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Explore, engage, empower: methodological insights into a transformative mixed methods study tackling the COVID-19 lockdown

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Action-oriented, transformative, and transdisciplinary approaches are increasingly heralded as promising tools that enable researchers not only to produce new knowledge about a situation, but also to actively engage in tackling it; however, such approaches raise critical questions about the methodological implications and conflicts involved in pursuing multiple objectives concurrently. This article seeks to advance this debate by examining the methodological implications of pursuing both knowledge production-oriented (epistemic) and action-oriented (transformative) objectives in urgent and uncertain situations. It asks how far a transformative mixed methods research design can leverage the potential of research to achieve multiple objectives in times of crisis. This methodological inquiry is based on a transformative mixed methods study on housing conditions and well-being which was initiated during the first COVID-19 lockdown in Switzerland. The study was composed of a country-wide survey, mobile crowdsourcing, interviews and Citizen Think Tanks. The results of this methodological reflection illustrate how this research design made it possible to (i) explore the effects of the crisis on domestic living spaces, (ii) engage with the crisis in a joint research space, and (iii) stimulate empowerment through reflection and mutual learning. These insights suggest the multidimensional orientation of the transformative mixed methods approach is appropriate for acting upon urgent crises. However, it challenges core methodological values and research constellations including (i) tackling unequal engagement opportunities, (ii) navigating social and epistemic control, and (iii) paying attention to situatedness and positionality. The article concludes that, in anticipation of future crises, favorable conditions for multi-targeted, collaborative research need to be fostered, both on the institutional and on personal levels. These conditions should enable fast and adequate team formation, as well as reflection and negotiation of positionalities, and divergent interests and objectives, of both scientists and citizens.

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Introduction

As researchers with backgrounds in sociology, human—environment systems research, sustainability sciences, psychology, inter- and transdisciplinarity, architecture and social computing, we found ourselves locked down in Switzerland as did all citizens of the country due to coronavirus disease 2019 (COVID-19) from mid-March 2020 on (Giachino et al., 2020). Our domestic living space rapidly transformed into places of work, schooling, care, and recreation—condensed spaces that required fast adaptation of daily routines and spatial organization. While health concerns directly related to the virus were center stage, there were early warnings of the potential impact of governmental confinement measures on the mental, physical, and social well-being of those affected. These included the risks of isolation, precarious living conditions, and rising gender inequalities (see, for example, UNFPA, 2020). In this situation, we, as researchers, were curious to explore how citizens[1] experienced the lockdown. We also felt a responsibility to provide opportunities for the empowerment of citizens to act creatively upon this situation where the rupture of routines (Oevermann, 2001) affected all dimensions of life. In a highly uncertain situation, we designed a transformative mixed methods study focused on housing conditions and well-being during the lockdown, as well as on coping strategies and societal learning for post-crisis times. From the very outset, this research (the "Swiss Corona Citizen Science" project) aimed to achieve multiple objectives. On the one hand it aimed to produce knowledge about the negative social effects of this unprecedented situation (henceforth called the epistemic objective). On the other hand, the aim was to contribute actively to mitigating its negative social effects and stimulate learning for post-crisis futures (henceforth called the transformative objective). The tripartite title of this article to 'explore, engage, empower,' reflects the epistemic and transformative objectives (Vilsmaier et al., 2017) that guided this research endeavor.

While the problem tackled was new, the attempt to pursue research with epistemic and transformative objectives alike is not. Several scholarly fields are concerned with research that not only produces new knowledge about a phenomenon or problem, but also actively engages in transforming it. Most prominently, the action-oriented research paradigm emerged to face crises. In the first half of the 20th century, Kurt Lewin established action research, with the aim to strengthen democracy and tackle social problems (Adelman, 1993). In Latin America, participatory action research emerged in the 1970s as research that is "committed to social and political action in order to induce needed transformations" (Fals Borda, 2001, p. 27). In a different context, yet with a similar objective, transdisciplinary and transformative research has more recently gained importance as a means to confront social–ecological crises (Hirsch-Hadorn et al., 2008; Jahn et al., 2012; Schneidewind et al., 2016) and "as a framework for addressing social justice issues" (Mertens, 2007, p. 212). Taken together, scholars from such an action-oriented, transformative and transdisciplinary research paradigm understand knowledge and social order as co-produced (Jasanoff, 2004) and research as relational and interactive (Bradbury and Divecha, 2020). They acknowledge the necessity of involving diverse scientific and life-world perspectives to understand the complexity of a phenomenon (Bammer et al., 2020; Hirsch-Hadorn et al., 2008; Popa and Guillermin, 2017), and consider societal needs, both throughout the research, and with regard to the intended outcomes (Mertens, 2007; Mitchell et al., 2015). In so doing, they strive to develop knowledge and practices for societal learning and transformation (Bradbury et al., 2019; Masson et al., 2021; Schneidewind et al., 2016). Frequently mentioned aspects of transformative objectives include awareness building (Binder et al., 2015), capacity building (Schäfer et al., 2021), empowerment (Blackstock et al., 2007) and the creation of new networks and relationships in the relevant societal field (Hansson and Polk, 2018). In sum, scholarship from these different research fields is characterized by a more or less explicitly articulated quest for meeting epistemic and transformative objectives simultaneously. However, critical reflections on the methodological implications, and empirical studies of the tensions involved in pursuing multiple objectives, are few. Some scholars point to a lack of methodological differentiation between generating scientific knowledge and generating societal change (Defila and Di Giulio, 2019). They question the often implicit assumptions about the (alleged) commensurability and synergetic nature of different objectives (Fritz, 2020; Binder et al., 2020), and call for a productive engagement with tensions and conflicts (Chambers et al., 2022).

But what exactly are the methodological implications of pursuing multiple objectives? And which tensions may arise when these are pursued in a context of urgency and high uncertainty (i.e., in times of crisis)? Turning to mixed methods scholarship offers some orientation. This methodology-oriented scholarship suggests that mixing methods to meet multiple objectives requires careful planning for integration across different research components and types of knowledge (Fetters et al., 2013; Fetters and Molina-Azorin, 2017). It, furthermore, highlights the need for methodological consideration of the social processes which pervade the implementation of such research (Jackson et al., 2018; Mertens, 2012) and, in particular, of the power dynamics among scientists and citizens involved (Camacho, 2020). Bringing these scholarly fields (transformative, action-oriented and transdisciplinary research, and mixed methods research) into conversation can nurture reflexive accounts of the methodological implications and challenges of pursuing multiple objectives in situations of urgency and uncertainty.

In this article, the methodological implications of pursuing epistemic and transformative objectives are placed at center stage. We ask how far a transformative mixed methods research design can leverage the potential of research to achieve epistemic and transformative objectives in times of crisis. This methodological inquiry is based on the above-mentioned study of housing conditions and well-being during the first COVID-19 lockdown in Switzerland. We reflect on our experiences of implementing the study, and rely on selected findings of the study where serving the purpose of the methodological considerations that are at the heart of this article. The mixed methods approach applied in this project was designed from a practice perspective (Tashakkori and Creswell, 2007) and was oriented to create knowledge with practitioners and citizens (Bradbury-Huang, 2010; Masson et al., 2021). Combined quantitative, qualitative, and collaborative methods were used to accommodate and tackle multiple objectives with changing roles and positionalities of all involved in the research. Besides meeting the epistemic objectives of the scientists involved, each research component was designed to provide either a service to the participating citizens, a task to stimulate them to engage with their own situation, or a space for mutual learning for post-crisis times.

