

# Design for Resilience: Mapping the Needs of Brazilian Communities to Tackle COVID-19 Challenges

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## ABSTRACT

The COVID-19 pandemic brought the urgency in the search for innovative solutions in different areas of knowledge to mitigate the effects and impacts of the disease, whether on health, social or economic terms. Urban and socio-economic determinants of informal-settlement communities make COVID-19 challenges even harder to be overcome, requiring local and situated solutions that consider their livelihood diversity. This manuscript shows the results of an exploratory pilot study which addressed the potential of participatory design to contribute to mitigating COVID-19 effects and impacts, identifying the problems, adaptative strategies, challenges for and needs of Rio de Janeiro and Belo Horizonte communities. It was drawn from triangulation of methods and analysis of multiple (primary and secondary) data sources. The needs of communities were raised through online roundtables with community members, representatives of NGOs, designers, architects and researchers. Analysis of the roundtables was conducted collaboratively by the researchers through online tools, including Affinity Mapping, and 5 Whys. The findings point out the needs of communities clustered in 6 major themes, five of which indicate potential areas in which participatory design can play a meaningful role and need to be further investigated.

**Keywords:** Community Needs, COVID-19 Challenges, Design for Resilience, Informal Settlements, Participatory Design.

## 1. INTRODUCTION

This exploratory pilot study<sup>1</sup> aims to identify COVID-19 challenges for informal-settlement communities, defining problems, adaptative strategies, and needs that are caused or exacerbated by the pandemic. It explores the potential of participatory design and co-design to build community-led solutions to problems expressed by community members addressing their related areas of challenges and needs. These were identified through two online roundtables that brought together active community members, NGOs' representatives, designers, architects and researchers from three universities (Lancaster University, UFMG, UEMG). A third roundtable was conducted to validate the results with participants.

The results show that, in addition to the evident demands related to the pandemic (such as making masks and other personal protective gear, assuring income and food, etc.), there are potential opportunities for participatory design contributions in communities, such as:

- improving the information/communication system about the disease and its effects,
- supporting social organization that enables collaborative initiatives (i) to reduce the effects and impacts of the pandemic, and (ii) to generate innovative solutions and strategies for suitable and sustained prevention of the disease,
- strengthening networks and partnerships, scaling initiatives and improving their accountability,
- building dialogues between public officers and communities, and
- recognising the value of women in facing pandemic.

## 1.1. COVID-19

On the 12<sup>th</sup> December 2019, the first case of a new type of coronavirus was officially recognised in Wuhan (Hubei, China), causing a highly communicable disease with a high mortality rate between (just under) 6% and 18% (re-estimated mortality rates by Baud et al, 2020). The pandemic was declared by the World Health Organization (WHO) on the 11th March 2020 (WHO, 2020) and has been bringing impacts on the world population such as health and economic crises as well as exacerbating sanitation problems. Several compulsory measures, which include (1) the construction, expansion or adaptation of hospitals to the conditions required to face the pandemic (Moghadas et al, 2020), (2) development of new medical and personal protection equipment (Tabah et al, 2020), (3) accelerated research for the development of vaccines and medicines (Lurie et al, 2020), (4) severe travel and human displacement restrictions (Chinazzi et al, 2020), and (5) creation and imposition of social isolation rules aiming at contributing to the disease control (Bavel et al, 2020). In this context, design problem-solving approach has been used in several initiatives worldwide, whether for the development of medical (e.g. Marchese, 2020) and personal protective gear (e.g. BBC, 2020), whether for creative approaches to creating effective means for the dissemination of information on the disease and its symptoms (e.g. Escola de Design, 2020; UFMG, 2020).

Brazilian cities began the quarantine in March. On the 16th March, the State of Rio de Janeiro announced the first measures to tackle COVID-19, such as the suspension of schools' activities, football games and events, shopping centres and gyms closures, among others (Procuradoria Geral do Estado do Rio de Janeiro, 2020). Belo Horizonte also closed "non-essential" services and recommended remote work, among other measures (Prefeitura Municipal de Belo Horizonte, 2020).

