Community-based Co-design across Geographic Locations and Cultures: Methodological Lessons from Co-design Workshops in South Africa

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ABSTRACT

In this article, we report on methodological reflections that emerged during community-based co-design workshops exploring maternal and child health challenges across four provinces in rural and urban South Africa. Based on these workshops, we present how cultural norms such as hlonipha facilitated learning opportunities for participants' engagement with gender norms and relations with community leaders and senior members of the community. We also describe stark contrasts with regards to cultural norms between rural and urban sites and their implications for co-design activities. By reflecting on the multi-linguistic, social, and cultural challenges conducting workshops across geographic locations, we discuss how cultural nuances influenced co-design workshops and artefacts. Adjustments to the rhythms of the workshops and co-design activities enabled "transferability" between rural and urban settings, and across diverse cultures, regardless of whether these settings include members from the same cultures.

CCS CONCEPTS

• **Human-centered computing** → **Participatory design**; *Contextual design*; *Field studies.*

KEYWORDS

multi-cultural, inter-disciplinary, community-based co-design, cultural norms, maternal and child health.

ACM Reference Format:
Sarina Till, Jaydon Farao, Toshka Lauren Coleman, Londiwe Deborah Shandu, Nonkululeko Khuzwayo, Livhuwani Muthelo, Masenyani Oupa Mbombi, Mamare Motlhatlhedi, Molebogeng Motlhatlhedi, Gugulethu Mabena, Alastair Van Heerden, Tebogo Maria Mothiba, Shane Norris, Nervo Verdezoto, and Melissa Densmore. 2022. Community-based Co-design across Geographic Locations and Cultures: Methodological Lessons from Co-design Workshops in South Africa. In *Participatory Design Conference 2022: Volume 1 (PDC 2022 Vol. 1), August 19-September 1, 2022, Newcastle upon Tyne, United Kingdom.* ACM, New York, NY, USA, 13 pages. https://doi.org/10.1145/3536169.3537786

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PDC 2022 Vol. 1, August 19-September 1, 2022, Newcastle upon Tyne, United Kingdom

ACM ISBN 978-1-4503-9388-1/22/08…$15.00
https://doi.org/10.1145/3536169.3537786

1 INTRODUCTION

Collaborative design, or co-design focuses on the empowerment and inclusion of communities inexperienced in design work; democratising design and creating sustainable and context-appropriate innovations. Sanders and Stappers's [51] definition of co-design as "the creativity of designers and people not trained in design, working together in the design process," has been a reference point for many projects seeking to involve communities and marginalised people in the development of solutions to local challenges [15, 28, 52, 56]. The Information & Communication Technologies for Development (ICT4D) community acknowledges the importance of co-design as a means of mitigating the ethical and design conflicts that arise when working in diverse, under-resourced, and often exploited settings, which has led to the need to understand how to conduct co-design appropriately and effectively in different contexts [28, 61]. Co-design is rooted in participatory design (PD), a design approach conceived in Scandinavian workplaces in the 1970s, and its concerned with the democratisation of innovation and design processes [20, 46]. While co-design is seen as a step forward from user-centred design (UCD), and emphasises the role of communities in decision-making processes within the design and development of solutions to their problems, it has maintained elements of its Western origins [62]. This has complicated the purpose of co-design as a liberating and inclusive design approach since it reinforces the power differentials between researchers and participants, particularly in under-served communities [25]. Researcher-participant power dynamics have always been a challenge in ICT4D work, and with co-design similar challenges arise. Alienation of participants through use of foreign materials [27], assumptions of equal educational backgrounds, and reinforced professional hierarchies have played a role in how co-design projects have been conducted, especially in the Global South. On the African continent, co-design has become increasingly popular which has illuminated the contextual and ethical challenges the application of this method faces [28, 61].

In this paper we report methodological challenges, diverse cultural nuances to consider, and lessons learned while conducting co-design workshops across geographical locations and cultures in four South African provinces, in the context of digital maternal and child health. We explore the application and transferability of co-design activities and discuss the cross-cultural and contextual experiences. This paper contributes and extends research to community-based co-design practices in multicultural, multifaceted settings within South Africa, and lessons of community-based co-design engagement in such settings.

2 BACKGROUND

2.1 Challenges of community-based co-design and ICT4D

Community-based co-design (CBCD) is the application of co-design techniques with the active involvement of the community being designed with, while embracing their values and norms. As Groeneveld, Boess, and Freudenthal [21] state, the CBCD approach treats community members as "equal partners in the design process." Furthermore, CBCD should also acknowledge power differentials and enable an environment where all stakeholders, designers, researchers, and other community members, can create collectively. The aim being to instill ownership, embrace the expertise of the community on their own challenges, and encourage full participation of community members in developing solutions. While these objectives are ideal, there are a multitude of challenges that co-design face in multi-cultural and diverse settings.

Presenting foreign modes of engagement to communities as a means to address local issues can be "intrusive or harmful to certain communities" [25]. Co-design, as practiced by many HCI researchers, involves a consideration of many assumptions not necessarily held by the community. Language is a significant barrier to successful community engagement more so within multidisciplinary teams when trying to reach common understandings [47]. This is further exacerbated when English-speaking researchers enter into communities who are non-native English speakers [59]. This has an impact on both the success of co-design activities, and how the activities and outputs may conflict with specific cultural norms. Stakeholders' different and conflicting interests can also complicate the co-design process, with multifarious motivations influencing how people participate [7]. Additionally, a contrast in values and goals of community collaborators and external organisations they are affiliated with can impede on co-design processes, as shown in the work of Gautam et al. involving vulnerable populations in Nepal [18]. They underscore the role of participatory design as a means of negotiating values [22] to achieve "comprehensive democratic participation" [18]. They also raise concerns about the ramifications of prioritizing certain vulnerable voices and how it could impact relationships with organizations that are designed to aid the community, leading to long-term ethical concerns. These are all ongoing tensions that need to be identified and explored when engaging with communities. The design tensions framework [58], which highlights the challenges of conducting collaborative research, emphasises the importance of reflection on design activities especially when conflicts and divergences in understanding can impact research. It serves as a guide for navigating systems and communities holistically, especially in the relations that exist within the community networks.

