
# Virtual social labs – requirements and limitations for online settings to be effective

Maria Schrammel , ilse Marschalek

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## Highlights

- Social labs don't always need in-person presence.
- Online workshops offer flexibility for virtual teams.
- Virtual social labs require increased staffing.
- Flexible structure combats premature exits.
- Roles in social labs must adapt for virtual use.
- Online tools support, not burden, collaboration.

# Title:

## Virtual social labs – requirements and limitations for online settings to be effective

## Short title:

## Virtual social labs

Corresponding author:

Maria Schrammel (ORCID: 0000-0002-7775-3604)

Zentrum für Soziale Innovation GmbH, Linke Wienzeile 246, 1150 Vienna, Austria

schrammel@zsi.at

Co-author

ilse Marschalek (ORCID: 0000-0001-6740-8199)

Zentrum für Soziale Innovation GmbH, Linke Wienzeile 246, 1150 Vienna, Austria

marschalek@zsi.at

**Abstract**

In response to the challenges posed by the complex field of food safety, the FOODSAFETY4EU project established social labs. Due to COVID-19 pandemic the lab process, typically held in-person, had to be converted to the virtual space. This means that all workshops, meetings, and collaboration processes and the pilot activity implementation solely took place online. This resulted in the novel situation of teams collaborating virtually throughout the labs. Virtual collaborations were already on the rise before the pandemic, evidenced by an increase in virtual meetings and workshops. This study examines the requirements and limitations for online settings to be effective in virtual social lab processes. It investigates virtual collaboration, team dynamics, and the use of online tools. Findings reveal advantages such as increased participation, but also drawbacks including technical issues and role accountability. Despite challenges, all four virtual social labs finally succeeded in engaging diverse stakeholders and achieving significant outcomes.

**Keywords:** social lab, participatory processes, virtual teams, virtual collaboration, digitalisation, multi-actor

# 1. Introduction

A social lab is a participatory and collaborative approach to addressing complex social challenges. Previous experiences underline social labs in an in-person setting, were participants meet face to face in workshops and implement co-created activities in their ecosystems (Marschalek et al., 2023). Due to the pandemic four social lab processes, implemented within the FoodSafety4EU project were transferred to solely virtual processes. Based on the experiences in these labs, this article provides insights into the requirements and challenges of online settings that enable effective team collaboration and the successful implementation of virtual social labs.

Prior to delving into our research, we present a theoretical foundation covering both social labs and virtual collaboration, exploring their unique characteristics.

## 1.1 Social Labs – a methodology for studying social change

Social labs, a concept first introduced by Zaid Hassan (Hassan, 2014), have found applications in various contexts and have been subject to extensive studies (Blok, 2023; Blok & Von Schomberg, 2023; Braun et al., 2022; Cohen et al., 2023; Frankus & Hönigmayer, 2023; Yorulmaz & Bührer, 2023). Recognized as an inclusive methodology for implementing and studying social change (Timmermans et al., 2020), social labs represent a collaborative and participatory approach to address complex social challenges.

According to Hassan (2014), a social lab brings together diverse stakeholders from different sectors to co-create innovative and sustainable solutions. Operating within a systemic framework, social labs acknowledge the interconnected nature of social issues. Through an iterative and experimental process, participants collaboratively test and refine potential solutions, creating a safe space for open dialogue and trust-building. The primary focus is on achieving actionable outcomes by transforming abstract ideas into concrete and practical initiatives. Social labs foster a culture of learning and knowledge sharing, documenting insights and lessons to contribute to collective understanding and

systemic change. Overall, they provide a unique and comprehensive approach to problem-solving, emphasizing collaboration, innovation, and tangible impact.

For successful social lab processes, a clearly structured co-creation process with dedicated tasks and settings for co-created activities (pilot actions) is essential (Marschalek et al., 2023). Intense collaboration processes require strongly committed performing teams (Hagy & Morrison, 2017), deliberately assembled with diverse stakeholders who are integrated into a team for an extended period. Instead of focusing on a specific project, these teams unite around a common problem, effectively combining theory and practice in a real-world context, such as social labs team seeks to address (Marschalek et al., 2022). Furthermore, clearly defined roles and responsibilities play a crucial role in ensuring the success of lab processes (Marschalek et al., 2023). Key factors in social labs include group dynamics, team building, and enhanced collaboration, especially when dealing with heterogeneous multi-stakeholder groups including non-scientific actors that necessitate methods and exercises to enhance collaboration and co-creation (Marschalek et al., 2023).