Belo Horizonte had over 6,000 confirmed cases and 144 deaths due to COVID-19 by the 1st July, according to the Health Secretariat (Secretaria Municipal de Saúde, 2020). In Rio de Janeiro, by the same date, there were over 57,000 confirmed cases and 6,618 deaths, according to the Health Secretariat of Rio de Janeiro State (Secretaria de Estado de Saúde do Rio de Janeiro, 2020).

## 1.2. Informal-settlement communities

Problems caused and exacerbated by COVID-19 are far from being solved, especially among informal-settlement communities (Corburn et al, 2020). In Brazil, the spread of the disease among residents of informal settlements, also known as “subnormal agglomerates (SBAGs)”<sup>2</sup> (IBGE, 2010), “*favelas*” or “(fragile or vulnerable) communities/territories” is of particular concern.

The characteristics of these territories vary across the country. Conditions generally related to these areas include geographic features that are not favourable to regular and safe urbanization, lack of urban infrastructure such elementary public services (waste collection, sewage treatment, water and energy supply, etc.) and the absence of a formal address (IBGE, 2010). Their population is predominantly composed of black and brown people, with a low level of formal education, income sources based on informal or low-income activities (e.g. cleaning, construction work, and waste picking and collection) and female-headed families (Musumeci, 2016).

Houses are usually overcrowded, shared by several generations of a family and sometimes by more than one family. The size and high density of these areas influence the residents’ quality of life, making the conditions of accessibility, ventilation and insolation critical (IBGE, 2010). These hard-living conditions lever particular forms of social organisation. As of 2010 (IBGE, 2010), 11.4 million people, around 6 per cent of the Brazilian population, lived in *favelas*. Rio de Janeiro city concentrates the largest population living in SBAGs with 1.4 million people in 763 agglomerates. In Belo Horizonte, about 307,000 people lived in 169 agglomerates. These are the most recent official figures since the 2020 census was not concluded due to the pandemic. Besides, there is a lack of official qualitative assessments (IBGE, 2010).

There is the need for accessible public data that contributes to understanding the reality and dynamics of these territories and challenges for communities, including an up to date characterisation of urban infrastructure such as elementary services’ coverage and quality, and the accessibility to technology services among others. Neglecting infrastructure corresponds to missing “essential aspects of aesthetics, justice and change” (Star, 1999, p. 379). How can one effectively address these challenges for communities and provide effective policies without knowing their features and extension?

## 1.3. Participatory design for community resilience

Resilience is considered “The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management” (UNISDR, 2016, p.22).

A disaster is “a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts” (UNISDR, 2016, p. 13). Therefore, this pandemic situation is understood as a disaster.

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Effects of a disaster are usually widespread and can be long-lasting, testing the capacity of communities and societies to overcome those using their own resources, requiring support from external sources at regional, national or international levels (UNISDR, 2016).

Most studies looking at community resilience and participatory approaches in emergency and recovery contexts have focused on natural disasters situations. In this context, the resilience of disadvantaged communities relies on community capability-building related to self-organisation, access to resources, network strengthening, collaboration, and to mechanisms that contribute to holding community-led plans and efforts accountable (Berke et al, 2011).

Successful participatory approaches to recovery and post-disaster reconstruction favour community empowerment, ownership, commitment to implementation, trust-building between communities, public officials, and key stakeholder groups, contributing to more resilient communities and to sustainable and inclusive actions and solutions. The sustainability relies on the capabilities of communities built throughout co-development processes to self-organise, access needed resources, and reinforce networks rather than on outcomes themselves (see Berke et al, 2011; Bott & Braun, 2019; Schilderman & Lyons, 2011; Vahanvati & Beza, 2017).