Power, time, and space, all which influence how human beings communicate in groups, have culturally-embedded properties that impact how communities function [26]. According to Foucault, power can be defined as relations between parties and is also defined by those parties [16]. He elaborates further that a person or collective influences others' actions by their own actions, demonstrating an exercise of their power [13]. These power dynamics, if misunderstood and mishandled, can have adverse effects on co-design and implementation [13]. Culturally-specific perceptions of space and territory have characteristics that contribute to how co-design is conducted as well [26, 53]. Spatial rules and cultural norms are important values to communities, with governing structures, communal spaces, and dedicated areas and buildings forming part of community culture. As such, it is essential for external researchers to be aware of any imposition on these norms in an effort to mitigate "cultural shock" in which there is unfamiliar behaviour and a lack of familiar environmental elements [23]. Understanding the cultural context will direct the approach researchers take and positively influence respect and consideration of beliefs in

the community [28]. Many of the challenges mentioned relate to acknowledging and navigating how power dynamics function in the relationships within the project, and within the community itself. Community-based co-design as part of ICT4D work is difficult to implement with many challenges, as researchers enter into an unfamiliar context with limited methods of engagement. ICT4D Ethics [12] and the San Code of Research Ethics [54] [1] are imperative resources to consider and enforce when working with multi-cultural and marginalised communities. Addressing this, one has to consider methods that embrace, rather than diminish, the norms and values of communities [44].

2.2 Methods across cultural contexts

Conducting co-design methods across different cultural and geographical contexts comes with various methodological challenges. Winschiers-Theophilus et al. [63] highlight the complications in contextualised research and transferability in their community-based co-design work conducted in rural sites in Namibia and Malaysia. They identified some key concerns that contributed to "cross-contextual transferability". These included community engagement, where deeper engagement leads to more "transferable" and transmissible innovations, and context, describing how common contexts and community needs in which co-design takes place leads to an increase in success of the end product and its evaluation across the regions. The works of Winschiers-Theophilus et al. [63] as well as others [28, 59, 61] aim to establish a mutual collaborator relationship between researchers, participants, and other stakeholders [32] but how this is achieved across cultural contexts remains a challenge. Postcolonial computing, as proposed by Irani et al. [29] offers an approach that regards diverse cultural epistemologies and historical contexts as a means of understanding and designing with communities for development. Delving deeper into cultural realities and working with vulnerable populations, the field of maternal and child health in various contexts requires additional care and consideration [3, 57].

2.3 Digital maternal and child health

Maternal and neonatal mortality is one of the major global health challenges, with low- and middle-income countries (LMICs) being significantly more affected and burdened [38]. In recent years, the use of digital health to support the care and health services of mothers in under-resourced areas has thus become prominent [6]. Co-design, as a means to innovate with and for mothers, is also popular, but not without obstacles. Wardle et al. [61] explore a co-design methodological approach with breastfeeding mothers in Cape Town, South Africa, using brainstorming and prototyping workshops. They formulated three factors to consider when designing with breastfeeding mothers including a focus on how engagement with design activities is influenced by caring for a baby, and empowering mothers through positive reinforcement. Mustafa et al. [39] also offer valuable insights into how religion and patriarchy impact design for maternal and child health in an under-resourced community in Pakistan. Lack of agency of mothers over their own health, misinformation, and household power dynamics are some of the significant contributors to how design of interventions are impacted. Additionally, existing interventions are poorly suited for many contexts, especially when cultural factors mentioned are ignored in design [29]. D'Ignazio et al. [14] and Gibson & Hanson [19] both employ workshop co-design methods when engaging with mothers. They uncover key insights into such design, including how feminist HCI [5] is an appropriate framework for co-design work with mothers, and how deviations from a planned approach may sometimes be necessary in certain circumstances. Lastly, Kumar et al. [30] identify the need for a "long, holistic, and intersectional view" of the wellbeing of women and the use of deep engagement with communities and multiple stakeholders to achieve this. Intersectionality [9], an integral framework for feminist HCI [5] and the empathic engagement effective CBCD demands.

While the above studies provide a valuable basis for co-design with mothers, each study does so in a single context. This presents an opportunity to explore how co-designing with mothers can be conducted across cultural contexts in a localised region, and whether such "transferability" of co-design methods is appropriate to support the design of culturally sensitive research and technologies for maternal health in the Global South, with a particular focus on four different provinces in South Africa.

3 METHODS

3.1 Research Design

This paper reports on the use of community-based co-design workshops to explore maternal and child health challenges and digital health opportunities in South Africa. These co-design workshops took place as part of a larger project initiated by an interdisciplinary team of researchers within and beyond South Africa, across social sciences, computer sciences and medical sciences. The project consisted of three phases. First, a Scoping Review was conducted to better understand how community-based co-design and ICTs health innovations manifested around maternal and child health in South Africa. Second, interviews with key community stakeholders such as mothers, fathers, other caregivers, and Community Health Workers (CHWs) were conducted to better understand the challenges these stakeholders faced when accessing maternal and child health (MCH) care. We finally concluded this study with generative CBCD workshops which allowed the community to prioritise the challenges identified in Phase II to brainstorm and prototype possible solutions. The work reported in this paper includes only the co-design work from Phase III. The previous two phases will be reported separately. The overall project and every phase of research received ethical approval from four local ethics committees in South Africa (University of Cape Town, University of Limpopo, The Human Sciences Research Council, and University of Witwatersrand) and one abroad (Cardiff's School of Computer Science and Informatics).

3.2 Research Sites

South Africa is a diverse country with a population of approximately 58.8 million people[2] and 11 official languages spoken by the various cultures found in the 9 provinces of the country[3].

[1] https://www.globalcodeofconduct.org/affiliated-codes/

[2] http://www.statssa.gov.za/?p=12362

[3] https://www.brandsouthafrica.com/south-africa-fast-facts/geography-facts/language

The co-design phase of the project took place across different geographical locations in South Africa: Sweetwaters - KwaZulu-Natal (KZN), Soweto - Gauteng province, Ga Dikgale, Ga Mamabolo and Ga Mothiba within rural Limpopo province, and Athlone in Western Cape. The research sites were purposefully selected to ensure geographical and cultural variation [43], taking advantage of the existing relationships with the communities from the local collaborators in each site. The research sites were spread across South Africa, some within rural areas (KZN and Limpopo) and some in urban areas (Gauteng and Western Cape), also including low-resource communities that would benefit most from digital MCH. The diverse nature of South Africa made the selection of the correct facilitators crucial to the success of the workshops. The 11 official languages also vary according to the provinces. For example 95% of the people living in the Limpopo province speak Sepedi whereas isiZulu is spoken by 79% of the people from KwaZulu-Natal, and Soweto represented various cultures such as SeTswana, SeSotho, and isiZulu.