Contrary to a single workshop, a social lab consists of a sequence of usually face-to-face gatherings fostering collaborative processes (Marschalek et al., 2023). In the FOODSAFETY4EU project, each lab consisted of three workshops. However, due to the COVID-19 pandemic, the original face-to-face co-creation process was transitioned to an online format. Although online tools have evolved to support successful virtual collaboration, teams exclusively meeting online still encounter challenges in engagement, motivation (Karl et al., 2022), communication, trust, and team performance (Breuer et al., 2016; Cheng et al., 2015; Choi & Cho, 2019; Morrison-Smith & Ruiz, 2020) – all crucial aspects for effective social lab processes.

## 1.2 Virtual team collaboration and its specificities

Even before the pandemic, there was a growing trend towards online meetings (Standaert et al., 2021). Approximately 40% of meetings have already taken place online, and it is projected that by 2024 around 75% of meetings will take place online (Karl et al., 2022; Standaert et al., 2021). Numerous studies have been conducted on virtual teams, distance collaborations, and the challenges teams face in virtual settings (Breuer et al., 2016; Choi & Cho, 2019; Dulebohn & Hoch, 2017; Karl et al., 2022; Morrison-Smith & Ruiz, 2020; G. M. Olson & Olson, 2000; J. Olson & Olson, 2011). Studies indicate that the composition and dynamics of teams in online meetings and workshops vary from those in face-to-face settings, posing challenges, e.g. in grasping the group's social dynamics.

According to Kuzminykh and Rintel (2020), in online settings, for instance, it is less clear which roles and importance group members have. Moreover, the study shows, that in online meeting and workshop settings, team members are not only physically but also psychologically distant from each other. Virtual team members meeting online have limited ability to observe each other's actual efforts, which can lead to biased and negative perceptions and assumptions (Morrison-Smith & Ruiz, 2020). Building trust and interpersonal communication are crucial challenges for virtual teams to achieve high performance, as these aspects influence the motivation and engagement of team members. However, studies during the pandemic have shown that specifically this important engagement and motivation in the online setting remains a challenge (Karl et al., 2022).

In virtual collaboration, multitasking during meetings and workshops is common, with larger groups exhibiting more multitasking behaviour (Karl et al., 2022). Additionally, the perception of attentional focus, which is signalled by eye contact, head movement, and body positioning, is different in the virtual space where only faces are visible on the screen (Rae et al., 2015). However, technology is continuously developing to mitigate these challenges. Meeting tools like Zoom, Microsoft Teams, Google Meet, and GoToMeeting provide virtual rooms and enable video conferencing. But Glikson et al. (2019) emphasise, to strengthen team awareness, participants' commitment, and reduce social loafing, additional tools are needed. Thus, in virtual team collaborations, desktop sharing, breakout groups, and whiteboarding tools are highly important. Technology facilitating these processes proved to support team building and interpersonal exchange (Glikson et al., 2019).

Nonetheless, this virtual environment offers advantages, including the seamless utilization of polling and chat functions, as well as glimpses into colleagues' personal lives. According to Karl et al. (2022) these insights contribute to the potential enhancement of relationships among co-workers.

Virtual collaboration presents certain challenges and risks, but organisational teams can effectively address and mitigate them when they are cognizant of these issues. Additionally, virtual collaboration brings forth new possibilities and advantages (Karl et al., 2022). Research indicates that team performance is influenced by individual personalities and commitments of participants (Kuzminykh & Rintel, 2020). Frustrations, such as delayed starts, absence of agendas, excessively long meetings, insufficient breaks, multitasking, and late arrivals, are encountered in both online and in-person settings (Karl et al., 2022). Even in meetings with identical formats and tools, the quality of performance and results can vary. Factors such as tardiness, lack of team cohesion, and participants multitasking across multiple events can affect attention levels and, consequently, the overall quality of results (Kuzminykh & Rintel, 2020).