Global guidelines on disaster prevention, preparedness, hazards mitigation, and recovery are approached from a risk management perspective (e.g. UNISDR, 2015; UNISDR, 2016), failing to address socio-cultural determinants and livelihoods' diversity that influence the sustainability of proposed policies and solutions to these.

Capability-building is critical to overcoming recovery challenges and building community resilience. Sen's (1999) capability approach expands the meaning of development beyond the narrow economic view that reduces development to measures such as income and Gross Domestic Product (GDP), emphasising the role of "the effective use of participatory capabilities by the public" (p. 18) as well as of appropriate public policy to enable people "to live the kind of lives they value - and have reason to value" (p. 18). In practice, there is still the need to address the plurality and autonomy-building of communities to promote well-being and capability-building (see for instance Escobar, 2018).

The emergence of participatory design methods can be traced back in the 1960s regarding public decision-making processes in the USA, and systems development during the 1970s in Scandinavia (Sanders & Stappers, 2008; Sanoff, 2007). The notions of participatory design and co-design capabilities are related to (1) designers' traditional skills set that enables tools development (Sanders & Stappers, 2008), and (2) management methods regarding the facilitation of visioning and strategic planning together with communities (Sanoff, 2007). Co-design concerns "collective creativity as it is applied across the whole span of a design process", being a specific instance of co-creation and referring to "the creativity of designers and people not trained in design working together in the development process" (Sanders & Stappers, 2008, p.6).

Participatory design processes are multidirectional learning processes by which designers, diverse stakeholder groups and citizens learn together throughout the process. Three clusters of capabilities are identified in participatory design processes from different mainstreams of participatory design literature (Huybrechts et al, 2018):

2. The capability to visualise – when design teams consciously collaborate with citizens to improve their capabilities "to collectively visualise their different views on matters of concern in their city" (p. 83);
3. The capability to reflect together – refer to confronting different views. This is also acknowledged as capability of knowledge abstraction, and evaluation, being considered speculative in nature;
4. The capability to act – related to enhancing “the confidence of designers and citizens in their capability to take collaborative action” (p.83) regarding the reflections through the use of a design language.

Although communities and their organisations have played a noteworthy role in dealing with disasters throughout history (Patterson et al., 2010), and community engagement is essential to successful disaster recovery, contributing to community resilience and stability, risk assessment and urban planning processes are still often being operated by experts without sufficient community engagement (Meyer et al, 2018). Participatory design, especially its approaches, processes, and methods have no visibility in the disaster discourse and are not systematically investigated. In participatory studies, participation ranges from data collection methods to research approaches such as Participatory Action Research (PAR). Hence, the potential of ‘active participation’ (Sanoff, 2007) through participatory design and co-design is still under-explored regarding emergencies and community resilience-building.

Health and well-being are beyond the absence of disease and span interwoven life’s aspects, being related to lifestyle, and other cultural and socio-economic determinants, including infrastructural ones (i.e. OECD, 2020, Crisp, 2020). Participatory approaches demonstrate proven effectiveness and positive shifts, for instance, in Water Sanitation and Hygiene (WASH) in Least-, Low-, Middle-Income countries using Participatory Hygiene and Sanitation Transformation (PHAST) methods (see for instance Kariuki et al, 2012; Dumba et al, 2013). However, participatory design methods are still under-explored in WASH-related areas as well.

## 2. METHODOLOGY

This qualitative and exploratory pilot study was developed thanks to the collaboration between Lancaster University, UFMG and UEMG. Triangulation of methods (Eisenhardt, 1989; Yin, 1994) was used, including online roundtables, mobile application group discussions, observation during the roundtables, and desk research. This methodology approach was drawn from multiple data sources, including primary and secondary data which were collected and analysed as follows.