The crisis situation to which this study responded constitutes a particularly interesting setting for methodological reflections. Due to the urgency of the situation, tensions between the multiple objectives might be particularly pronounced. This

allows tensions that in 'normal' times might be more tacit and difficult to elicit to become visible. Based on experiences and selected results of the study, we cast light on the chronotopical shifts (Waldenfels, 2009; Bachtin, 2008 [1975]) caused by the crisis, and how these altered the researchers' and citizens' positionality and situatedness in the research. We discuss how these crisis conditions shaped the diversification of objectives and affected the methodological implementation of the research, as well as the types and qualities of outcomes. Combined with reflections on the tensions involved in this kind of research, this article contributes methodological lessons learnt for future transformative research that strives to address multiple objectives. By demonstrating how mixed methods approaches can inform research with scientific and social impact, it furthermore contributes to strengthening the links between the distinct, yet highly complementary, scholarly fields of transformative research and mixed methods research.

The article is organized as follows. In the next section the consequences of the crisis situation for the research methodology are traced. Section "Methods" introduces the overall research design and individual components, elaborates on how, and from which perspectives, integration was conceptualized, and describes the analytical process. The results gained through these methodological reflections are presented in the section "Results and outcomes", showing how far the multiple objectives of exploring, engaging and empowering could be achieved. Section "Discussion" critically discusses the experiences and results, highlighting tensions and frictions in the attempt to address multiple objectives with a transformative mixed methods design. The conclusion points to the potential of, and requirements for, action-oriented, transformative mixed methods research to face crises.

Consequences of the crisis on research methodology

This section describes the characteristics of the crisis situation and traces their implications for the research methodology that this article critically reflects upon.

The COVID-19 crisis caused a rupture in the chronotopical regime of the early 21st century. Besides significant uncertainties and unknowns that had to be confronted in designing the research (Bammer et al., 2020), temporal and spatial paradoxes had to be dealt with. While in early 2020, public life came to a sudden halt, urgency was the tempor(e)ality (Felt, 2017) of scientists who wanted to contribute to tackling the crisis. And while the rupture affected all areas of life, many public and private activities were transferred to the domestic living space and virtual sphere. In response, the "Swiss Corona Citizen Science" project was launched. Both urgency and remote research conditions significantly influenced the research design and implementation, as did the situatedness of all involved in the lockdown. These conditions affected (i) the interdisciplinary team formation and problem framing, (ii) the scientists' and citizens' positionality and situatedness, (iii) the diversification of objectives pursued, and (iv) the implementation of the mixed methods approach.

(i) The interdisciplinary team formation and problem framing:

The team was composed of four research groups who could not rely on former collaborations. Integration of the research groups' respective approaches to the crisis thus required a virtual process of bringing together research interests and creating a mutual understanding between persons with different epistemological positions, conceptual frameworks (Eigenbrode et al., 2007; Freeth and Caniglia, 2019; Klein, 2010) and values regarding the role and responsibility of the researcher (Meinherz et al., 2020; MacMynowski, 2007). In a series of virtual meetings spanning over just 3 weeks, the interdisciplinary team conceptualized the overall study design.

(ii) The positionality and situatedness of scientists and citizens:

The constitution of the team, and the research design, were strongly influenced by our "connectedness and identification with the research participants" (Qin, 2016). By emphasizing researchers' and citizens' situatedness (Rose, 1997), the differences of lived experiences—depending on social, and spatial locations (Qin, 2016)—and their influence on understanding and transforming the crisis situation were taken into account. Given the circumstances, the involvement of experience-based knowledge (Collins and Evans, 2002) from multiple perspectives was considered a necessity (Bradbury and Divecha, 2020).

(iii) The diversification of objectives pursued:

In response to the crisis conditions, the problem was framed from different actors' perspectives. Each was tied to different prioritization of objectives:

- From a scientific perspective, exploring how different population groups experience, and cope with the COVID-19 crisis in Switzerland was prioritized (research question: How do different populations groups experience, and cope with the COVID-19 lockdown in Switzerland and what role do housing conditions play therein?). Methodologically, the focus was on exploring the extent to which a mixed methods design can leverage the potential of research to achieve epistemic and transformative objectives in times of crisis (research question: To what extent can a mixed methods design leverage the potential of research to achieve epistemic and transformative objectives in times of crisis?).
- From a citizen perspective the research gave precedence to engaging with the individual and social efforts of dealing with the COVID-19 crisis. The objective was to develop a reflexive and proactive relation to the situation, and to access existing support tools related to economic, social or health risks to navigate the crisis.
- From a collective perspective, enabling mutual learning and empowerment was prioritized. Additional focus was placed on citizens and scientists working together to produce coping strategies to tackle the negative effects of COVID-19-related measures, to co-create desirable futures and, ultimately, to jointly induce transformation.

In principle all actors involved explore, engage, and (potentially) empower, but do so to different degrees and in different roles according to their primary motifs of participation.

(iv) The implementation of the mixed methods approach:

The urgency of the crisis situation and the ensuing tempor(e)alities for the research endeavor affected the study implementation. While research ethical standards were upheld (approved by the Human Research Ethics Committee of EPFL[2]), some research quality criteria (e.g., pre-testing of session designs, sampling strategy) had to be balanced with societal relevance and timeliness (Bryman et al., 2008). Furthermore, the virus spread and the spatial distancing it required transferred all research activities to the digital realm. For some activities the latter has already become a natural habitat (e.g., online surveys), while for others it required creativity and improvization (e.g., interdisciplinary team formation, interactive online discussions). Lastly, the uncertainties and unknowns confronting the crisis management demanded flexibility, adaptability and experimentation in project design and management (Senabre Hidalgo and Fuster Morell, 2019). For example, the easing of lockdown measures impacted the closing date of the survey and re-directed the focus of the interactive online discussions onto post-crisis projections.

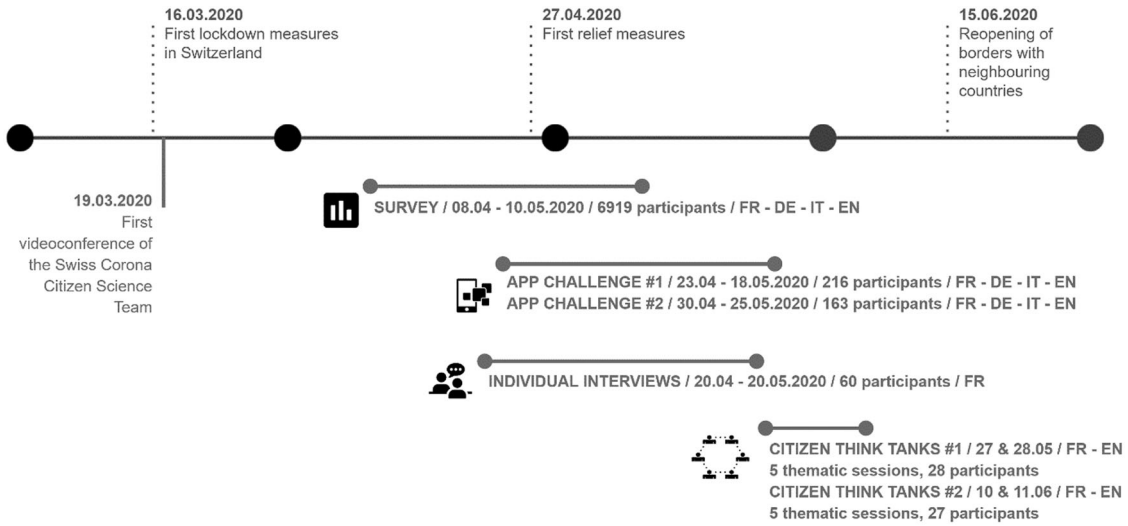

Fig. 1 Research components implemented during the lockdown [FR = French; DE = German, IT = Italian].