3.2.1 Sweetwaters - KwaZulu-Natal Province. The first community engagement workshop took place at a community-based research center in Sweetwaters. Sweetwaters is 97Km outside Pietermaritzburg in the uMgungundlovu district and is zoned as a rural area with a household income of R2,400 per month [4] ($1 = R14.68). This community comprises of around six hundred thousand people and is representative of the Zulu population in KZN with 100% of the population listed as Zulu speakers[5].

3.2.2 Soweto - Gauteng Province. The second community engagement workshop was scheduled at a health-based research centre within a local hospital precinct in Soweto, a peri-urban, low to middle income area in Gauteng, South Africa. Soweto is South Africa's largest township located in Johannesburg. This township comprises of around 1,3 million with the dominant language being isiZulu [6]. The average monthly income for this region is R2,500 [7].

3.2.3 Dikgale - Limpopo Province. The Limpopo province hosted our third workshop. Ga-Digkale is zoned as a rural, low income area with a monthly income of R1,250 [8] and is located 90km east of Polokwane. This community is representative of the Sepedi people with 95% of the 9 353 people in this population listed as speaking Sepedi [9].

3.2.4 Cape Town - Western Cape Province. The final workshop was conducted with a local NGO that is based in Athlone, and offers services such as physical, speech, and occupational therapy to mothers of special needs children who would otherwise not be able to afford these services. Athlone has a population of roughly 33,314 people. The area is zoned as urban with a monthly income of around 4,775 ZAR per month. This population is predominantly English speaking with approximately 59% of the population listed as English speaking followed by 29% Afrikaans and 8% isiXhosa [10].

3.3 Challenge Identification

To contextualize the work reported in this paper for the co-design phase, we provide a summary of the second phase that involved conducting telephonic and in person interviews with mothers and fathers. These interviews aimed to better understand the challenges the participants faced while trying to access health services for themselves or their children. The interviews were conducted from January to June 2021, either in person or online, depending on the COVID-19 infection rate and subsequent lock-downs present in the country. Informed consent was obtained verbally or written before each interview and participants were invited to take part in the workshops discussed in this article. We conducted 58 interviews. This included eight participants from Cape Town, twelve from Limpopo , ten from Sweetwaters, and 28 from Soweto. The interviews were conducted in the local language and the calls were recorded. The recordings were transcribed and analysed by five researchers using thematic analysis. Based on the findings from the interviews and the insights from the scoping review, we identified ten challenges that became the starting point for the co-design phase reported in this paper. These challenges are: 1) Parent well-being, 2) Traditional healers versus western medicine, 3) Postpartum care, 4) Building parenting skills in early life, 5) Accessible and affordable access to health information, 6) COVID-19 vaccine hesitancy, 7) Misinformation, 8) Personalised and timely support, 9) Health worker emotional support for parents and other care givers and finally 10) Involving fathers. These challenges include the challenges that affect both urban and rural communities.

3.4 Challenge Prioritization

3.4.1 Developing Challenge and Design Cards. As visual methods have shown their potential to actively engage with the community while capturing maternal health lived experiences [3, 4], we designed a collection of challenge and design cards (see figure 1) to visualize the identified challenges and aid the discussion and brainstorming of potential solutions. Design cards have been successfully used to graphically depict complex concepts, facilitate brainstorming, share understanding [34, 47], and to facilitate co-design while developing sensitivity and empathy [2, 31, 37, 57, 64]. Considering the literacy levels of the communities, the cards were designed with minimal writing and used pictorials, aiming for a more realistic visual styles [1] to support the understanding and sharing of the lived experiences of our communities. These black and white images further depict men and women representative of the communities used in this study, aligned with existing literature [55, 60]. The buildings and surrounds depicted in the images are representative of both rural and urban settings. Graphics were used to enable cost-saving replication and transferability across regions and cultures and the text on the cards were translated into the languages of each community. Limitations on the use of the cards included oversimplification of challenges and overloading of

[4]http://www.statssa.gov.za/publications/P0318/P03182019.pdf
[5]https://wazimap.co.za/profiles/municipality-KZN225-the-msunduzi/
[6]http://www.statssa.gov.za/publications/P0318/P03182019.pdf
[7]https://wazimap.co.za/profiles/ward-79800042-city-of-johannesburg-ward-42-79800042/
[8]http://www.statssa.gov.za/publications/P0318/P03182019.pdf
[9]https://wazimap.co.za/profiles/ward-94703017-makhuduthamaga-ward-17-94703017/
[10]https://wazimap.co.za/profiles/ward-19100049-city-of-cape-town-ward-49-19100049/

information. These were mitigated by merely using the cards as a starting point for reflection and discussion on local challenges.

3.4.2 Accounting for the local socio-cultural context. Language is known as a significant barrier to fruitful engagements between researchers and communities who do not share the same language and culture [47, 59]. It was clear that the workshops needed to be facilitated by researchers who not only spoke the local language, but also understood the cultural norms and customs of the people in each of the provinces visited during this study [42]. We upskilled research facilitators by training local researchers with similar levels of experience in qualitative research who also spoke the local language. Two members of the research team with experience in co-design and design thinking engaged with the local researchers to test the co-design activities.

3.4.3 Participants. Through the help of our local collaborators we recruited a total of 43 community participants including mothers, fathers, and CHWs. We provide more details on these participants in Table 1.

3.4.4 Co-design Workshops. Each workshop started with the facilitators welcoming the participants and setting the stage by explaining that every contribution provided by the community would be considered valuable. The researchers reaffirmed consent which included recordings, photographs, and video to ensure that the participants were still comfortable to engage in the workshop. This was done verbally in KZN, Gauteng, and the Western Cape, and written consent was obtained in Limpopo in their local language (Sepedi). The workshops included the following three activities: 1) challenge card discussion and challenge prioritization, 2) brainstorming, and 3) low fidelity prototyping.