Primary data was collected through two online roundtables which were carried out in June. The roundtable script and the analysis process were collaboratively co-developed by the authors. One online roundtable had participants from two Belo Horizonte communities, and another had participants from three Rio de Janeiro communities. Each roundtable lasted around two hours. A third roundtable was conducted to validate the results.

The secondary data collection included public data (NGOs’ and community members’ Instagram and Facebook posts, websites, press news) and literature review focused on participatory approaches to community resilience-building in emergencies and on

mainstreams of participatory design, COVID-19 in the world and in Brazil with emphasis on the disparities and demographics of *favelas* in Brazil.

The sample of this research was purposively selected. The screening of participants provided opportunities for mixed and balanced gender participation and considered participants who are not suffering from bereavement or other distress. The screening was conducted by the researchers on the ground, who were already engaged with the communities, through phone calls. Alternatives of participation such as flexibility regarding the meeting application and the option to have one-on-one discussions were also strategies put in place as a contingency plan to mitigate against participant distress.

**Table 1: Belo Horizonte (BH) online roundtable**

Roundtable role	Gender	Related Community / Role
Participant 1	Male	Community A / NGO representative and community member
Participant 2	Male	Community A / NGO representative
Participant 3	Female	Community B / Kindergarten teacher, community member and volunteer
Participant 4	Male	Community B / NGO representative and community member
Mediator	Female	Lancaster University / Research Associate
Time moderator	Male	UFMG / Master student
Observer 1	Male	UFMG / Professor
Observer 2	Female	UEMG / Professor
Observer 3	Female	UEMG / PhD candidate

**Table 2: Rio de Janeiro (RJ) online roundtable**

Roundtable role	Gender	Related Community / Role
Participant 5	Female	Community C / Nurse, doula and community member
Participant 6	Female	Community D / Journalist and community member
Participant 7	Male	Community D / NGO representative and community member
Participant 8	Female	Community D / Educational project founder and community member
Participant 9	Female	Community E / Social movement representative and community member
Mediator	Female	Lancaster University / Research Associate
Time moderator	Male	UFMG / Master student
Observer 2	Female	UEMG / Professor
Observer 3	Female	UEMG / PhD candidate

Note: informal-settlement community E refers to an occupied building in RJ. The notes regarding this informal settlement specifically are identified as 'RJ (building)' on the maps (results).

The online roundtables were run in the first language of the participants. They were audio and video recorded, transcribed and translated. The analysis of the participants' talks was carried out by identifying and selecting problems, adaptive strategies and challenges around five topics: (1) sources of information, communication means and impacts on routine; (2) prevention; (3) diagnosis and treatment; (4) support, and (5) change.

Problems and adaptive strategies were identified in the participants' speeches in these first four areas. The researchers' notes were clustered according to the similarity between them through cross-reference using an online Synthesis Wall that included areas for each theme and related problems, adaptative strategies and challenges.

Challenges were further explored and developed through two design tools and one engineering method (How Might We [HMW] questions [IDEO.org, n.d.], Synthesis Wall [or



Affinity Mapping] [Service Design Tools, n.d.], and the 5 Ws [see for instance Ohno [1997]]. Changes' and challenges' analyses were conducted through additional cross-reference considering the exploratory HMW questions and 5 Whys topics that led to the identification of 6 themes (regarding needs that should be considered to address the challenges) through another affinity mapping.

Additionally, a group was created through a mobile application for each roundtable group with the purpose of supporting participant-technology interactions, serving also as ice-breaker before the roundtables and providing additional opportunities to ask any question and further discuss the topics after the roundtables.

Our findings were rooted in the real context of the communities, considering the views and perceptions of community members actively involved in COVID-19-related initiatives in their communities and NGOs' representatives who have been engaged with these communities. Our contribution relies mainly on what can be learnt from these as pointed out by Stake (2000, pp. 446-447): "Potential for learning is a different and sometimes superior criterion to representativeness". As emphasised in ethnography we are interested in understanding viewpoints, "surfacing silenced voices" (Star, 1999, p. 383).