Methods

Research design and data collection. The transformative mixed methods design developed in this research consisted of four components (Fig. 1). It follows a sequential, multi-stage procedure (Fetters et al., 2013) whereby the degree of citizens' involvement increased gradually while the number of participants decreased (Boeckmann et al., 2005). Here, the components, their rationale, and integration are described.

A *country-wide online survey* was launched on April 8, three weeks after the introduction of the first lockdown measures in Switzerland. It closed on May 10, 2020, the day before most of the restrictions were lifted (for a chronology of events see Giachino et al., 2020). It was disseminated via a press release from the coordinating university (EPFL) to Swiss mainstream media, the university's website and social networks, and the researchers' personal contacts. The goal was to reach and recruit the maximum number of people in a short time in order to gain a substantial data basis. It was accessible in three of the official languages of Switzerland (German, French, Italian) and English. The survey's primary objective was to explore how lockdown measures affected different population groups in terms of housing and well-being. The survey provided supportive resources linked to various questions, such as telephone numbers for psychological counseling, reporting domestic violence, or neighborhood solidarity networks. Respondents could express their interest in participating in further activities—the mobile crowdsourcing, interviews, and Citizen Think Tanks (CTTs)—thus preparing the ground for integration (Fetters et al., 2013). Due to the methodological orientation of this article, the sample composition is presented in detail in the section "Engage: How citizens and scientists engaged with the crisis situation in a shared research space" where the objective of stimulating engagement is assessed.

A *mobile app*[3] was set up to create a research space for exploring and engaging with the effects of the COVID-19 crisis in everyday life. Survey respondents who expressed their interest and willingness to participate in further research activities were invited to participate. The app was also publicized through the university's website and social networks. Two so-called Challenges were launched: Challenge 1 was accessible from April 23 to May 18, 2020 and Challenge 2 from April 30 to May 25, 2020. The challenges were built on questions raised in the survey and guided participants through questions and tasks to reflect upon and share experiences of, and strategies for, confronting the lockdown and post-crisis futures. The app offered the possibility of in situ and immediate reporting of everyday life experiences on mobile devices (Ertiö, 2015). Besides responding to conventional close-ended questions, participants were encouraged to share stories and images (Ruiz-Correa et al., 2017) of how the new circumstances gradually transformed their lives.

Semi-structured interviews were conducted with survey respondents who expressed their interest and willingness to participate in interviews, and provided their contact details for this purpose. The interviews with these self-selected citizens were conducted between April 20 and May 20, 2020 with the objective of listening carefully to individuals' crisis experience. They explored how interviewees managed the imposed adjustments in living spaces and what resources they used—from material, temporal, social, emotional and physical perspectives. The interviews deepened insight into selected aspects touched upon in the survey, and aimed to merge the data obtained with these respective methods (Fetters et al., 2013). They additionally addressed the evolution of interviewees' experiences of the pandemic over time, and their expectations for the future.

The *CTTs* were designed as spaces for mutual learning and for envisioning post-crisis futures, thus moving from an individual level to a collective level. In a series of two interactive online events for each topic, on May 27–28 and June 10–11, 2020, citizens who had previously participated in the survey or the mobile crowdsourcing collaborated with scientists who hosted the CTTs. The sessions were structured along basic principles of formative scenario development and assessment (Scholz and Tietje, 2002) and closed with feedback regarding the collaboration. The CTTs' topics emerged from the survey and mobile crowdsourcing. Results of the latter were used to stimulate discussion, thus striving for integration through building (Fetters et al., 2013). In five CTTs, scenarios for desirable futures were co-created for housing, mobility, local economy, digital governance, and tourism. Results have been published in reports co-authored by citizens.[4]

Integration design. The rationale underpinning the integration of the components was guided by approaches to integration in inter- and transdisciplinarity scholarship (Bammer et al., 2020; Defila and Di Giulio, 2015; Jahn et al., 2012; Klein, 2010) and this was

Table 1 Indications for tracing the objectives and corresponding data sources.

Objective		Indication of whether and how far the objective was addressed	Data source and analysis
epistemic	Explore	Knowledge produced about, and insights gained into, different crisis realities	Descriptive statistical analysis of selected survey items; synthesis of images and analysis of 'manifest' content of answers collected in the app
transformative	Engage	Number and composition of participants who engaged (or not) with the research components (i.e., the sample) and the depth and characteristics of engagement	For breadth of engagement: descriptive analysis of the sample For depth of engagement: answers to open-ended questions in the app; CTT transcripts and evaluation survey
	Empower	Perceived study participants' reflexivity and ability to act as traced in texts/images/discussions	Analysis of 'latent' meaning in answers to open-ended questions in the app; CTT transcripts and evaluation survey

complemented by the dimensions for integration in mixed methods research (Fetters et al., 2013). As with the study objectives, this has been elaborated on from the different actors' perspectives.

From a scientific perspective, integration was prepared for at the design level (Fetters et al., 2013). Firstly, questions and tasks from the different methods were linked to sequentially deepen and complement both the topic addressed and the type of data collected (numerical, text, image). Secondly, the participants were invited to subsequent research activities to connect the survey with the mobile crowdsourcing, interviews and CTTs through sampling. Thirdly, survey and mobile crowdsourcing results were built on to set the agenda for the CTTs. Finally, during data analysis and interpretation integration was realized through merging the respective datasets and creating narratives.

From a citizen perspective, integration was conceived as individual and social learning (Tauginienė et al., 2020) through sequential participation which gradually increased the citizens' engagement. Step by step, citizens could draw on reflections induced by the survey questions, and extend their contributions in the experimental and creative formats of mobile crowdsourcing and the CTTs. In appropriating the research space, citizens could become researchers of their own situation, enter a social learning and sharing process, and incorporate their insights into their daily lives (Bradbury et al., 2019).

From a collective perspective, integration of knowledge that is rooted in diverse personal and professional life-worlds was emphasized to address an emergent and extraordinary phenomenon (Bammer et al., 2020; Jahn et al., 2012). By gradually deepening exploration and mutual learning, integration from the collective perspective ultimately aimed at developing the ability to act of all involved. This was the most pronounced in the dialogical formats, where scientists' and citizens' knowledge and experiences were incorporated (Hirsch-Hadorn et al., 2008) in post-crisis scenarios.

Analysis of research implementation and data. For this methodological article the research design was reflected and analyzed against the background of its implementation and of selected results obtained from the different research components. The focus lied on understanding the extent to which the transformative mixed methods design enabled the simultaneous addressing of the three main objectives of the project—to explore, engage and empower. Analysis of the content generated through the respective methods (e.g., to obtain results regarding experiences and effects of the crisis situation) was performed only to the extent necessary to support the methodological reflection[5]. The results of the content-oriented in-depth analyses of the data collected in this transformative mixed methods study are published elsewhere (Clément et al., 2021; Hansmann et al., 2021; Pagani et al., 2021).

