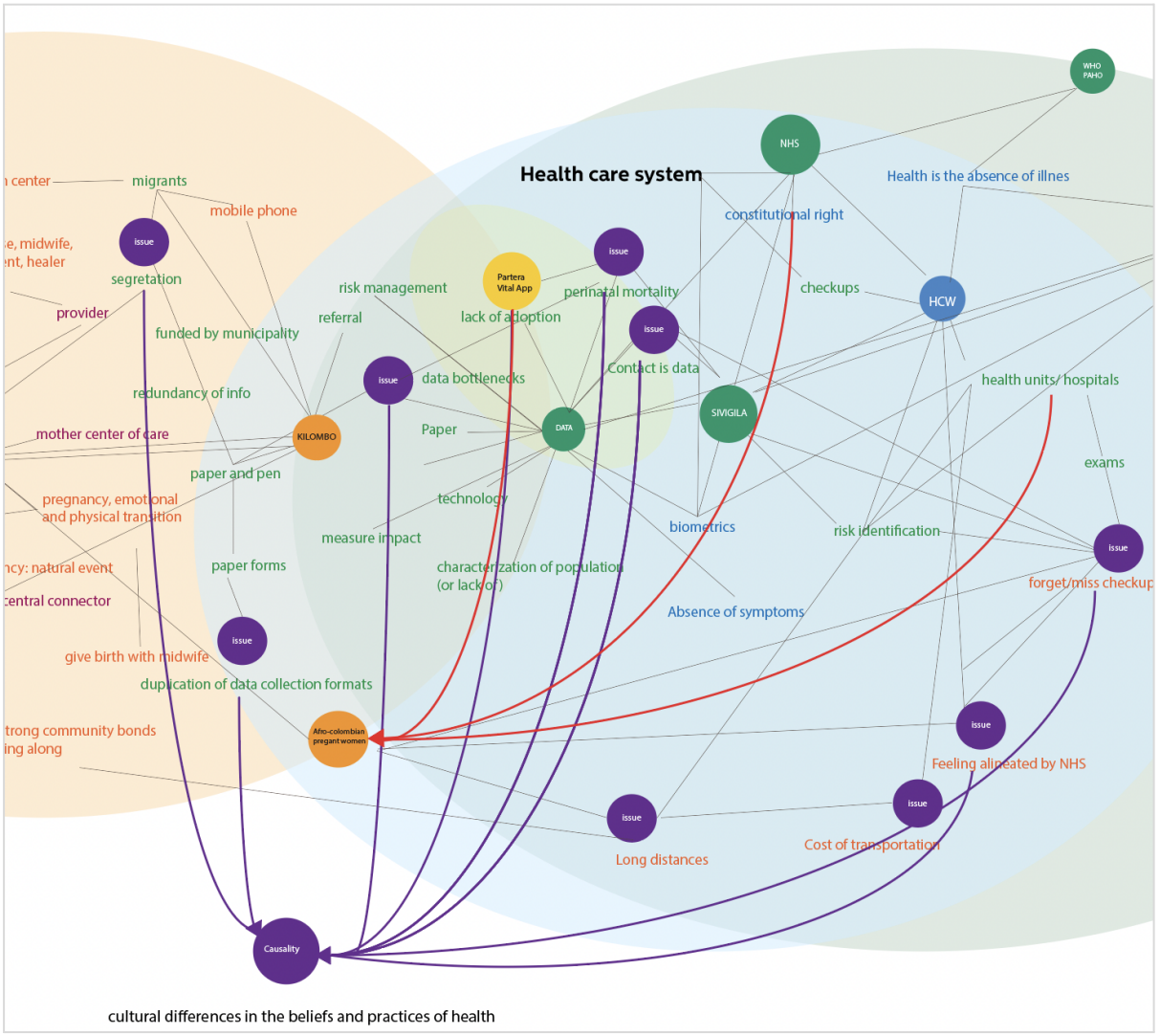


Figure 17. Map 2: Equal opportunity principle

Map 2: Equal opportunity principle

Significant efforts are made by the national healthcare system and the UNFPA to support Afro-Colombian pregnant women, as shown by the red arrows in Map 2 (see Figure 17). However, it is important to note that these actors' initiatives hold western healthcare dominant traits, which ultimately creates backlashes and ruptures between Afro-Colombian communities and the healthcare system. Thus, the equal opportunity principle is confirmed in Map 2. However, it does not yield the participation of Afro-Colombian pregnant women expected. Instead, this principle appears as a dominant attitude towards these communities.