### 3. RESULTS

The maps below show the results regarding problems, adaptive strategies, areas of challenges and the relationships between them. Notes that refer only to the context of Belo Horizonte communities were identified with 'BH'. Notes that refer only to Rio de Janeiro communities were identified with 'RJ'. Notes that refer only to the community E informal settlement were identified with 'RJ (building)'. The remaining ones without any indication were mentioned by community members in both cities.

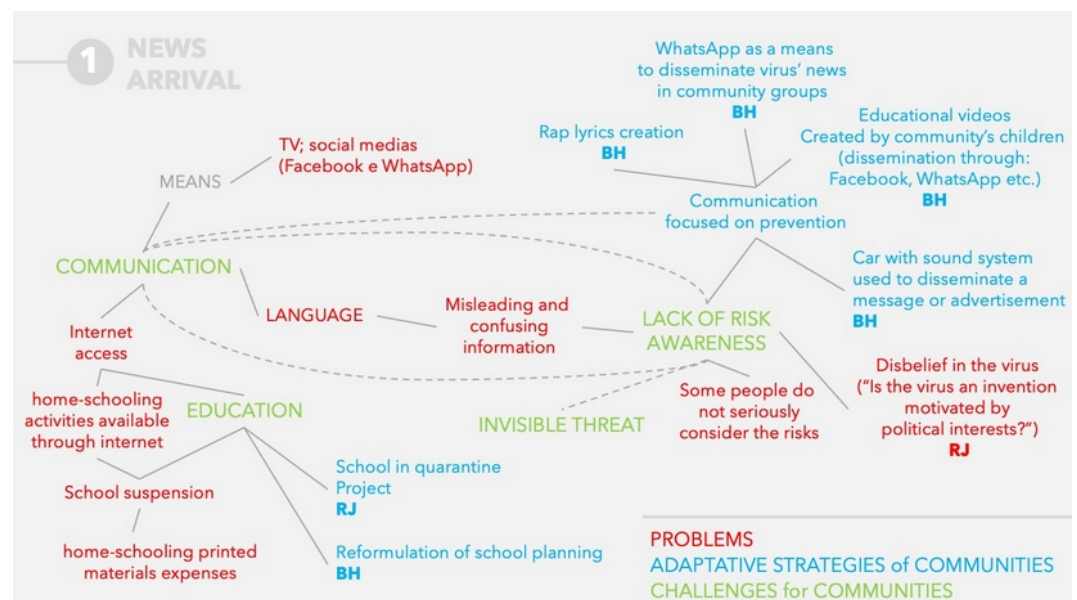


Figure 1. Theme 1: news arrival - sources of information, means of communication and impact on routine.