- **Challenge card discussion and prioritization:** It was important to ensure that the researchers, facilitators, and participants had a shared understanding of the challenges illustrated by each challenge card, to enable the participants to prioritise the challenges as a group. This was achieved by using the challenge cards as an ice breaker activity during which the facilitators asked participants to explain what they see in each of the illustrations. Thereafter, the facilitator asked the participants to give an example of an instance when they faced similar challenges in their daily lives. Finally the facilitator ensured that the participants and the researchers agreed on the challenges depicted on the cards by asking the community if they agreed with the title displayed on the card in the local language. The cards where then placed on a wall to allow the participants to rate the challenges according to how much the challenge affected them. The top two or three challenges were then selected for the brainstorming session which we discuss next.
- **Brainstorming Session:** We started this session by explaining each of the design cards, paying special attention to the technology design cards to ensure that the participants understood how the technology illustrated in each card worked and how it could be implemented. The participants were then divided into groups in separate rooms with the facilitators. The researchers were present only as a support mechanism should the facilitators need any assistance in rolling out the co-design activities. The participants were provided with the design cards (see figure 1) which depicted possible resources (people, places and technologies) that could be used to generate solutions for the elected challenges, as well as cardboard posters and markers. The facilitators asked the community members to come up with as many solutions as they could think of and to use the design cards to help them ideate these solution during a one-hour session.
- **Low Fidelity Prototyping Session:** In the last co-design activity, participants were briefed to engage in low-fidelity prototyping. During the training of facilitators, how to present prototyping as an activity was discussed for each context. Simplified definitions of prototyping were brainstormed, including: creating examples of the ideas using the materials provided; making physical representations of the brainstormed ideas; and using the craft materials to bring ideas to life. It was made clear that low-fidelity meant that creations do not need to be sophisticated and advanced, but rather just an example to visualise and explain how ideas could work. By making use of arts and craft supplies, as well as the design cards, participants were thus tasked to prototype at least one of the potential solutions that emerged from the brainstorming session. Participants were guided on how to use different crafting supplies to represent an idea or parts thereof, especially if any participants got confused with the activity. Effort was made to ensure participants' imaginations were not limited by creating examples unrelated to their chosen ideas, and to be as abstract as possible using the materials provided. The aim was to overcome any barriers to creativity when wanting to represent unfamiliar concepts. Since this was a new activity for most participants, there was the risk that they would replicate any example shown to them and thus create a bias and limit the diversity of prototypes created. The prototyping session lasted for an hour. The session was concluded with the participants presenting their potential solutions to the group.

3.5 Data Analysis

Notes from three sites were taken by a bilingual researcher and the audio recordings were transcribed to support the analysis. For the remaining site a local facilitator transcribed and translated the audio recorded isiZulu to English and also supported the analysis. We reviewed the notes, identifying similarities and differences in the conducting of workshops and how the participants responded after the workshops were concluded. All the collected materials which included recordings, photographs, and notes were thematically analyzed. These themes were iterated upon and the most prominent findings are described below.

The data analysis for this study took place after the field work was completed. Thus, we could not include the participants of the study in our data analysis and had to refer back to video, audio, and written notes to validate the themes identified.

4 FINDINGS

In this section we discuss the cultural norms and that played out in the activities of the co-design workshops and how these norms

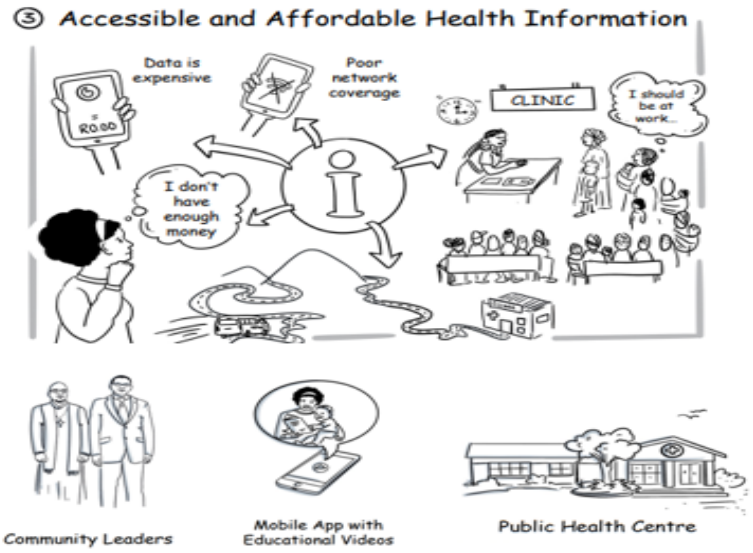

Figure 1: Example of an MCH challenge card (top) and design cards (bottom)

Table 1: Breakdown of participants.

Site	Mothers	Fathers	CHWs	Workshop duration
KZN	7	1	2	6h30
Soweto	9	0	2	5h00
Limpopo	5	5	2	5h30
Western Cape	8	0	2	6h00

affected the workshops. We also discuss the complexities that arose in our ranking process and the impact of using the design cards to support the brainstorming and prototyping sessions.

4.1 Unpacking Cultural Observations

4.1.1 Hlonipha. Hlonipha is a cultural politeness phenomenon [41] present in both language and cultural practice, found in South Africa and other African countries [17, 36], which strongly dictates gender norms and be further extended into how it affects men and women differently [49], as it also refers to how women are allowed to speak, especially in the company of men. For example, it is expected that you do not look men or elders in the eye while speaking to them. Fandrych [17] explains that this practice is so entrenched in South African cultures that the Sotho set of languages can be discussed as two separate dialects, namely Sesali spoken by women and Senna spoken by men. This occurs because there are terms regarding sexual organs that women from the cultures that practice hlonipha are not allowed to use. This manifested in the rural areas with the women, particularly those in KZN, who were uncomfortable with discussing the **Postpartum Care** design cards. The facilitators in KZN reassured the participants that there is no topic that they could not discuss openly and freely. However, the KZN-based participants only fully discussed this card once explicit permission to do so was obtained from the male participant. In addition, participants in Limpopo, similar to KZN, were also more reserved when discussing this card, with one male participant politely refusing to discuss the card, stating:

> *"No, No I am out. Skip me."* - Father, Limpopo

The **Involving Fathers** also highlighted gender issues. The rural mothers in KZN did not believe that involving fathers is a challenge or priority within their community. Much of Zulu culture believe that it is a woman's job to raise the children. It is not a role that is traditionally fulfilled by men. The female participants discussed the fact that having partners who are not involved in the upbringing of their children is challenging. As expected very few mothers voted for this card as one of the challenges they would like to explore further, regardless of the fact that this card was discussed in detail during the sessions. This can be attributed to the fact that the women believe child rearing is solely their responsibility and fathers only render financial support portraying a largely patriarchal community. This card brought more attention to absent fathers in Limpopo; surprisingly, it was the fathers who led the discussion, not the mothers. The male community leaders started the conversation by stating:

> *"This is a problem in our community. Fathers get bored with their children at home and go to the tavern. They are like visitors in their own homes. We need to teach*

> *men about raising children."*- Father and community leader,Limpopo

One father disagreed, and stated that he would have liked to be more involved in his child's life:

> *"I disagree. Women will not let men take the journey with their children."* - Father, Limpopo

Some mothers agreed that fathers are absent; however, at least one mother stated that she has a husband who is very present in raising their child. Unfortunately this card did not receive many votes. In fact, it received the least amount of votes and had to be discounted. This was interesting to observe, because this community kept looking for the presence of fathers in all the challenge cards where they were not explicitly depicted. They kept asking:

> *"Where is the father?"* – Mother, Limpopo, *"Is this a single mother?"* – Father, Limpopo

Hlonipha also touches on the patriarchal nature still present in some South African cultures where respect is shown in terms of seniority first followed by gender [33]. This was prominent in both KZN where the women had to ask explicit permission to discuss taboo issues in the presence of males. We observed how cultural norms, absent at the other sites, manifested in Limpopo. This being the workshop with the most male participants. The workshop in this region included two male participants who were members from the local royal family as well as a *Headsman* who served as a representative of the royal council. This altered the workshop dynamics with a member or the royal family opening the workshop and welcoming both the researchers and the participants. This community would also allow the members of the royal family to answer any questions asked by the facilitator first. There are, in contrast, instances where the dominance of the community leaders opened the door for discussions of taboo topics with the Headsman openly addressing the Postpartum Care card by stating:

> *"This is a mom, who we should be taken care of at home"*
> - Father and community leader, Limpopo

The participants further deferred the leadership of the brainstorming and prototyping activities to two senior community members. These observations have implications impacting our co-design work across low-income communities, especially when considering methodologies that aim to lessen power imbalances and instill equality in research activities. This can be very difficult to do in settings as experienced by Mustafa et al. in Pakistan and Bangladesh [39, 40] and is relevant in this context, where cultural practices such as hlonipha are at play. Female participants will always be disadvantaged in these settings and limited in their responses if the existing dynamics persist during their life time.

Finally, hlonipha also loosely translates to respect and is present not only in African cultures but also African languages. The practice and observation of hlonipha is very important to African cultures, with Zulu people believing you are not subscribing to Zulu principles if you do not practice ukuhlonipha [49]. This concept can be found in the Sotho-Tswana cultures as well [17]. The rural sites allowed each participant to explain what he or she saw in a challenge card, one by one, without interruption, before moving on to the next participant. This occurred because it is considered rude in Zulu and other African cultures to interrupt someone while they are speaking. This embodiment of hlonipha ultimately led to the workshops taking far longer than initially intended.

4.1.2 Impact of geography on culture. The workshops reaffirm the existing urban-rural differences, as the two rural sites (KZN and Limpopo) included fathers as participants whereas the two urban sites (Gauteng and Western Cape) had no fathers attending the workshops. Indeed, we did not observe any gender issues influencing the workshops at the urban sites as there were no male participants, resulting in an environment that enabled the women to talk freely. The workshops at the urban site also had a less formal arrangement in regards to turn taking. All the participants freely discussed bodily issues, absent fathers, religion, and all the other challenge cards. Women participants from the urban sites candidly discussed the involving fathers card for a long time. One mother from Gauteng burst out in laughter when this card was displayed, stating:

> *"Where are the fathers? there are no fathers..."* - Mother, Gauteng

The urban women were able to discuss sensitive topics such as involving fathers and postpartum care more freely than their rural counterparts highlighting the conflicts of hlonipha with gender-equality.

Interestingly at the urban sites we also observed an active participation of more experienced and older women/mothers who joined the discussion, encouraging young mothers to involve the fathers of their children in their upbringing. For example, an experienced mother commented:

> *"Fathers can do everything mothers can. They can feed the baby, they can change nappies, they can do it all. You must make them do it. Don't just ask for money for support."* - older Mother, Gauteng

The workshops and in particular the design cards encourage women to reflect on the parenting expectations bringing forward many concerns. While discussing the *Parental well-being* challenge card paternal involvement (or lack thereof) in child rearing was a major concern as one of our participants commented:

> *"This goes back to involving fathers [another card]. People think mothers are strong. They can multi-task, [but] parents need a break from parenting. Men say...a woman is sent by God, then they treat us like we do not have feelings."* - Mother Gauteng

The design cards helped women externalise their emotions and parental concerns that were explicitly put forward in the brainstorming and prototyping sessions, with mothers indicating that fathers should provide practical and emotional support to mothers (see figure 2.)

Similar to Gauteng's participants, participants in Western Cape responded jokingly to it as they expressed the absence of fathers in their and their children's lives. While many mothers at the Cape Town site expressed that fathers do not want to be involved in their children's lives, the women also stated that there are few fathers who expressed that they would like to be involved. However, MCH information, programs and interventions are not catered for them, so often they felt left out of the conversation. Mothers reflected on how the society needs to change in connection to

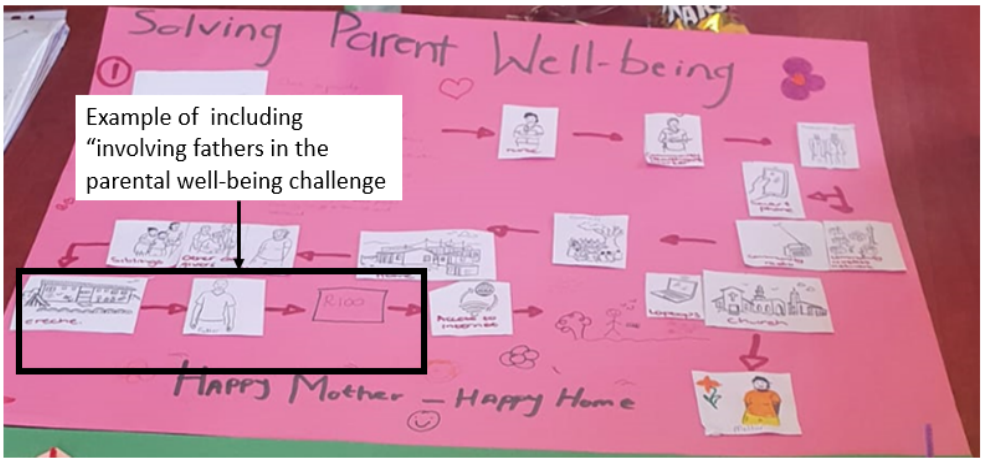

Figure 2: The Involving Fathers challenge is addressed in the parental well-being prototyping session

how children are raised and about the potential benefits of father's involvement practically and emotionally. A mother expressed her personal experience:

> *"My husband became a complete alcoholic because he could not deal with his feelings. We ended up divorced."*- Mother, Cape Town

4.2 Co-Design Sessions: Challenges with research tools and artefacts

It was not only the cultural norms that impacted our methodology. Some of our research tools and artefacts also introduced complexity that we did not foresee. We discuss these next.

4.2.1 Challenging Ranking. Ranking the challenge cards proved to be problematic. Although we initially planned to conduct the ranking of the cards individually for every site, this was not often possible. Ultimately we ended up adapting the ranking methods for each site. For the first workshop in KZN the local facilitator with experience working with the communities suggested to do the ranking collectively rather than individually as they considered it will be too complex for the mothers. The challenge cards were numbered 1-10, in no particular order, and a voting system where the participants raised their hands to vote for the priority of the challenge was implemented. However, this way of ranking led to many of the cards receiving an equal amount of votes, which made it difficult to identify the most prevalent challenges. We then had to conduct to second round of voting to help prioritize the cards. We slightly readjusted the ranking for the following activities in an attempt to get a simpler ranking process. In Gauteng, we provided the participants with different coloured stickers that represented the numbers 1 (most important) to 10 (least important) to help the prioritization (see figure 3). We displayed the challenge cards on the walls of the community hall and asked the participants to place a sticker, corresponding to the priority of the challenge, on each challenge card. Unfortunately, this method of ranking still did not go as planned as we expected each card to receive the same number of stickers as participants present. However, some challenge cards ended up with less stickers indicating that all the participants did prioritise the affected cards. Luckily identifying the top ranked cards was evident by the shape or colour of the stickers used for the scoring system.

Although the same ranking system used in the previous workshops was enforced in the Western Cape workshop, we adjusted the ranking by encouraging participants to first personally rank a smaller set of all 10 challenge cards in front of them. Participants were then asked to cast their vote using the stickers on the challenge cards displayed in the room. This site voted almost identically for all the cards. For instance, all the participants casted the same vote by placing red stickers on the Parental well-being card (see figure 3).

This did not occur at any other site. This may be influenced by participants having more time to individually rank the cards first, without peer or time pressure. It was also clear that the responses and ratings from the participants was influenced by having children with special needs. For example, it should be noted that this community leaned more towards parent well-being card reflecting on the traumatic experiences finding out their child will have special needs and the ongoing counselling they needed afterwards.

4.2.2 Prototyping and brainstorming challenges. Although the challenge and design cards supported workshop discussions and captured participants' reflections on maternal and child health challenges, we also observed unintended consequences. The participants skipped the brainstorming session in all the sites excluding Cape Town, and started prototyping using the design cards instead of coming up with a list of potential solutions. This had a knock-on effect on the prototyping session in particular as participants did not select a single solution to prototype, but simply used the prototyping materials to recreate some of the original solution (see figure 3, images D and E).

In addition, participants had difficulty using the technology design cards when they did not fully understand all the technologies presented despite the facilitators explaining each technology before the brainstorming sessions. The facilitators re-explained whenever they were asked; however, terms like *Internet-in-a-box*, *Community wireless networks*, and *chatbots* were foreign to these communities

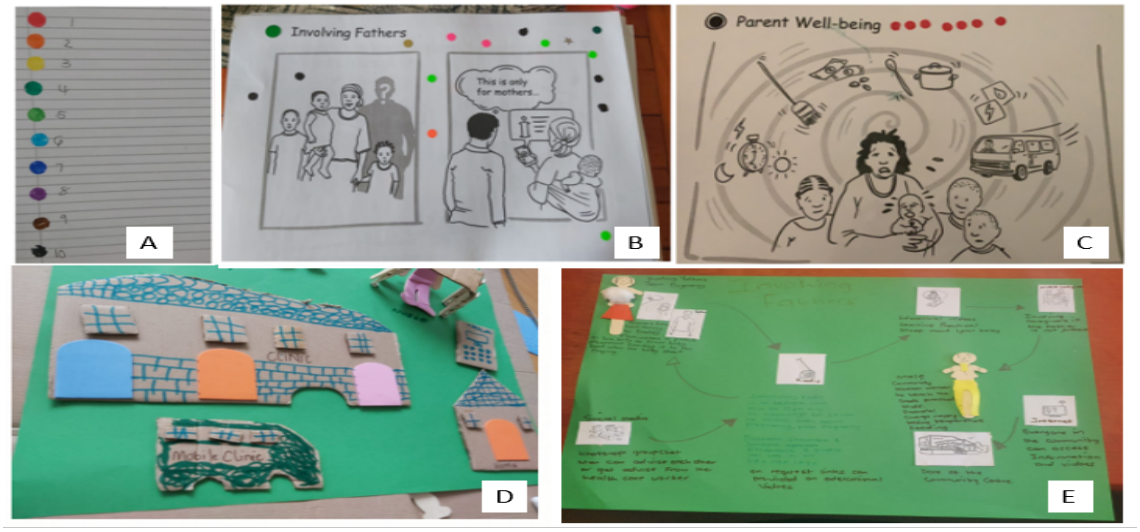

Figure 3: A) An example of ranking system, B) Rankings for the the "Involving father's" challenge card in Gauteng, C) Parent wellbeing card in Western Cape, D) An example of brainstorming and prototyping on one board, and E) brainstorming with design cards leading to no deeper information explored in prototyping.

leading to the participants defaulting to familiar concepts such as *mobile data* and *WiFi*. So it is possible that *chatbots*, *data collection apps* and *sensor data* were not explored due to their unfamiliarity to the community.