Map 3: Dialogical principle

This principle, mapped with a black arrow, solely exists from Kilombos to pregnant women due to their combined medicine practice (see Map 3 in Figure 18). Regrettably, this principle is choked by the municipality’s data collection variables and duplicated formats imposed on Kilombos. Addressing these pitfalls, we identified design opportunities in the next maps.

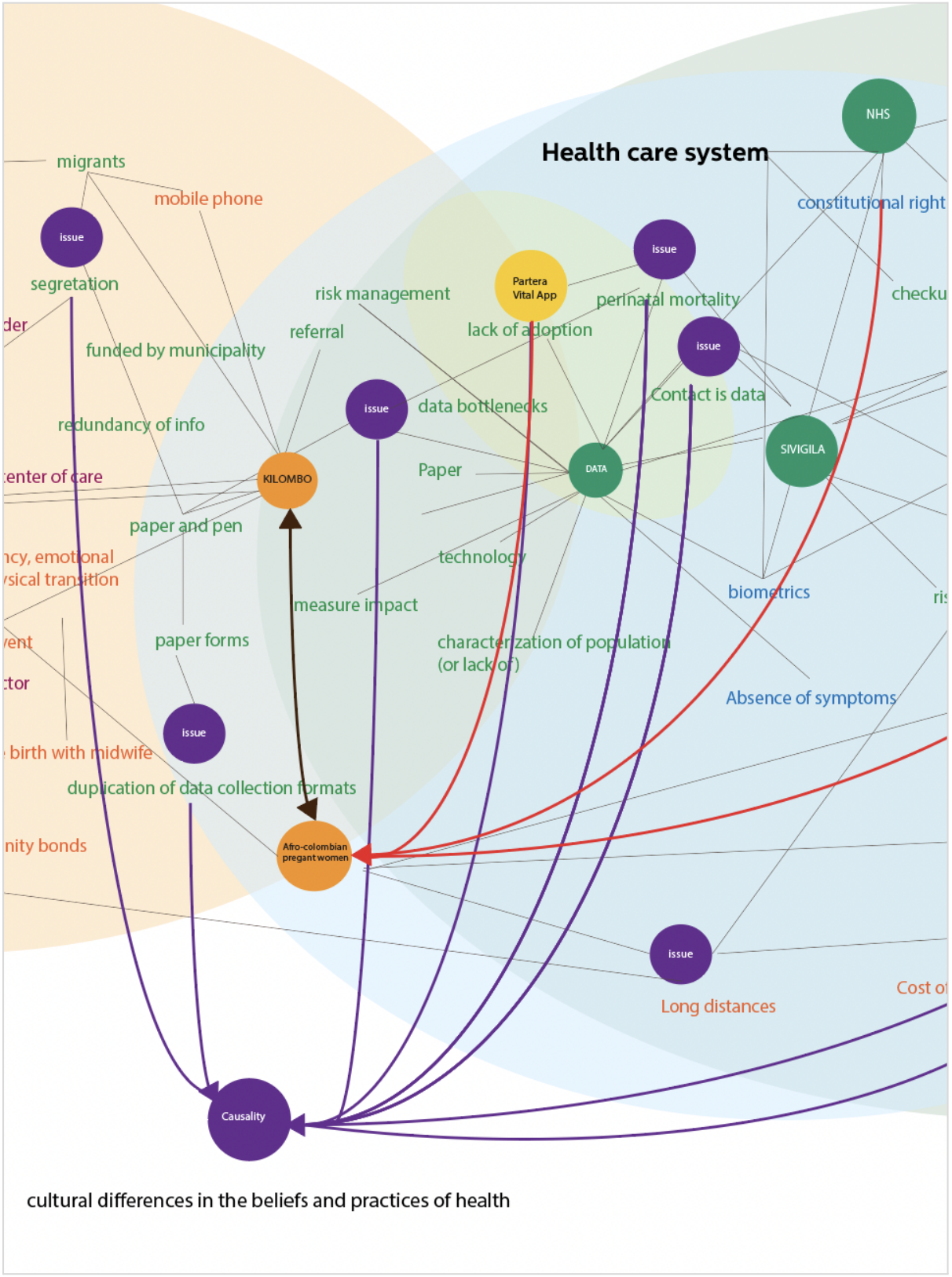


Figure 18. Map 3: Dialogical principle

Map 4: Desired futures based on hubs, leverage and relations

We identified the following hubs, which are critical junctions of the functioning of our system:

1. *Midwives* since they are a bastion of culture, spiritual and communal leadership. They hold together a tight web of beliefs and practices around pregnancy and have influential roles in their communities.
2. *Kilombos*, which have many lines connecting to both Afro-Colombian communities and the healthcare systems, and bridging Afro-Colombian women and midwives to antagonist actors such as the regulators and healthcare providers.
3. *The national healthcare system,* as the macro regulator of public health activities, has a strong position within healthcare entities. However, its leverage is limited within the Afro-Colombian communities.
4. *Data* holds significant relations with all actors within the system, which denotes its importance and central role in the perinatal system. However, despite its importance, data does not represent the practices of all actors nor yield value to all.

   Data ignores ancestral midwifery practices and lacks cultural correspondence with Afro-Colombian communities. Data collection is limited to pathologies, biometrics and demographic variables captured in administrative formats.

   Distinctly, data is the epitome of this clash of health perspectives in the system studied. Data is, therefore, a concrete manifestation or embodiment of the systemic fractures elicited earlier. Addressing this systemic pitfall in a dialogical manner can increase the inclusion and participation of Afro-Colombian communities, as presented next.