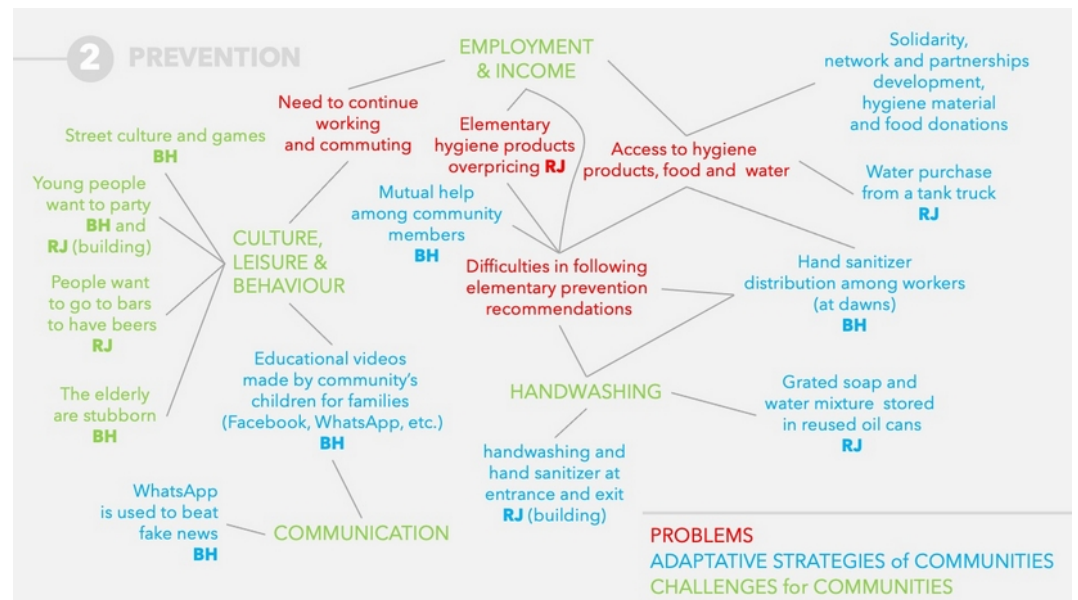


Figure 2. Theme 2: prevention.

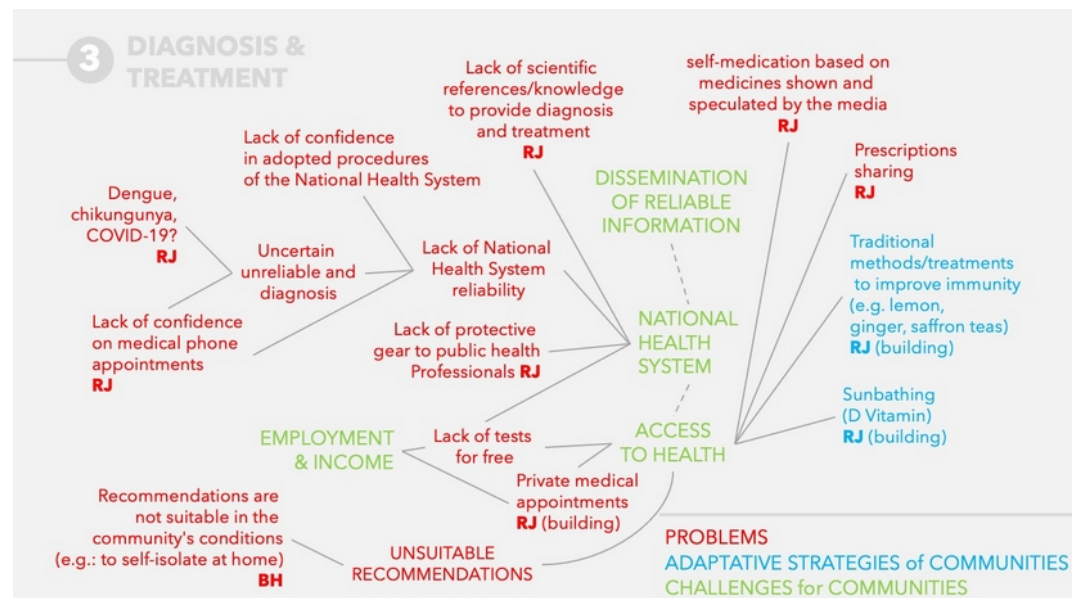


Figure 3. Theme 3: diagnosis and treatment.