Indications for tracing the multiplicity of objectives. In order to inquire how far the research design addressed the multiple objectives, 'explore, engage, empower', we looked for the following indications (see Table 1):

- 'Explore' is indicated by the insights gained into different crisis realities, displayed by the examples of state of mind, domestic living spaces and distribution of care work during the first lockdown.
- 'Engage' is indicated by the number and composition of participants who engaged (or not) with the research components (i.e., the sample) and the depth and characteristics of engagement. To grasp the latter, we reflected on the nature of participants' contributions, e.g., how text and images were used.
- 'Empower' is indicated by the perceived reflexivity and ability to act as traced in texts/images/discussions. Selected data and experiences from the app and the CTTs were interpreted regarding the extent to which they pointed to the participants' abilities to act, both individually and collectively.

The following section describes how the data that informed this methodological assessment of outcomes in terms of 'explore, engage, empower' were analyzed.

Quantitative analysis of survey and close-ended app questions. The survey data were sorted for respondents residing in Switzerland, reducing the sample of 6919 to 6269 responses. Subsequently, a descriptive analysis of single and crossed variables was conducted using the program R. Similarly, responses to the close-ended app questions were analyzed regarding the general sentiment concerning the crisis, its handling, and the associated challenges.

Qualitative analysis of open-ended app questions and CTT transcripts. Open-ended app questions were analyzed following a qualitative inductive approach (Bengtsson, 2016). These explored *changes* and *challenges* experienced during the lockdown, as well as *recommendations* for coping with them. They were analyzed, both regarding their manifest content ('what') and their latent meaning ('how'). 'What' categories characterizing *change* responses included, for example, living space, freedom of movement, and personal relationships. Across all themes, the same 'how' categories, describing the manner in which a response was expressed, and the latent meaning it conveyed, were used. These were description/observation, assessment/judgment, question/uncertainty, and recommendation/advice. In order to avoid inter-

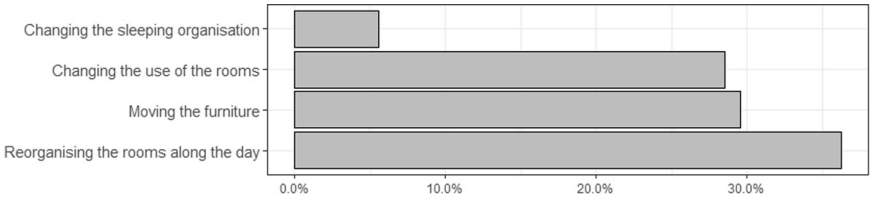

Fig. 2 Survey respondents' home transformations (total number of answers is 3110 whereas the number of people having made transformations is 2356).

coder variability and ensure consistency, one team member conducted the analysis and iteratively discussed emerging categories with two other team members.

The analysis of the CTT on (post-)crisis housing relied on the sessions' audio recordings and notes taken on a virtual whiteboard (Box 1). With the goal of extrapolating whether and when 'explore, engage and empower' occurred, it focused on: (i) the participants' interests in and expectations regarding the session outcomes; (ii) the degree and form of their participation (i.e., spontaneous/guided speaking; descriptive answers/active questioning); (iii) the direction of their interactions (i.e., citizen–citizens, citizen–scientists); (iv) the characteristics of the discussion (e.g., empathic). Lastly, a short evaluation survey regarding citizens' perceptions of their degree of participation was analyzed.

Synthesis of image content in the app. Images and accompanying captions submitted in the mobile crowdsourcing were evaluated and sorted according to the most frequent topics. Three main themes underlying the set of images symbolizing changes in participants' everyday life resulting from the crisis were identified, and two regarding participants' visions for post-crisis futures. For each theme, an image mosaic was produced. In this curation process the privacy of the citizens was ensured. One of the co-authors performed this inductive synthesis of image content and discussed critical cases with two other team members.

In the section "Results and outcomes", insights from across these research components are used to create narratives (Fetters et al., 2013) centered around the three objectives of 'explore, engage, empower'.

Results and outcomes

In keeping with the article's overall aim to provide methodological reflections, this section shows how far the transformative mixed methods approach served to address the three objectives—to (1) explore, (2) engage, and (3) empower. It presents (1) how the effects of the crisis situation on domestic living spaces were explored, (2) how the space for research-based engagement was appropriated, and, ultimately, (3) how reflection and mutual learning stimulated empowerment. The outcomes in sub-sections "Explore: How situations in domestic living spaces were perceived during COVID-19 confinement ", "Engage: How citizens and scientists engaged with the crisis situation in a shared research space", and "Empower: How tackling the crisis situation strengthened abilities to act" draw on the integration between the research components of the mixed methods design, while Box 1 shows examples of how the different objectives were integrated within a single component.

Explore: How situations in domestic living spaces were perceived during COVID-19 confinement. Selected findings of the various research components serve as an indication of the extent to which the transformative mixed methods design allowed for exploring the crisis situation. When survey respondents ($n = 6269$) were asked about their state of mind compared with times before confinement, an ambiguous picture emerged. While around 40% indicated that they felt the same, just as many (37%) felt anxious and 28% were depressed more frequently. Likewise, for every five people who said they were as happy as before, three said the opposite. In addition, 46% of respondents reported lacking physical interactions, and 59% claimed that they missed their loved ones (20% moderately agreed with this statement). For 11.5% their state of mind improved with confinement.

In the week leading up to their participation in the mobile crowdsourcing, the most common sentiment shared among participants was the loss of structure and sense of time in their day-to-day lives. Nearly all participants reported that once-mundane activities, like going to the supermarket, became a planning keystone in their weekly routines, and around two thirds confirmed that it was difficult to separate work time from leisure, care, and family time. In addition, the survey showed that the most common challenge faced by respondents during the first lockdown was to adapt their living space to accommodate changes in their private and professional lives.

In the survey such home transformations were explored as tangible ways of grasping how people navigated the crisis and the uneven resources they had at their disposal (Fig. 2). Of the respondents, 38% made at least one change within their home. This consisted mainly of reorganizing their rooms during the day (36%), moving furniture (30%), and changing the use of the rooms (28%). Building on this, mobile crowdsourcing provided citizens with tasks to explore the most significant changes due to the COVID-19 crisis within their home. Pictures of plants, delivery packages, hygiene material, and collections of work, educational, and cooking materials were shared (Fig. 3). These suggest that as teleworking gradually became the new normal, participants experimented and found creative ways of adapting to it. From carving out work stations wherever space permitted, to buying new equipment, the COVID-19 crisis changed their relationship with personal spaces. The interviews and CTTs further nuanced these impressions with participants' intimate stories of who took care of new arrangements in the domestic space, whether it was a matter of negotiation or tension, and the feelings of comfort or discomfort this triggered.

The integration of the research components allowed for a broad overview of the social distribution of domestic transformations and an original exploration of gendered roles and emotions related to domestic life. Five out of ten women with children declared they were exclusively in charge of home-schooling, while this was the case for only one man out of ten (Fig. 4). When examining emotions, while the majority of both men and women felt 'calm' (respectively, 23% and 20%, of the chosen answers), the second most common feeling for men was 'confident' (16% of their answers), whereas it was 'tired' for women (19% of their answers). This led to the hypothesis that women carry the greater additional burden of maintaining the balance between intimate, family and work life within changing domestic spaces.