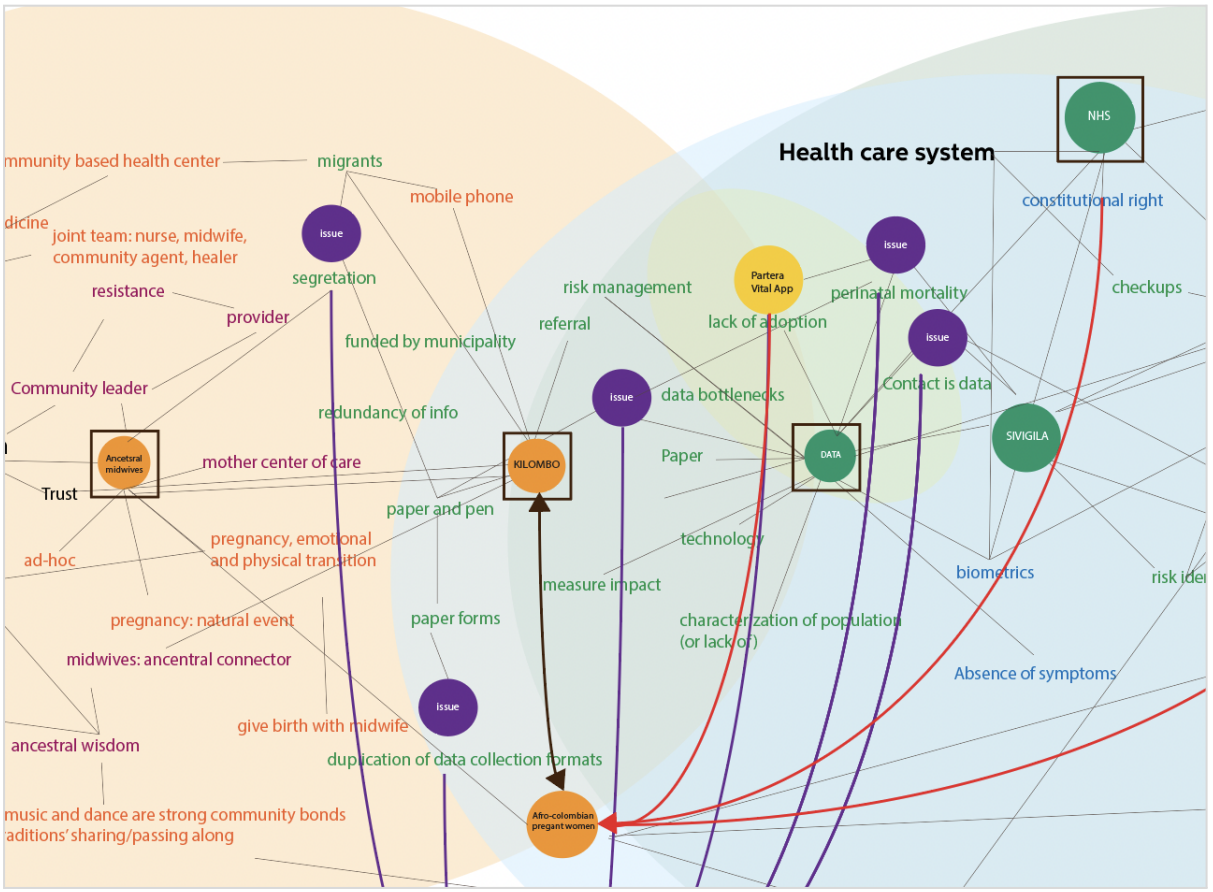


Figure 19. Map 4: Highlighting key hubs

Exploring the possibility design space: a framework for ICT inclusion of Afro-Colombian midwifery

Kilombos have a strategic advantage over other actors to unlock systemic change due to its:

- A combined western and ancestral approaches to pregnancy
- Strong network and leverage in the system
- Administrative abilities and familiarity with medical data collection

However, for the inclusion and participation of Afro-Colombian communities to happen, dialogical principles need to be put into practice in the creation of the mobile app under development. Thus, we propose an ICT dialogical framework that:

- Reflects ancestral and western practices in its functions
- Has data entry according to Kilombos' routines and ways of performing their practices with pregnant women. Where data entry happens after performative practices instead of making them a central and leading task.
- Uses Kilombo's mixed linguistics in the UI. Avoiding unfamiliar clinical medical terms (see Figure 20).
- Holds icons and images that reflect Afro-Colombian culture, skin colour and hair (see Figure 21).
- Includes metrics familiar with Kilombos' practices, such as kilograms (see Figure 22).
- Has simple visual representations of the data that is easy to understand by Kilombo's personnel. Instead of percentages and charts that can alienate them (see Figures 22 & 23).

Figures 20, 21, 22, & 23. Icon of Yumma app created by Faviana Huarachi.

Fostering the transition through the use of the Kilombo Yumma mobile app

By following the ICT dialogical framework for the mobile app creation, we argue that the transition to a more pluralistic healthcare system will be fostered through daily practices of more participatory data collection led by Kilombos. This will allow for building dialogical relations between Afro-Colombian communities and the national healthcare system, where antagonists' beliefs and practices can mingle and co-author new possibilities for more pluralistic and participatory healthcare. Last but not least, we created Map 5, where we placed the Kilombo's app following our distilled dialogical framework, to observe the following knock-on effects (mapped in purple arrows, see Figure 24):

- The app becomes a new hub connecting Kilombos, pregnant women & SIVIGILA
- The app tackles deep systemic issues such as segregation, data bottlenecks in perinatal health, next to logistical and economical barriers for pregnant women since Kilombos' services include home visits.

We acknowledge that the transition is only beginning with the Kilombo app, and its acceptance by the municipality is yet to be seen. Other Kilombos have manifested their interest in the app to speed up their data collection, consolidation and sharing.