It is important to emphasize that current literature and research on virtual team collaboration primarily focus on teams within a single company or sector. In contrast, social labs bring added challenges, including navigating diverse perspectives, customizing communication to various sector cultures, involving different stakeholder groups (government, industry, research, civil society, etc.), and nurturing emerging collaborations. While insights from existing studies can be applied to multi-stakeholder collaborations in social labs, their application requires careful consideration due to specific complexities.

## 2. Research Question

Considering the existing literature on virtual team collaboration and the additional complexities of social labs, we formulated the following research question to specifically examine social lab processes in online settings:

**What are requirements and limitations for online settings to be effective in a virtual social lab process?**

In order to comprehensively address our research question, we are actively exploring distinct hurdles within virtual social labs. Our investigation delves into the intricacies of structuring and designing online social lab workshops to facilitate seamless collaboration among lab teams. We aim to

illuminate the specific challenges inherent in collaboration processes and group dynamics within online workshops. Additionally, we seek to understand how to effectively manage the collaboration of diverse participant groups in online settings.

Our focus extends to a close examination of social lab roles and the challenges faced by managers and facilitators in supporting teams during their collaboration processes. We also consider technical constraints associated with virtual collaboration in online processes. These expected insights contribute to the discourse on social labs and virtual collaborations and are also useful for all those who want to conduct virtual cooperative processes.

# 3. Approach

In the following chapter, we will initially introduce the research field. In this case, it involved four virtual social labs. Building upon the work conducted in these labs, we gathered and analysed data. Subsequently, we will elucidate the methodological approach employed in this process.

## 3.1. Field of research

Within the European Union (EU), the significance of food safety is underscored by its far-reaching implications for public health, societal welfare, and economic resilience. The FoodSafety4EU team has sought to address the perceived inadequacies of the EU's food safety regulatory framework in adapting to emerging challenges within the dynamic food sector, such as sustainable production. A notable observation is that consumers often only engage with food regulatory bodies during crises, which highlights a perceived failure in regulatory effectiveness. The Eurobarometer on Food Safety in the EU (2019) highlighted the absence of an integrated platform among various food safety stakeholders in Europe, impending regular interaction and collaborative efforts towards shaping and maintaining a robust Food Safety System (FSS) for the future. Bronzwaer et al. (2019) have emphasized the necessity for future endeavours in food safety research and regulation to transcend fragmentation and redundancy. They argue for a flexible approach capable of responding adeptly to new opportunities and threats, particularly those arising from ineffective risk communication strategies.

To find answers to these challenges, FoodSafety4EU has established four multi-actor co-creation processes known as "Food Safety operational labs" (FSOLabs). These labs served as platforms for developing and piloting innovative ideas aimed at addressing these challenges and fostering an adaptive, iterative, proactive, and even predictive Food safety system.

The labs brought together various food safety stakeholders from scholar, civil society organisations (CSO), industry, policy and networks sector to collaboratively devise and test actions for implementation. Each lab focused on one of the four predetermined priorities in the food safety sector: i) Harmonization of enforcement practices with emphasis on unregulated hazard and emerging issues; ii) Aligning research programmes and funding opportunities at national and EU level; iii) Food safety strategic and innovation agenda (SRIA); iv) Innovative approaches and models to inform civil society about food safety research and risk assessment. While these priorities were set at the project's outset, they were adapted as needed for further implementation and problem addressing, distinguishing FSOLabs from the general approach of social labs that typically involve problem setting and reframing.


*Figure 1: Virtual FSOLab path*

In line with the social lab approach used in previous projects (Marschalek et al., 2022), within the FoodSafety4EU project, the four FSOLabs facilitated participatory processes for stakeholders in the food safety field to engage in the co-creation. The labs operated both vertically, focusing on specific topics and developing solutions, and horizontally, sharing recommendations and strategies through cross-learning workshops.