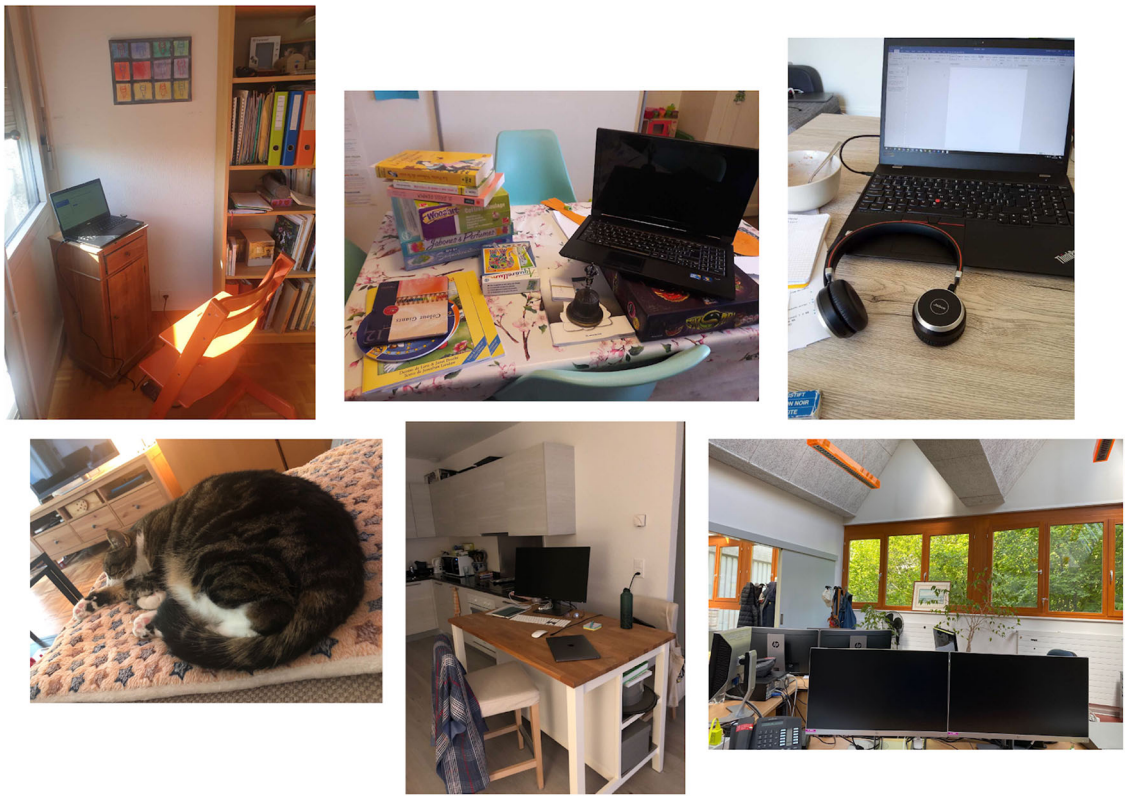

Fig. 3 Selection of images in response to "What is the most significant change that has happened in your daily life due to the COVID-19 crisis during the past week?" Source: Mobile Crowdsourcing, Challenge 1.

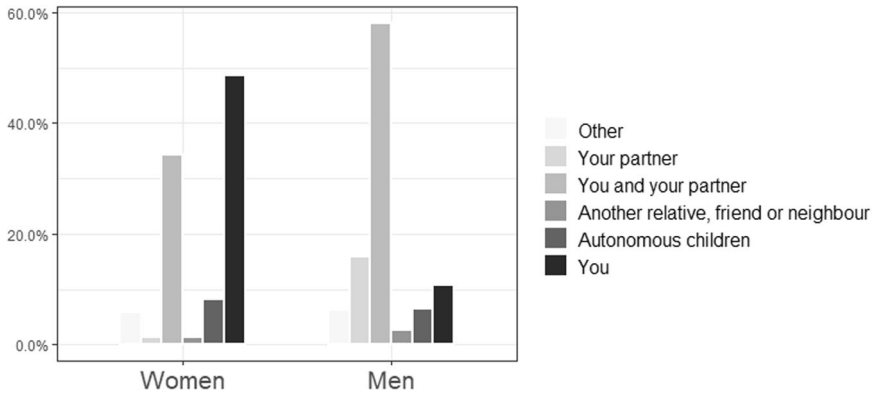

Fig. 4 Survey responses ($n = 1830$) to "If you have children, who is taking care of homeschooling during the lockdown?".

Engage: How citizens and scientists engaged with the crisis situation in a shared research space. Looking at response rates and numbers of participants throughout this study provides a first indication of the extent to which citizens engaged in the research space. With 6292 responses from across Switzerland, the survey had a wide reach and involved a high proportion of the Swiss population. While the survey aimed for breadth of engagement, the subsequent research components aimed for depth of engagement. Accordingly, comparatively fewer participants were reached through the other research components: 216 and 163 citizens, respectively, engaged with the two Challenges in the mobile crowdsourcing, 60 dedicated their time to individual interviews, and 28 and 27, respectively, joined the CTTs. A procedural perspective suggests that the sequential design succeeded in stimulating the continued engagement of a considerable group of citizens throughout two or more research components[6].

Despite this wide engagement, the study did not stimulate the engagement of all population groups equally. First, although the survey was translated into four languages, the vast majority of the sample comes from the French-speaking population residing in Swiss Romandy. Second, 64% of the sample is composed of women, and third, the survey was slightly biased in terms of education level as 51% of the sample holds a higher diploma (Fig. 5), against 44% of the general Swiss population (Swiss Federal Statistical Office, 2019). The proportion of respondents with no degree is lower than for the total population, which echoes the underrepresentation of the industrial sector in the sample. This overrepresentation of French speakers, women and educated population groups was also found in the mobile crowdsourcing sample. This indicates that this mixed methods study did not engage the working class—supposedly more at risk during the crisis—as effectively as it did the middle and upper classes.

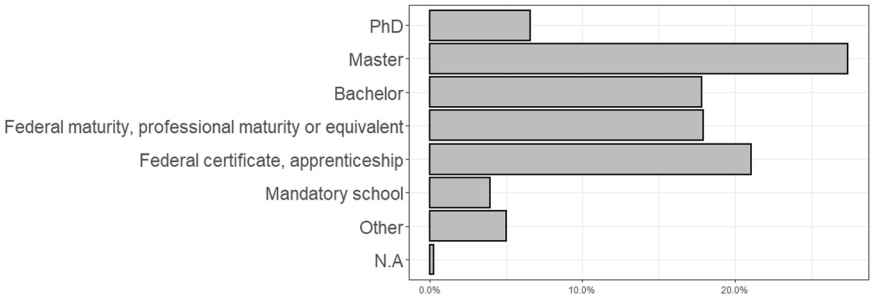

Fig. 5 Survey respondents' distribution regarding their level of education ($n = 6269$) [NA = No answer].

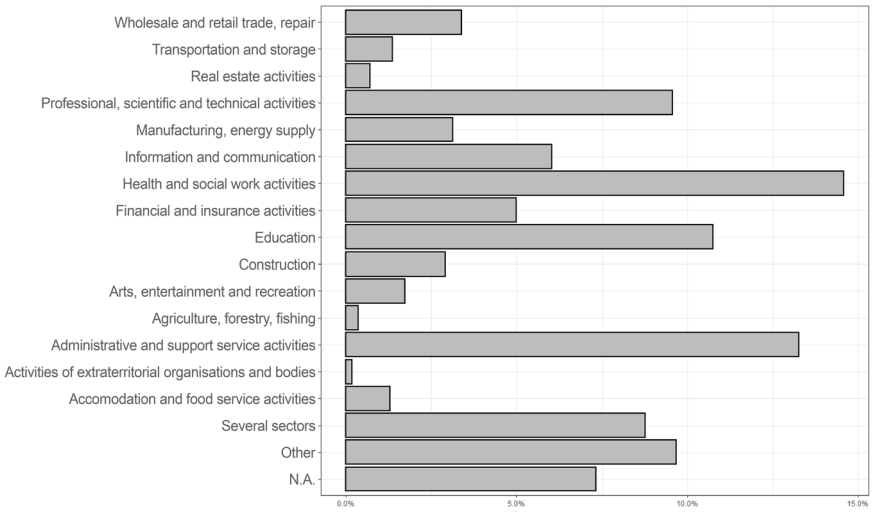

Fig. 6 Survey respondents' distribution regarding their professional sector ($n = 6269$) [NA = No answer].