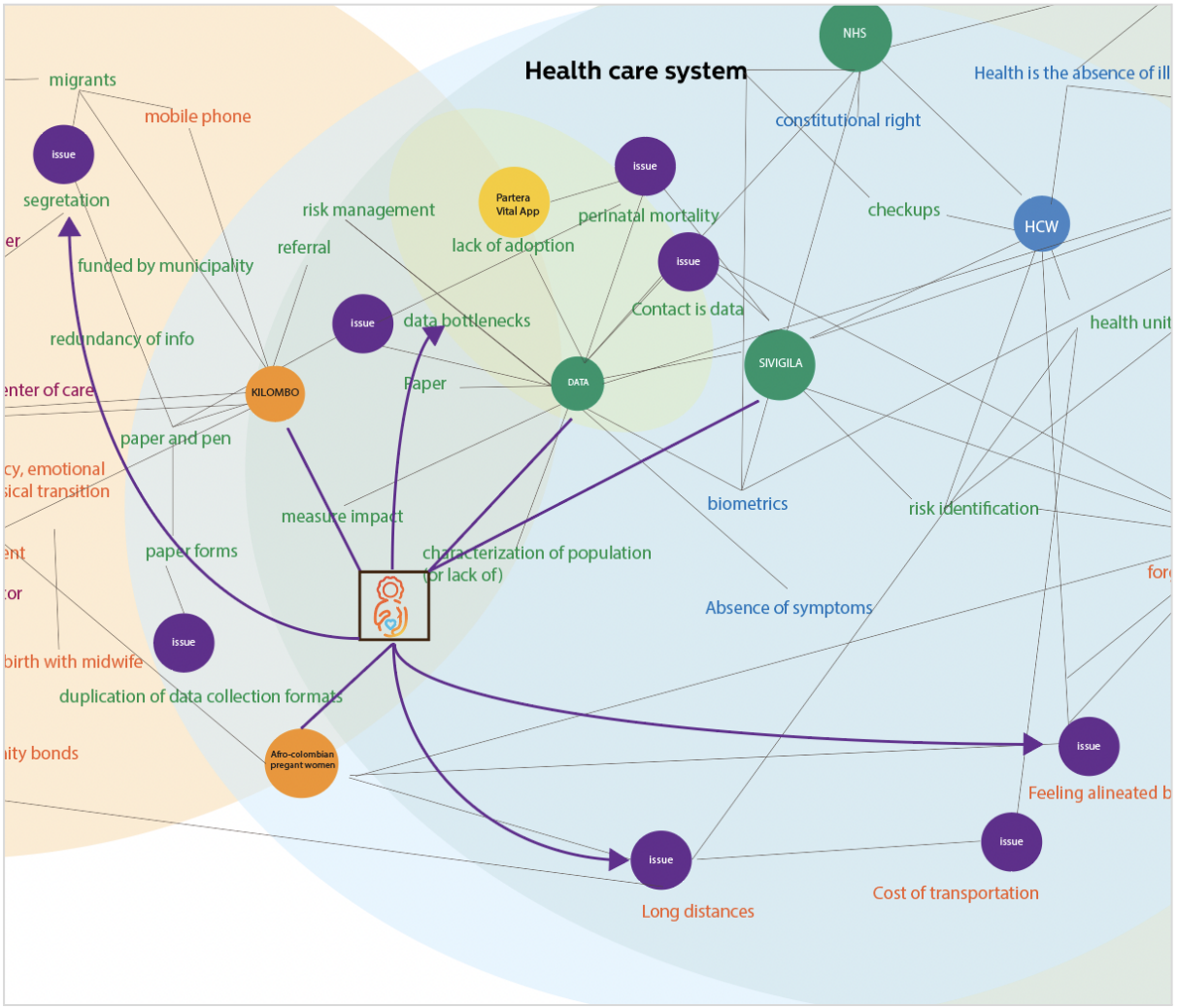


Figure 24. Map 5: Positive knock-on effects of the Kilombo app in the system mapped in purple arrows

Discussion

The systemic design toolkit enabled us to approach the current ICT health surveillance issues in structural and tangible ways by eliciting systemic fractures and their concrete data limitations.

Systemic design enabled us to define increased equity and participation for Afro-Colombian communities in health surveillance by highlighting the strategic position of Kilombos in the perinatal system.

At the same time, we also acknowledge a blind spot from systemic design, which called for the necessity to use complementary principles, such as the dialogical principle from Morin, to address plurality, equity and participation within the complexity of the perinatal care system in Colombia.