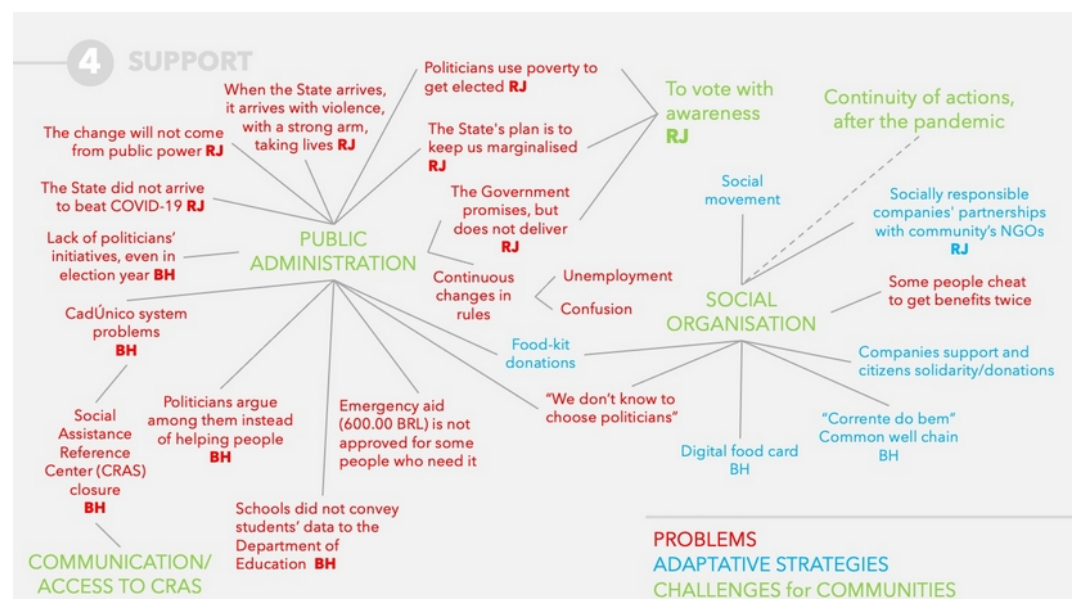


Figure 4. Theme 4: support (public sector, institutions and other organisations).

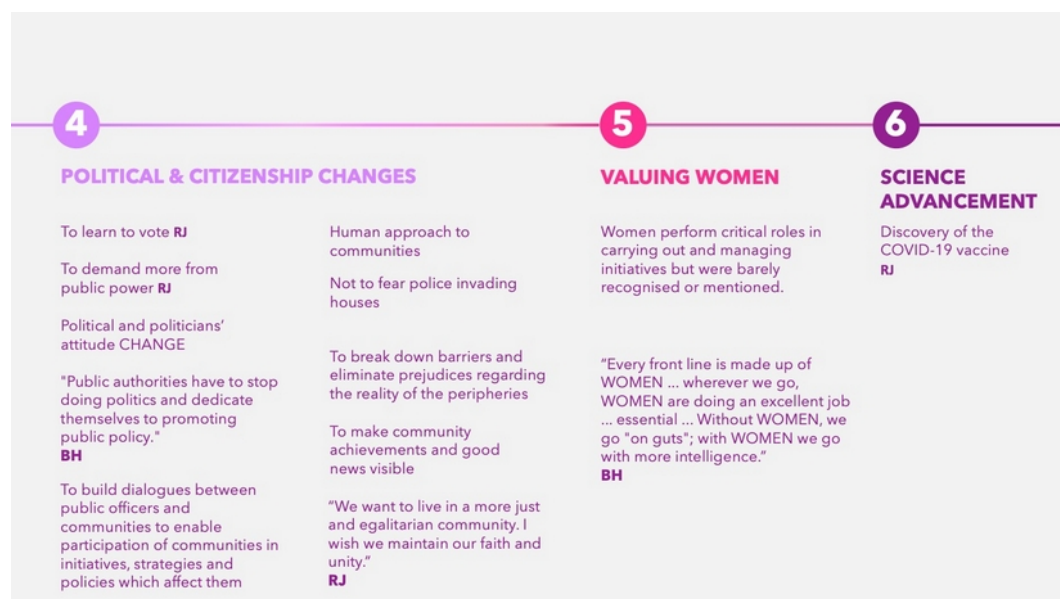




Figure 5. Areas of challenges.



(a)



(b)

Figure 6. Needs related (a) to themes 1, 2, 3 and (b) to themes 4, 5, 6.