In the interviews and the CTTs, more women than men engaged, reflecting the initial sample's composition. Due to resource constraints these components were—with the exception of one English-speaking CTT—predominantly held in French. Thus, more citizens residing in Swiss Romandy joined the dialog, which led to an exclusion of citizens from the German- and Italian-speaking parts of the country. Building on futures that app participants had identified as desirable, many discussions within the CTTs were motivated by the citizens' desire for sustainability transformations. A participant in one CTT critically raised the point that the 'usual suspects' participated, while those citizens not (yet) engaged in building alternative futures were under-represented. This observation is a further indication that the research design did not stimulate the engagement of all population groups equally.

The study, however, reached two interesting sub-groups. First, a great number of health and social care professionals, who are key in tackling this crisis, responded to the survey (Fig. 6). Both the survey and the mobile crowdsourcing provided a symbolic value to their vital work, while opening space for considerations other than the stress generated by the additional workload, i.e., the lived situation within homes. Second, responses were obtained from 195 people who lost their jobs due to the crisis, and who could use this research to express concern and gain visibility.

Besides the numerical metrics which indicate the scope of engagement, the type and quality of responses and discussions indicate whether the mixed methods design effectively promoted engagement. A look at the research components with a higher degree of collaboration reveals diverse forms of engagement (Box 1). The curation of images and drawings, and the drafting of texts, entailed an intense and proactive engagement with one's own crisis experience, which complemented the structured and unidirectional engagement of the survey. These open and creative forms of engagement offered intimate and personal accounts of social realities during the lockdown. For example, in the mobile crowdsourcing, citizens shared how they handled the limited access to nature. This restriction sparked an interest in gardening. Tending to their greenery, whether aromatic herbs to ornamental succulents, provided many with a little escape to nature right within their homes. In the CTTs the dialogical quality of engagement was most pronounced. Citizens not only shared their experiences, but dug deeper, sometimes sparking debates about controversial issues, sometimes expanding the thematic horizon set by the scientists and engaging with the experiences and perceptions of others.

Empower: How tackling the crisis situation strengthened abilities to act. The research components alluded to different facets of strengthening abilities to act, indicating the extent to which the mixed methods approach stimulated empowerment. While elements of the survey were assumed to support citizens' ability to act during the lockdown (e.g., on domestic violence), in the mobile crowdsourcing and CTTs, citizens could themselves identify the relevant issues for which they wanted to develop and share coping strategies. The written inputs in the mobile crowdsourcing uncover various ways in which those involved gained a reflexive stance towards the crisis situation. In particular, the analysis of recommendations in which participants shared strategies to tackle the reorganization of everyday life, suggest that the crowdsourcing tasks stimulated reflection, and reveal several participants' self-conception as active agents in navigating the crisis. Abstracting from their own experiences, numerous participants recommended developing a routine to structure one's

daily life, e.g., finding a regular rhythm of getting up and going to bed, or getting dressed even when working or studying from home. Many also recommended setting aside time to cope mentally with uncertainties and concerns; trying new leisure activities, such as home gardening; spending quality time with household members or having remote interactions with loved ones; and learning to decelerate the pace of life. These recommendations suggest that the mobile crowdsourcing supported several citizens in conceiving themselves as active subjects—as actors who have the ability to act in ways that mitigate the crisis' negative impacts.

Furthermore, a look at future-oriented activities spanning across this mixed methods research exemplifies how reflexivity was conceived as the basis for citizens' empowerment. As a first step, the survey invited citizens to express their desires for the immediate post-lockdown period. Seeing family and friends was, for almost 30%, the first thing they wanted to do after the lifting of confinement measures. Women were more likely than men to say they want to see their family as first priority (34% vs. 23%), while slightly more men than women wanted to travel after the easing of lockdown measures (16% vs. 11%). In the mobile crowdsourcing and CTTs, citizens could engage more deeply with their visions for desirable post-crisis futures. The analysis of drawings and images submitted in the mobile crowdsourcing shows that many preferred futures had a strong focus on environmental protection, sustainability, and solidarity (Fig. 7). The accompanying texts specify that many envisaged living in greater harmony with nature and moving away from consumption-based lifestyles. Others emphasized the need for societies as a whole to show more support towards one another. Lastly, many participants indicated that they would appreciate a general deceleration in the pace of their day-to-day lives. Sharing these reflections with others can be seen as a way of opening up alternatives, creating mutual learning, and expanding the other participants' abilities to act.

The individual reflections on rethinking and reorganizing our society post-crisis were taken up in the CTTs. Here engagement with the situation and its potential for transformation was the most interactive, giving room to collectively develop strategies for moving towards desirable futures (Box 1). Answers to the short evaluation surveys give an estimation of the extent to which citizens considered that the CTTs strengthened their abilities to engage with, and shape, transformation pathways. A large majority across the five CTTs stated that working with the scenario technique "stimulated me to reflect on what a desirable future could look like", "allows me to better understand how I can contribute to changing and shaping the future", and "is a productive way of working together for the common good". Only a few, however, declared that participating in these activities made them feel like "being a researcher". Hence, blurring between the clear-cut roles of scientists and citizens—albeit intended—had occurred only to a limited extent. Some participants argued that more time for collaboration would have been needed for this to occur. In one CTT, participants built on this momentum and self-organized a follow-up session.

Discussion

This article presented methodological insights drawn from a study that was conducted in an entirely unknown situation. Given the need to better understand and tackle the impact of the first COVID-19 lockdown on housing and well-being in Switzerland, a transformative mixed methods design was chosen. It was initiated with the ambition of creating a shared virtual research space to explore how different population groups experience the crisis, to engage with the individual and social efforts of dealing with the crisis, and to enable mutual learning and empowerment to actively respond to it. Thus, from the very outset the study was conceived to address knowledge production-oriented (epistemic), and action-oriented (transformative) objectives. However, the chronotopical shifts caused by the crisis strongly impacted its implementation. It is therefore necessary to critically revisit whether the multiple objectives were met and to shed light on the tensions and challenges encountered. These include (1) tackling unequal opportunities to engage, (2) navigating social and epistemic control, and (3) paying attention to situatedness and positionality. By rendering these visible, this discussion contributes methodological lessons learnt for future transformative research that strives for multiple objectives. This critical discussion, furthermore, contributes to strengthening the links between distinct, yet highly complementary, scholarly fields that advance research pursuing not only epistemic, but likewise transformative objectives.

Box 1 | The CTT on housing: Mon logement à l'épreuve du confinement: Quelles orientations pour l'après?[6]

One topic, ten strangers, two sessions of 2.5 h, one Zoom platform. This was the setting of the CTT on housing conditions during and after the first COVID-19 lockdown. Before starting the exploration, a *shared*, and emotionally *safe*, space was needed. To build trust, personal agendas were made explicit: participants' expectations revolved around practical concerns (e.g., the design of future housing) or emotional issues (e.g., how others experienced the confinement). This reflected the complexity and double nature of dwelling in-between human and material components (Pagani and Binder, 2021).