Particularly, we recognise that providing equal opportunity to Afro-Colombian communities does not necessarily imply their participation and inclusion in the perinatal system. This was corroborated by the limiting dialogical ability of dominant actors, such as regulators, which limits the participation of other forms of health practices with negative consequences.

Lastly, we acknowledge that the principles and systemic design methods used were all developed by western practitioners such as Morin, Roemer and van Ael. This can unintentionally favour a western discourse and positive digital bias. To avoid this, we suggest being aware of dominant discourses in systems and to allow alternative ones to emerge. Also, to allow digital solutions to be conceived bottom up.

Conclusions

Systemic design was found useful to offer wider opportunities for participation to historically oppressed groups; as a method, it allowed to identify qualities within a system to create structural changes while understanding the vital role of data. When working in highly antagonist systems, like the Colombian perinatal one, it was found important to understand certain limitations within western principles and methods. Future research should be done with similar context settings to validate the findings identified.

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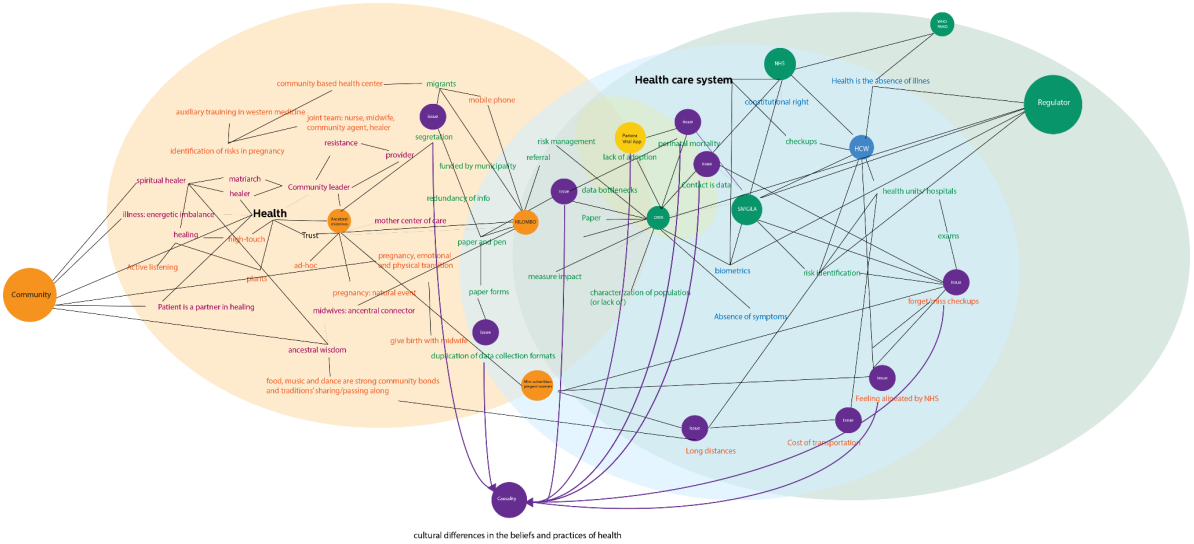
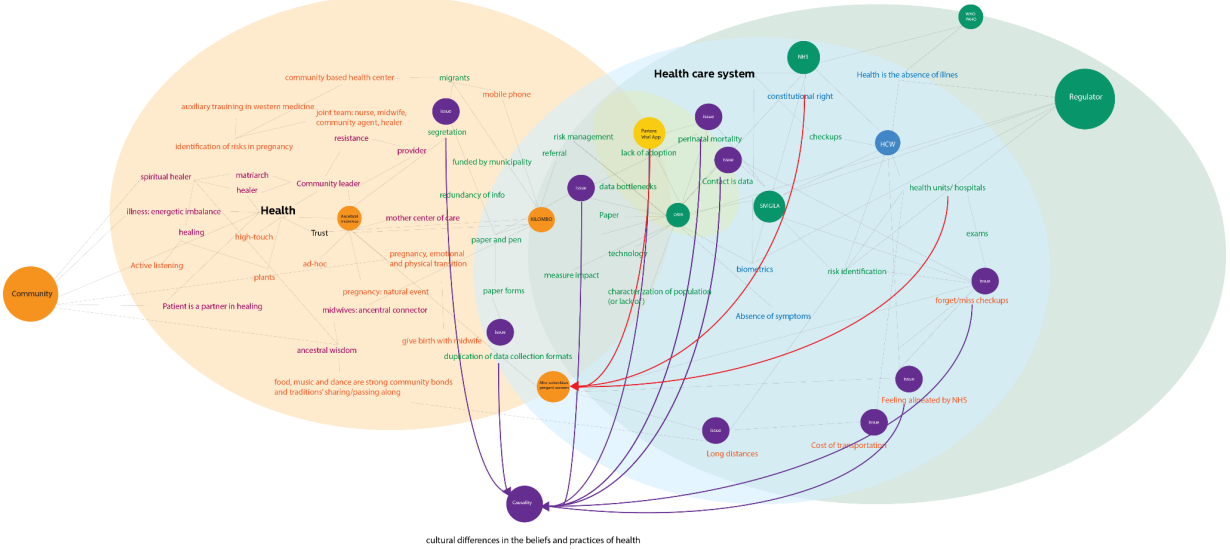
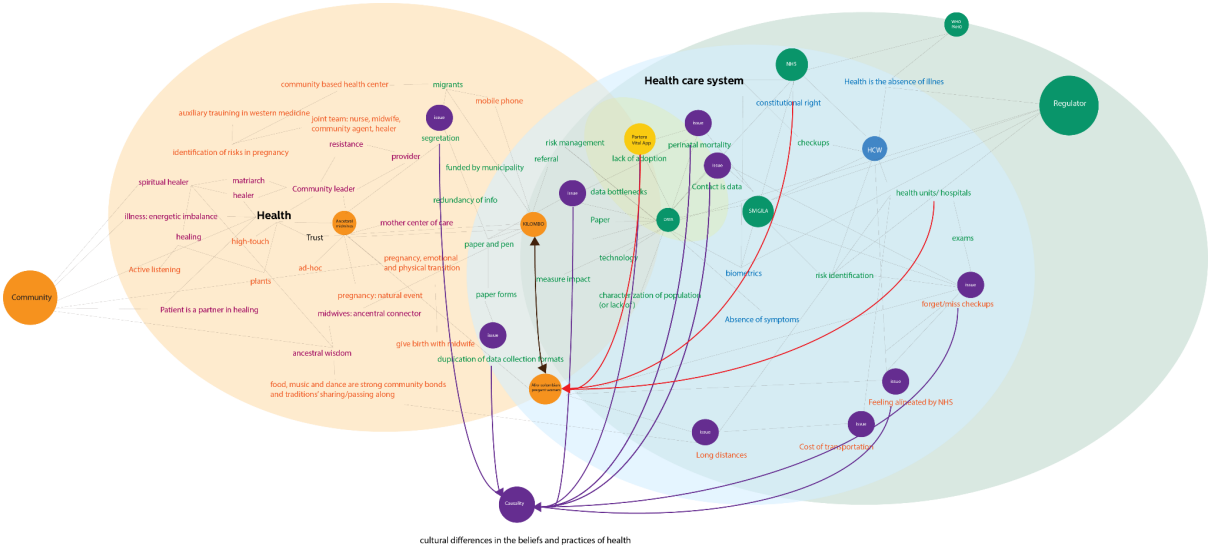
Appendix