Figure 1 shows the path the virtual FSOLabs followed. Before the co-creation processes started, the FSOLab management teams conducted a diagnosis of the current situation for each of the four priority fields. The project adopted the problem setting and reframing phases accordingly, as the FSO labs worked with a specific predefined challenge. Furthermore, they conducted a stakeholder mapping process, identifying and recruiting specific stakeholders who were important to engage in the co-creation process within the FSOLab specific pre-defined fields of interest. Multi-stakeholder teams then participated in co-creation processes, developing and testing ideas for actions. Over a series of workshops planned within one and a half years, the teams established ideas, gathered feedback, improved and tested them, and critically discussed them with a broader audience, enabling continuous learning cycles throughout the lab processes.

The learning cycles were structured across three workshops. Workshop 1 (~1.5 days) focused on ideation, co-creation, and the selection of ideas for specific actions based on relevant diagnosis aspects. Workshop 2 (~6 hours) involved discussing, improving, and adapting actions based on feedback and experiences. Workshop 3 (~4 hours) was dedicated to the evaluation of actions, discussing options for further development, and concluding with exploitations and recommendations. Between 12 and 25 persons took part in each of these workshops.

As authors, we accompanied all four labs throughout their processes. Our responsibilities encompassed both conducting introductory training sessions and coordinating cross-learning activities. To ensure that the lab teams were well-prepared and equipped with methods and

techniques to facilitate creative processes, support participants, address group dynamics, and offer networking opportunities, the teams were provided with a manual (Marschalek & Schrammel, 2023). Various interactive workshop techniques were employed to support co-creation processes, with all methods and tools carefully selected to meet the specific needs of the online setting.

Throughout these training sessions, we introduced lab roles drawing from experiences in previous in-person social labs (Marschalek et al., 2022): The **lab manager** is responsible for the overall lab process and serving as the primary organizer and contact person. The lab **facilitator** is professionally moderating the lab workshops. The labs primarily consisted **of lab participants**, a group of individuals recruited from within and outside the project with diverse professional backgrounds and regions. Among these lab members traditionally one **pilot host** is chosen to act as main contact person and leader of the pilot activities. We as authors did not take any of the roles described above.

Following the guidelines outlined in the manual (Marschalek & Schrammel, 2023) and the training sessions, the lab management teams utilized the initial workshop to gather and deliberate on ideas for pilot activities with the participants. Nevertheless, this stage unveiled variations arising from distinct topics, group compositions, and facilitators. Consequently, each lab adopted a unique approach in developing and ultimately executing their ideas. At the conclusion of the lab process, all teams devised and implemented their respective pilot activities as briefly described below.

## 3.2 Overview of FSOLab pilot activities

Within **FSOLab 1**[1] the team co-created two pilots under the title “Roadmaps toward harmonization and integration in the setting of risk analysis”. One related to the mycotoxins and the other to the recycled food contact materials.

For mycotoxins, a necessity for a streamlined risk assessment toolkit arose. The focus was on T-2 and HT-2 toxins, known contaminants in various food commodities like oats, posing significant health risks to consumers. It was recognized that existing risk assessment procedures for these toxins have critical gaps. Two main issues were targeted within the pilot: impediments in analytical data sharing and the demand for swift risk assessment. A strategy was devised, outlining a rapid data collection and risk assessment approach. This involved the creation of a simplified risk assessment toolkit, comprising a training manual and two user-friendly Microsoft® Excel files. One file aids in rapid data collection, based on EFSA's standard sample description format (SSD2), customizable for specific contaminants and food matrices. The second file includes spreadsheets for data processing and risk assessment, utilizing deterministic calculations. The beta version of the toolkit is freely available on the Foodsafety4EU Platform (www.foodsafety4.eu) and will be refined based on user feedback.

In the realm of food contact materials, with the ongoing revision of the European framework regulation (EG) 1935/2004), an opportunity arose for a roundtable event. This event aimed to incorporate the multi-stakeholder approach employed in FoodSafety4EU and formulate a common position. Thirty-five issues were identified for science, policy, and society (SPS) stakeholders through various sources, including interviews and a literature review. These issues were collectively discussed, refined, and scored by all stakeholders, with a tracking system for SPS-category scores. The analysis revealed several issues of high importance across all SPS stakeholders, while some

[1] https://foodsafety4.eu/fsolabs/fsolab-1/

scored high due to a single SPS category. The highest-scoring issues were subsequently discussed within the SPS-category groups, leading to the formulation of potential solutions with a timeline.