The Western Cape site responded differently during the brainstorming and prototyping sessions. To ensure that the participants understood the principles of the technology cards, the facilitator described them and offered supporting examples. It was evident that this was needed and helped the participants understand the technology they were not familiar with. The follow-up brainstorming and prototyping session did generate multiple ideas by the participants. Probing participants was encouraged, and often needed, as it led to interesting insights and conversations on how technology can fit into their current ecosystems and everyday realities. It should be noted that this workshop was attended by a researcher in the network who had extensive experience in co-design.

Last but not least, participants also found the amount of craft material overwhelming on all the sites and elected to use only a fraction of the crafts with some participants stating:

> *"Do I have to use any of this stuff?"* - Mother, Gauteng

and:

> *"Do we have to use **all** of this stuff?"* - Father, Limpopo

5 DISCUSSION

Our study highlights key challenges on the use of co-design workshops in low-constraint settings across geographical locations with different languages and cultural dynamics. Here, we aim to contribute by providing methodological reflections and lessons learned [48] to support the development of co-design workshops to support not only the understanding of inequalities but also support the design of cultural sensitive content and research [11]

5.1 Adapting methods to local cultural dynamics

5.1.1 Adapting to Geography. Our findings highlighted several cultural differences in practice not only in the different provinces of South Africa, but also between rural and urban settings that influenced how the co-design workshops were conducted. During our engagements, we needed to adjust the temporal rhythms of the workshops to account for geographical and cultural diversity, especially for the rural communities of Limpopo and KZN to give extra time and accommodate the cultural practices and norms of the community. With regard to the urban sites, only the Western Cape workshop went slightly over the allocated time frame. This finding has implications for how community-based co-design is conducted in similar settings. Aligned with Rosner [48], it is advisable to plan a flexible time frame to conduct co-design activities in rural settings to enable participants to feel comfortable and encourage free participation. Luthuli [35] explains that the presence of hlonipha is more prominent in rural areas because urbanization often dilutes cultural norms, as different cultures mix and start to learn from each other. This means that the exact same methods will not be suitable to both urban and rural settings, even if these settings include people from the same culture.

5.1.2 Adapting to gender norms and recognising the implications of hlonipha. The main goal of the workshops was ultimately to make use of community-based co-design aiming to be more inclusive by involving the communities we are designing for in the design decisions and activities. We refer to Sanders and Stappers [51] who talk about the inclusion of communities as equal partners in the design process as well as Groeneveld and Fruedenthal [21] who state that community-based co-design treats community members as equal partners. While we believe in these principles, it is also important to acknowledge that it will be challenging to include

women from these communities as equals due to the strong gender norms present in patriarchal societies (e.g., [39]). In some cases it is advisable to separate men and women, especially in the rural areas if the data being gathered includes sensitive topics or language which women practicing hlonipha will not be able to engage with. Researchers will ultimately lose the opportunity to gather rich data if the women are not able to freely talk and share their experiences that embed culturally loaded topics. This separation, however, would come at the cost of involving fathers collectively and may contribute to the divide in gender roles and understanding of MCH challenges. It is thus necessary to acknowledge the potential conflicts in regards to gender issues and balance these scenarios to ensure an active engagement from all participants. It is possible to offer gender equity workshops before any workshops take place; however, hlonipha is not necessarily practiced in an oppressive manner and women from these cultures might be as invested in these practices as the men are [41]. In our workshops, it was valuable to recognize that the behaviour of the participants in the workshops was not necessarily rooted in power differentials, but rather in cultural norms and traditions that even though it might disempower women, we needed to respect it in order to maintain the power relations present in our activities.

The aforementioned cultural norms were not present in the urban settings. This could be because no men attended the workshops; however, both Rudwick [50] and Fandrych [17] found that not only urban women, but also urban men, have started to critically engage with patriarchal practices and different interpretations of hlonipha. Luthuli [35] further argues that urban areas are in the process of phasing out hlonipha. These tensions between urban and rural settings create a complex multi-stakeholder environment where the dynamics between the groups impact the outcome and quality of the co-design activities and the design of any socio-technical intervention.

Whilst this study experienced the affects of hlonipha as challenging, the presence of hlonipha should be seen as an opportunity to consider more effective co-design activities.

5.1.3 Adapting to community hierarchies and seniority. Finally, many African cultures still follow a patriarchal system [17] where respect is not only based on gender, but also on seniority. We experienced the impact of community leaders in our co-design activities with the members from the royal family naturally leading all the activities, even though there were other men who took part in the workshop. In this case the power relations were profoundly complicated with the status and decisions made by senior participants impacting how others engaged and responded [16]. These relations were observed in the hierarchy of seniority and then gender, although the senior members were men as well. While we wanted to include fathers in the workshops, traditional African culture still places the onus of child rearing on the mother. Many of the MCH challenges discussed would therefore mostly affect the women in the room, as understood by local cultures. The design of any artefact aimed at addressing these challenges should include fathers, but should ideally enjoy equal input, if not more, from the mothers. In addition, few participants recognized the important role of the father and suggested to reinforce their role in a child's development to provide practical and emotional support. Thus, fathers would need not only encouragement, but also to be considered, whenever possible, when discussing how to foster active parental involvement during co-design activities. In our case, we let the norms play out as it was too late to adjust our methodology to accommodate this scenario. If we had known from the start that we would be honored with the presence of members of the royal family, we would have asked the community liaisons to communicate with these leaders to negotiate the best way to enable the mothers to lead the conversation with their support and guidance. The result was a tension that tried to balance the contextual hierarchies and unexpected impact of these hierarchies playing out in the workshop, with the overall objective of encouraging active engagement among all participants in developing ideas that will support them.

5.2 Co-Design materials and artefacts: Beyond visual representations

5.2.1 Unintended interpretations of Challenge Cards. The challenge cards which were initially devised with the intention to provide a common understanding of challenges raised unexpected and diverse interpretations across various contexts. COVID-19, for instance, was only explicitly represented on two challenge cards; however, at the Limpopo workshop, most challenge cards were linked to COVID-19 and its accompanying restrictions on daily living. We later discovered that community gatherings regarding COVID-19 and vaccines had been taking place. This, paired with the Limpopo province reporting some of the highest COVID-19 vaccine uptake rates nationally, largely attributed to a successful community-based health information campaign, might explain how COVID-19 formed part of the participants' interpretations of the challenge cards. While it may be necessary to make efforts to clearly distinguish between challenges, it is also valuable to understand the meaning ascribed to each of the cards.