Such complexity was revealed during the discordant and enriching descriptions of "What housing is for you?". Starting from the *exploration* of the dwelling's qualities brought about an unexpectedly positive evaluation of its role during the confinement. The participants answered the question "What do you miss during the crisis?" predominantly with a description of what *contributed* to their well-being (e.g., a small dwelling was described as a place to "center oneself").

A virtuous circle was triggered, stimulating citizens' *engagement* through the generation of empathic messages. From mechanically naming the next person to talk, participants started dynamically giving each other space, and taking opportunities to talk. The shared space became filled with doubts and questions, but also spontaneous answers. This gave birth to a supportive network where participants' knowledge was shared, reinforcing mutual trust. Citizens pointed to topics that they deemed important and which had been overlooked during the CTTs (e.g., how to guarantee the safety of vulnerable household members). In a feedback questionnaire, 71% stated that the CTTs allowed them to express their ideas.

The participants slowly appropriated the research space, subverting the pre-defined roles introduced at the beginning (e.g., the (co-)moderator, the expert). Eventually *empowered*, citizens set the agenda for new informal talks, identified contributions that each of them could make, and shared their personal projects, looking for tools that could support their implementation.

This virtuous circle culminated in the definition of both scientists' and citizens' needs and responsibilities: "I need *keys* to make sense of what we are currently experiencing with regard to our dwelling" one participant stated. These keys must be "full of empathy," and therefore require the "translation" of academic language.

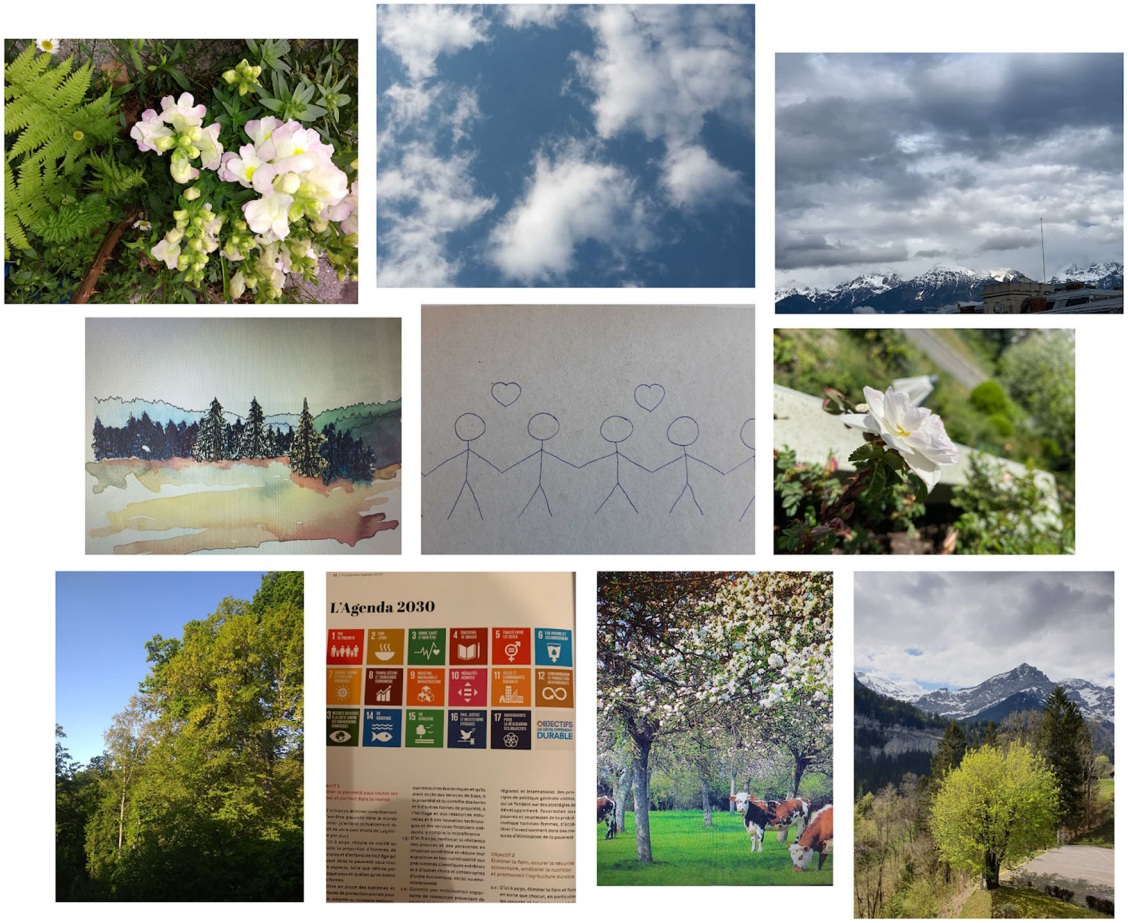

Fig. 7 Selection of images in response to "What does your preferred future look like?" Source: Mobile Crowdsourcing, Challenge 1.

Tackling unequal opportunities to engage. The results of the methodological reflection provided indications that the mixed methods design, in principle, met the study's multiple objectives. Yet, critically reflecting on the outcomes, room for improvement can be identified. Notably, the quantitative, qualitative and collaborative methods did not stimulate the engagement of all population groups equally well, as the underrepresentation of citizens from the working class suggests. This can be explained by the fact that, although promoted by the national media, the survey was spread by an academic institution, and required the time, inclination and emotional availability to respond. This provided a reminder of important barriers to citizens' participation in research (Oliver and Boaz, 2019). Furthermore, more women than men participated in the study. This is not surprising for recruitment in social science surveys (Smith, 2008), but resonates with the gendered dimension of the COVID-19 crisis, which was particularly harsh for traditionally female employment sectors like health, service, and education. While the sequential decrease in the number of participants was intended in order to deepen engagement (Boeckmann et al., 2005), it also exacerbated the bias of the initial sample collected in the survey. This steadily reduced the diversity of participants to the 'usual suspects'. This phenomenon and 'stakeholder fatigue' (Bracken et al., 2014) are widely known, but the challenge of lasting engagement was presumably particularly pronounced in this crisis situation. The latter highlights the delicate question of how much time and emotional investment research might possibly ask from crisis-strained and over-burdened citizens. This is a question that needs to be answered in light of the effects and accrued benefits of participation (Oliver and Boaz, 2019).

Navigating social and epistemic control. Analyzing the implementation of this study showed that addressing multiple objectives using a transformative mixed methods design hinges on constant negotiation and decision-making on how much weight to attribute to each objective. This underscores the need to place more emphasis on methodological consideration of the social processes pervading the implementation of such research (Jackson et al., 2018). Depending on the actor perspective taken, the importance of objectives can be weighted differently, giving rise to tensions and frictions. Besides the need to carefully prepare interfaces and integration in the design of mixed methods research (Fetters et al., 2013), this study suggests that the actual interactions of scientists and citizens at these interfaces warrant greater attention in order to create conditions for mutual learning and to induce action. This lesson learnt corroborates the relevance of reflexive processes (Bradbury and Divecha, 2020; Popa and Guillermin, 2017), of developing abilities to collaborate with diverse actors (Freeth and Caniglia, 2019), and of acknowledging power dynamics in heterogeneous teams (Camacho, 2020; Callard et al., 2015; Fritz and Binder, 2020). This was apparent, for example, when negotiating within the interdisciplinary team over which kinds of questions the mobile crowdsourcing should include. The creative questions stimulating reflexivity were not necessarily the same as the more standardized ones which promised pertinent insights from a scientific perspective. Documenting which objective a decision related to (e.g., a question was included in the app) proved useful in making interests visible and negotiable within a heterogeneous team. Furthermore, the processes of analyzing the results uncovered that the multiplicity of scientific objectives and epistemological positions within the

team had not been sufficiently clarified. The urgency hindered an appropriate constitution of the interdisciplinary research field and impeded extensive conceptual work and theoretical integration (Klein, 2010). For example, during data analysis and interpretation, incompatible conceptions of 'housing' between individual-centered and systemic approaches surfaced and led to a conceptual reframing to 'domestic living space.'