**FSOLab 2**[2] pilot "Using a food safety knowledge network for the alignment of transnational funding cycles and research priorities as fundamental part of safe and sustainable food systems" was implemented by conducting in-depth interviews with funding experts from six European Countries and a follow-up online workshop to jointly discuss the identified challenges and how to address them. Resulting recommendations included for example enhancing the traceability in the distribution of financial resources & resolving fragmentation, the establishment of food as a funding discipline in its own right, improving transparency in the allocation of funding to distinct scientific disciplines, and prioritizing long-term developments and societal challenges for funding. In general, the results of this pilot action revealed the need for closer integration and networking of research funding bodies and identified the major problems and challenges in the European funding environment from the view of funding bodies. As the pilot study only included six European Countries, the developed model opens the possibility for replication on a broader scale with expansion to all European countries. The outcome of FSOLab2 has been condensed in a manuscript that has been submitted to the open access journal Heliyon.

**FSOLab 3**[3] pilot "Alliance on food systems: Emerging risks and hazards" addressed the fragmentation of the food safety stakeholders, policy priorities and emerging technologies. FSOLab 3 encompassed a series of workshops with the primary objective of identifying key food safety challenges, involving experts and stakeholders in the food system. In the subsequent phase, eight challenges were chosen to delineate hazards and associated actions/R&D topics based on expert consensus. Over 112 Research and Innovation (R&I) topics were meticulously identified, providing brief descriptions in terms of societal benefits, necessity, potential objectives, outcomes, and rationale. The third phase involved a process of prioritizing topics based on their short-term, medium-term, and long-term impacts, followed by an extensive two-month open consultation period targeting a wide audience. Notably, the SRIA definition devoted considerable attention to addressing diverse needs articulated by stakeholders in the Food Safety System. The open consultation included participants from research, academia, policy, and non-governmental organizations, representing varying levels of responsibility and decision-making authority. The outcome is anticipated to be a new, cohesive, and more effective Strategic Research and Innovation Agenda (SRIA) that will significantly contribute to the development of a robust European ecosystem. This ecosystem aims to strengthen Europe's position as a global leader in food safety standards, fostering broader societal impacts.

**FSOLab 4**[4] pilot "Supporting solutions/tips in smart ways for communication about food safety" aimed at exploring effective and innovative methods to educate the general public on this often perceived as a dry subject. The pilot plan involved the creation of amusing characters, portraying average individuals making food safety mistakes, showcased through engaging comics, videos, and educational materials tailored for adolescents. This concept underwent testing by the food safety authority in Tunisia, utilizing comics in both French and Arabic, and by industry in Czech Republic, employing comics in Czech and English. These materials were integrated into school resources and complemented by other social media content. Analysis of the Czech social media campaign revealed

[2] https://foodsafety4.eu/fsolabs/fsolab-2/
[3] https://foodsafety4.eu/fsolabs/fsolab-3/
[4] https://foodsafety4.eu/fsolabs/fsolab-4/

significant engagement, with over 225,000 views, accounting for at least 25% of a video on TikTok (considering the initiation of a video as a view). Feedback from teachers suggested that practical demonstrations could enhance food safety lessons, with students expressing more enthusiasm for class discussions and less interest in written exercises. Student comments highlighted increased knowledge about aquaponics and food choices as the most common learning outcomes. This pilot underscores the effectiveness of tailoring materials to a specific audience.

## 3.3 Method

In order to answer our research question, we apply a qualitative research approach. Our object of research is the 4 FSOlabs mentioned above. All analysed materials were created during the lab processes and collected from all 4 labs. The following sections describe firstly the different materials that were collected in the lab processes and secondly the method of analysis.

### 3.3.1 Material

After each of the three lab workshops, the FSOlab managers had to complete an extensive reporting template. In this template, which consisted of seven to nine chapters with open questions, they described and documented all the content-related and methodological steps that they had applied in the workshop. For example, they documented all the ideas collected for pilot activities - before a final decision was made from this list. They provided a comprehensive description of all the results obtained. In this template, the managers also reflected on the course of the workshop, the methods used, the group dynamics and the atmosphere. They also reported on experiences and challenges, such as recruitment and drop-out of participants. Finally, they summarised feedback of the participants as gathered at the end of each of the workshops. The templates have been adopted for each workshop series. The reports were sent in promptly, usually no more than two weeks after each workshop. In total, we collected 12 reports from the lab managers.