Furthermore, what the community is experiencing culturally, at the time and space the co-design workshop takes place [26], should be understood as best as possible, either through early engagements with community members or liaising with community leaders. For instance, conducting workshops during a pandemic, where participants have been inundated and overwhelmed with information, can have an impact on the engagements and outcomes of the co-design workshop. These considerations are important to contextualize any emerging ideas and recognize the possible influences of each site's cultural reality that may complicate the ideation process.

While the visual representation of the cards help to elicit personal narratives and reflections, especially highlighting different mothering experiences, one particular card was the exception i.e., the "Involving Fathers" card. In Limpopo, the absence of fathers in the majority of cards was questioned and consequently the lack of paternal representation led to a common interpretation and inquiry on this omission. Even though we had accounted for the absence of fathers as a challenge in the community, we projected this issue into the formulation of the challenge cards. Evidently, there was an assumption that the cards will be considered as separated challenges, requiring participants to respond to what is intended to be represented in isolation on challenge cards. In reality, these challenges are intertwined and are co-existent within these communities, making it difficult to elicit a response on each individual card

without referencing others. While the challenges were informed by engagement with the community participants, the illustrations thereof were only validated by the local researchers. This emphasises once again the need for involving participants throughout the formulation of the design activities and materials as one runs the risk of maintaining alienating or foreign processes that distract from the generative activities.

Lastly, the manner in which responses were evoked played a role in how challenge cards were interpreted. When asked to respond to the challenge cards, the use of language can impact the quality of response received. For instance, asking "What do you see on this card?" compared to "What is happening on this card?" evoked varying responses, not entirely expected. The former generated literal explanations of the cards, with responses describing details seen, while the latter provided a contextual understanding of the cards and its depiction of the challenge triggering more reflection. Language usage and the importance of appropriate translation for the context proved vital to achieving co-design tasks and contributed to a shared understanding of the activities and challenges [59]. While having a local facilitator who communicates in the local language is beneficial to community-based co-design, how information and prompts are translated and communicated also impact the interpretation of activities and the consequent generation of ideas based on an understanding of the challenge. This is influenced by how co-design methods are "transferred" [63] across contexts, and the efforts to make the workshop appropriate for diverse and multi-cultural communities.

5.2.2 Accounting for the different roles of the design cards. All the sites, with the exception of the Western Cape site, used the design cards not to brainstorm, but rather to start prototyping immediately. They then moved on and recreated their initial prototype using craft material instead of delving deeper into a single solution. This is contradictory to the planned co-design process where participants brainstorm a challenge by listing many possible solutions and then moving to the prototyping phase where they prototype a single-selected solution [10]. Design cards are often used in HCI research and has proven beneficial for ideation and concept deployment [24]. However, the ease of use provided by these cards makes it easy for participants to move straight to a possible prototype, which makes it difficult to gauge further depth and development in the subsequent prototyping session. Aarts et al. [1] further explain that it is important to not only carefully design the design-cards themselves, but also the process to be followed when using the cards if they are truly going to serve as a medium for capturing ideas. In our case, the design cards process was loosely defined, which led to the deviation from the intended process to accommodate different modes of participation [48]. This divergence in understanding had implications for the research findings and needed to be reflected upon [58]. The participants actively enjoyed the prototyping activity and the artefacts graphically depicted their solutions; however, the prototyping session did not significantly add more depth to our community challenges.

Finally, with the exception of the Western Cape site, the inclusion of technologies not known to the community limited the uptake of these technologies in the brainstorming and prototyping sessions. Brewer [8] and Ramachandran [45] reported similar findings in early stages of co-design. In our study, this was present throughout the different workshops. At the Western Cape site, the facilitator provided in-depth examples of chat-bots on her phone, and related these examples to government chat-bots that the community has used. This tangible example led these groups to consider chat-bots in a meaningful and innovative manner in their solutions. While we avoided a "blue sky" ideation [25] through the use of diverse design cards that proved useful to support prototyping, participants should fully understand the scope of the technologies in the design cards for the ideation and prototyping phase to be successful with these communities. Thus it is important to consider the use of tangible examples of the technologies, then continuing to support the creative process and provide more depth into the prototyping results.

6 CONCLUSION

This paper has described how cultural norms and different geographies influence community-based co-design workshops both positively and negatively across communities in South Africa. Including members of the community in the planning of co-design workshops is needed to adequately account for any cultural norms and to adjust co-design activities to each socio-cultural context. Our workshops highlighted that including translators who enable the community to express themselves in their own language is not enough to obtain full and free participation. The research facilitators should also have a deep understanding of the cultures of the participants in order to respectfully and meaningfully handle any cultural nuances that arise, especially in rural settings. How they transfer methods and techniques across cultures and geographies needs careful consideration, even if, in our case, workshops are conducted in similar settings in a single country. Gender sensitization is very important at the beginning of the session to mitigate gender issues and facilitate a more equity-driven engagement with co-design activities. Although the use of design cards provoked reflections and empathy with the challenges during the workshops, they need to be carefully considered as these artefacts also produced unintended consequences shaping brainstorming sessions into prototyping sessions. In our case, the design cards were successful in enabling prototyping, more than the craft materials supplied. Finally, the inclusion of complex and foreign technologies to research participants can be done positively if the practical and tangible examples are provided to demystify these technologies.

ACKNOWLEDGMENTS

We would like to thank all the participants in the study including the CoMaCH UK-South Africa Network members as well as local and international partners, cross-disciplinary co-researchers as well as practitioners with experience engaging with communities. We would also like to thank Prof. Simone Honikman (University of Cape Town), Prof. Emman Haycraft (Loughborough university), and Dr. Francisco Nunes (Fraunhofer Portugal AICOS) for providing comments to the ethics protocol of the co-design activities. This study was funded by the UKRI GCRF Digital Innovation for Development in Africa (DIDA) awards (Ref: EP/T030429/1). Jaydon Farao was financially supported by Hasso Plattner Institute for Digital Engineering, through the HPI Research School at UCT. Nervo

Verdezoto would also like to acknowledge the Centre for Artificial Intelligence, Robotics and Human-Machine Systems (IROHMS) operation C82092, part-funded by the European Regional Development Fund (ERDF) through the Welsh Government.

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