## 4. DISCUSSION

Prior literature on community resilience using participatory approaches to emergency and recovery emphasises the importance of community-led solutions, stressing the needs (1) to hold local planning efforts of communities accountable, (2) to reinforce community self-organisation and networks, building capabilities and enhancing their access to needed resources, including external ones. This literature on emergencies focuses mostly on natural disaster emergency and recovery. Besides, the main guidelines on these situations adopt a risk management perspective, failing to address livelihoods diversity, including socio-economic and cultural determinants.

This pilot study looked into community resilience potential through a design lens and identified intersections with the findings of other participatory studies on community resilience. In the context of the pandemic in communities, the need to develop, test and implement community-led solutions to enable comprehensive and sustained initiatives which can mitigate COVID-19 effects and impacts on these communities was recognised. COVID-19 threats also exacerbate existing problems. Additionally, the need for mechanisms that can contribute to the accountability of community-led plans and solutions in order to promote equality and justice in the distribution of benefits was identified.

The importance of participatory design in the pandemic situation drew attention to needs, beyond the above-mentioned aspects in the disaster context, such as:

- To inform policy briefs and recommendations,
- To build dialogues between public officers and community members,
- To set collaborative, respectful, plural and human strategies to beat and mitigate COVID-19 effects and impacts on communities in diverse thematic areas (see Figure 6) as emphasised by community members during the validation process.

The political environment characterised by conflicts involving power disputes and corruption scandals as well as politicians' attitude as 'tourists' close to the polls aggravate the situation, influencing on community disbelief in COVID-19 threats (see Figure 1 problems) and community distrust of politicians (see Figure 4 problems). Communities do not believe that a positive change can be brought from politicians' initiatives (see Figure 4 problems) and have acknowledged the critical role of active community members, NGOs and private sector partnerships and collaborations as a way to mitigate the COVID-19 effects and impacts (see adaptative strategies of communities in Figures 1, 2, 3, 4). Most strategies are community-led.

Furthermore, the need (1) to co-design sustained initiatives and extend existing ones, (2) to eradicate the stigma and prejudice towards communities, and (3) to recognise the value of women were pointed out throughout roundtables conversations (Figure 6). This pilot study contributed to initiating dialogues and reflections (Huybrechts et al, 2018) with community members employing visualisation tools and research techniques. It also highlighted relevant themes (themes 1 to 5, Figure 6) to be addressed through collaborative actions utilising participatory design to co-design plural solutions, strategies, actions, and inform policies.

## 5. FUTURES RESEARCH AND LIMITATIONS

This study contributed to understanding community members' perspectives and initiatives to cope with the pandemic threats and pointed out areas that still need to be investigated and developed through future participatory design research. They range from short-term to long-term development to contribute to community-led solutions and initiatives. Our findings are not statistically significant as the sample of this study was very small, and it would be very difficult to statistically define enough participants considering this research timeframe, resources, and especially the accessibility of participants to technologies (required to preserve their safety in the current pandemic circumstances). This is a typical feature of real context studies that differ from lab experiments (see for instance Paulus et al, 2015). Moreover, the knowledge gap regarding *favelas'* and informal-settlement characteristics and up to date demographic data still hamper the understanding and extension of the challenges for and needs of vulnerable communities. Thus, future research can contribute to understanding the applicability of participatory design, specifically of the potential of co-design of collaborative initiatives, in emergency and recovery situations, theme that is still under-researched.

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## ENDNOTES

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<sup>2</sup> The subnormal agglomerate is a cluster composed of at least 51 households. Most subnormal agglomerates lack elementary public services, occupying or having recently occupied (public or private) land owned by others. They are high-density areas and their buildings are usually disorderly arranged. In some Brazilian cities, small SBAGs predominate fragmented in the urban setting. In others, there are rather large ones, with over 10,000 houses (IBGE, 2010).

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