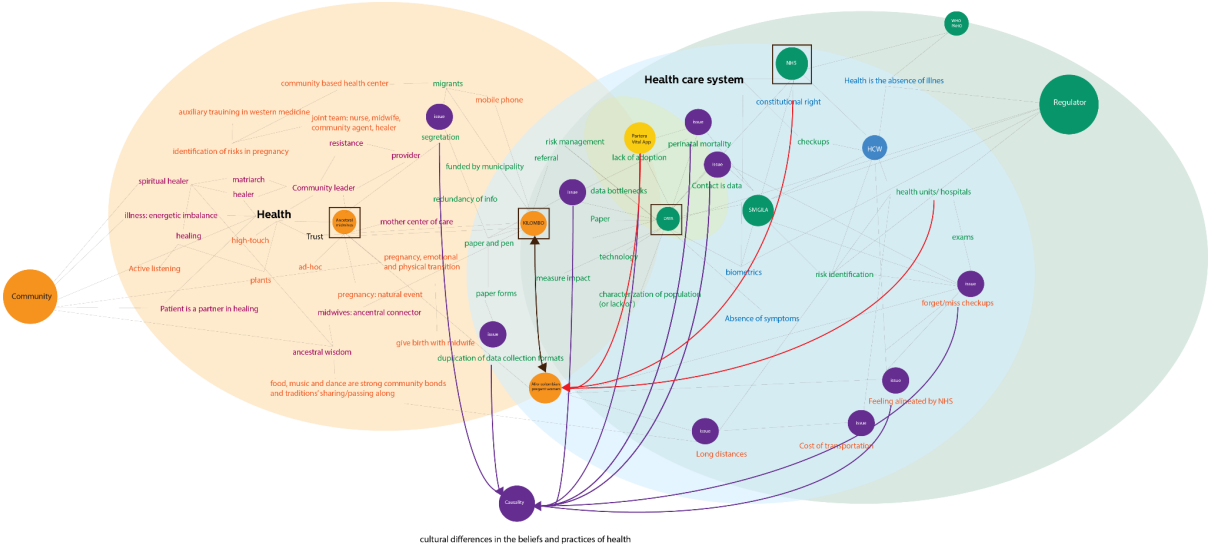
Map 1: Two colliding worlds living side by side, Afro-Colombian and national healthcare actors. Plotted issues and causality (purple arrows).



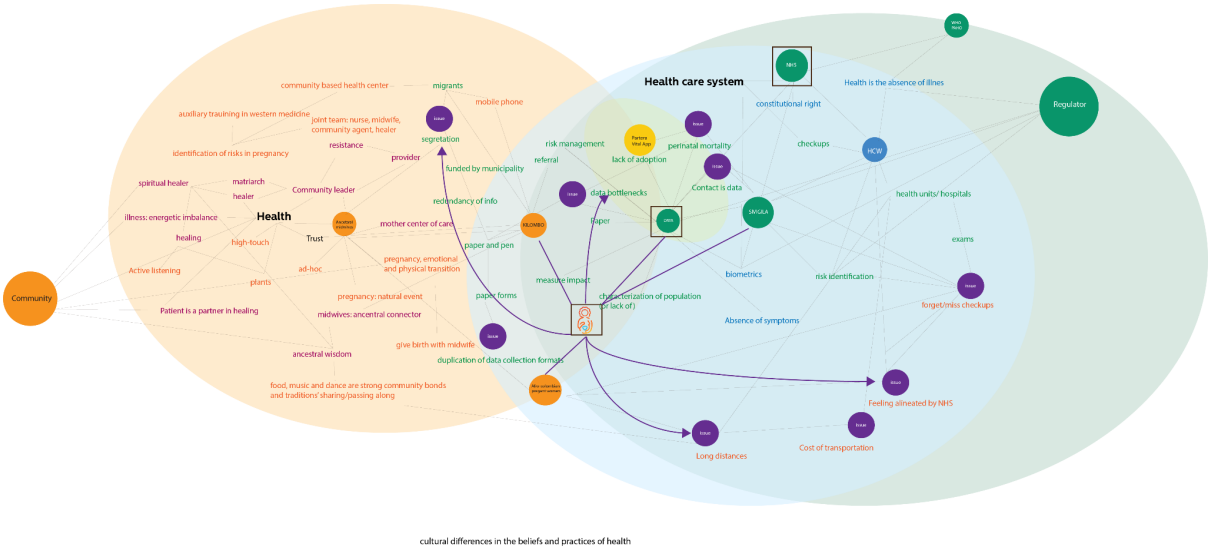
Map 2: equal opportunity mapped with a red arrow



Map 3: dialogical principle mapped with a black arrow



Map 4: Hubs



Map 5: knock-on effects of the Kilombo app in the system mapped with purple arrows