More fundamentally, the multiplicity of objectives revealed tensions regarding epistemology and the quality of outcomes. In analyzing and interpreting data, a core methodological challenge of research pursuing epistemic and transformative objectives was faced (Herberg and Vilsmaier, 2020). Generating knowledge in a dialogical format with scientists and citizens does not allow for controlling the scientists' influence on the subjects in the same way as is the case in less interactive formats (e.g. pre-formulated questions and tasks in a survey or mobile crowdsourcing). Accordingly, the epistemic quality of collaborative research differs from that of qualitative and quantitative empirical research, which either strives for a clear separation of the researcher and the subject of research, or, depending on the epistemological assumptions, strives to trace the researcher's influences on their field of study (Herberg and Vilsmaier, 2020). This challenge manifested in the CTTs when citizens contested and attempted to modify the agenda framed by the scientists, leading to limitations in controlling the effect of the sessions' design on the results, and impeding the realization of the scientific objectives. This lesson learnt points to the need to carefully differentiate the multiple objectives for methodological reasons, while acknowledging that the explicit merging of objectives can have a value on its own. Moreover, it requires an acknowledgment that questions of epistemic control cannot be separated from questions of social control (Fritz and Meinherz, 2020; Herberg and Vilsmaier, 2020), which demand continuous negotiation throughout the research process.

Paying attention to situatedness and positionality. The pursuit of multiple objectives was rooted in the situatedness of all involved in the same crisis. One lesson learnt from this experience is that a particular emphasis on roles and positionalities of those involved is required throughout the research process. This includes the need to critically revisit narrow conceptions of what it means to be a researcher (Appadurai, 2006). Self-reflection on the researchers' own situatedness (Haraway, 1988; Rose, 1997) informed the study design, implementation, and interpretation. For instance, reflections on our privileges regarding access to information, work and housing became a driver for creating a supportive and empowering research design, i.e., for pursuing transformative objectives. Likewise, our gendered position sharpened our perspective on gender inequalities within domestic living spaces. The multiplicity of objectives entailed dynamic positionalities, i.e., shifts in researching *about*, *with* and *for* Swiss citizens (Freeth and Vilsmaier, 2020; Kenens et al., 2020). In the CTTs, scientists engaged not only as professionals but as citizens too, to actively blur a clear-cut division of roles, while citizens, guided by mobile crowdsourcing tasks, became researchers of their own situation. However, these efforts notwithstanding, long-established roles and entrenched structures (Wittmayer and Schäpke, 2014) were largely upheld. Despite striving for a research space in which scientists and citizens could jointly develop coping strategies and post-crisis futures, we - as the researchers initiating the project - assumed a powerful role in pre-structuring the research space, setting the framework of what was being discussed, and facilitating the interactions (Fritz and Binder, 2020). What was intended as a collective engagement with the crisis situation resembled in practice, with a few exceptions, 'invited' rather than 'claimed' participation spaces (Gaventa, 2006). Nevertheless, in this study citizens gradually intensified their engagement and integrated their research experiences and learnings. This points to the potential of sequential and multi-stage mixed methods approaches for action-oriented and transformative research.

A systematic ex-post impact study would be required to establish clearly the effectiveness of pursuing the multiple objectives and the longer-term impacts of the transformative mixed methods approach. Whether the support offered in the survey was taken up, hence contributing to participants' handling of the situation, is unknown. Similarly, while the collaboration dynamics in CTTs and post-crisis scenarios point to an engagement that strengthened participants' abilities to act, the degree to which empowerment occurred is difficult to gauge at this stage.

Conclusion

The mixed methods study presented in this article was grounded in the spirit of an action-oriented, transformative and transdisciplinary research paradigm. The chronotopical shifts caused by the COVID-19 pandemic, however, required adaptation and, sometimes, improvised responses to an entirely unknown situation. This has highlighted the potential for transformative mixed methods approaches to deepen understanding of the crisis' effects while strengthening individual and collective reflection and action. Based on the methodological insights into pursuing these multiple objectives it can be concluded that effective use of action-oriented and transformative mixed methods research in response to crises requires:

- distinguishing explicitly, and negotiating carefully the multiple objectives pursued to account for the priorities of all research participants throughout the process;
- conceptualizing knowledge integration from different perspectives, and considering a crisis' effects on and according needs of all involved;
- acknowledging and tackling firmly existing social and epistemic hegemonies between scientific and societal actors in order to develop transformative power in heterogeneous research alliances;
- adapting institutional and organizational conditions for dynamic research alliances between administrative bodies, civil society organizations, the economic sector, and the public at large;
- and fostering personal and professional preparedness of current and future generation academics for a changing role in a changing world.

In light of an all-embracing crisis that globally impacts all dimensions of life and affects the daily routines of both scientists and citizens, it seems timely for action-oriented, transformative research to shift from the margins of academia towards a research mainstream that enables immediate contributions to societal transformations. A transformative research culture that fosters epistemic curiosity and a proactive attitude in all people can go beyond a "contribution of research to enhancing human rights" (Mertens, 2007), and, ultimately, lead research itself to be considered a human right (Guattari, 2015 [1992]).

Data availability

The datasets generated and/or analyzed during the current study are not yet publicly available due to an initial embargo period defined in the project's ethics protocol approved by the Human Research Ethics Committee of EPFL.

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Note

1 Here the term "citizen" designates inhabitants of a given territory, and is not linked to a formal citizenship status. We use the term due to its wide uptake in "Citizen Science" (Irwin, 1995; Strasser et al., 2019).
2 Some questions on respondents' health conditions and economic situation were judged too sensitive by the Committee and would have required not only the university's but also cantonal approval. These had to be removed because the urgency of the situation did not allow to wait for this approval.
3 https://www.civique.org
4 For the reports of the Citizen Think Thanks see https://www.coronacitizenscience.ch/the-citizen-think-tanks
5 Due to the complexity of the mixed methods design, not all data/components could be considered in the methodological reflection. A meaningful inclusion of interview data would have gone beyond the scope and available space of this article.
6 For the report in French on this Citizen Think Thank see https://www.coronacitizenscience.ch/wp-content/uploads/2020/08/CTT_-Rapport_Logement-1.pdf
7 Due to anonymization and confidentiality requirements defined in the ethics protocol, linking the respective data collected at the level of respondents was not possible. The exact proportion of citizens who took part in all research components can, hence, not be calculated.

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Author contributions

The first and second author conceptualized the methodological research questions of this study and designed the article. All authors made substantial contributions to the conception of the research, the collection, analysis or interpretation of data and to drafting or revising the manuscript. All authors have approved the final version of the article and agree to be accountable for their contributions.

Competing interests

The authors declare no competing interests.

Ethics approval

The study was approved by the Human Research Ethics Committee of EPFL.

Informed consent

In accordance with the study's ethics protocol, approved by the Human Research Ethics Committee of EPFL, all study participants gave their informed consent to participate in the survey, the crowdsourcing activities, the interviews and the Citizen Think Tanks.

Additional information

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