At the conclusion of the lab process, all participants were requested to complete a final survey containing qualitative open-ended questions. These questions covered various aspects, such as their motivation for participating in one or more of the labs, whether their expectations were met, and if they had prior experience with social labs. In addition to gathering general information about the participants, including their stakeholder group affiliation and gender, they were also asked to evaluate various aspects of the workshop, lab management, composition of lab teams, and the online workshop format. Content-wise, participants were queried about the development process, topic, effects, and relevance of their pilot activities. They were also prompted to reflect on their lab experience and indicate whether they would consider participating again or recommend it to others.

Additionally, the four social lab management teams came together for monthly calls and in cross-learning events. Minutes and documentations of these events discussing experiences and challenges are also analysed for this study. We had minutes of 18 jour fix meetings, and comprehensive reports of two cross-learning workshops available. Also, we collected lab participants' final survey, filled in by 20 persons. Note, that we as authors are aware that the results of the final participants'' survey are not representative for the four labs, but still provide relevant insights in additional to other mentioned data sources.

### 3.3.2 Analysis

Following the approach of structured content analysis according to Mayring (2002) we applied deductive and inductive coding. We both authors coded the material using the software MaxQDA.

We started with the deductive codes based on main issues as discussed in the literature and main aspects of the lab process as addressed in our templates and meetings. These codes were amongst others: Recruitment and group composition, group dynamics, pilot development, roles and tasks or challenges and advantages of online tools. We added inductive codes that came up during the analysis process such as commitment, collaboration challenges and recommendations, adaptions to the format and mitigation strategies.

In a next step the content was paraphrased and structured according to predefined fields of research: i) structure and methods of the online workshops, ii) collaboration processes and group dynamics, iii) collaboration in an online setting iv) roles in a virtual social lab, v) pilot implementation and vi) online technology and tools. In the results section we structure our insights according to the six fields for challenges that we identified in our analysis.

# 4. Results

In general, it can be said, that considering the situation due to the COVID-19 restrictions, the virtual social labs allowed to continue their activities and maintain social distancing requirements, ensuring the safety of participants while still facilitating meaningful engagement. So, in short, it went quite well. However, the labs had to contend with specific difficulties. The following sections describe the challenges the labs had to address under these unique circumstances.

Initially, we present findings related to online social lab workshops, encompassing their setup, organization, collaboration, group dynamics during implementation, and their distinctive role concerning participants with diverse professional backgrounds and different origins. Subsequently, we delve into insights concerning the virtual pilot implementation phase. This is succeeded by chapters on traditional social lab roles within virtual team collaboration, technical constraints, and the meaning of online tools.

## 4.1 Structure and design of online social lab workshops

The virtual nature of the investigated four social labs provided a high degree of flexibility for arranging workshops, enabling easy adaptation to the specific needs of each lab. In response to this flexibility, certain labs opted to enhance their workshops by spreading sessions across multiple days. For instance, FSOL1 chose to divide their second workshop in such a manner to enable the engagement of a maximum number of participants:

> *"One of the feedbacks from previous workshops was that it was hard for most people, especially those from industry, to reserve an entire day for the workshops. As we also have two different pilot topics, it was decided to split up the first session for each group and make them half a day, with a plenary session following at a later date. This way we could organise the workshop for each group with as many participants from the particular group for maximum input from within the group" (FSOL1_WS2).*

Moreover, participants emphasized the efficiency and effectiveness of the virtual social lab and its online workshops. According to our management teams, the utilization of online tools, fosters increased interaction among participants, resulting in more streamlined and effective meetings. It aids in adapting methods for successful implementation, facilitating fast feedback and open discussions conducive to fruitful co-creation.

Nevertheless, both participants and lab managers highlighted a significant drawback of virtual social labs—limited social interactions. The absence of face-to-face meetings reduced the spontaneity of conversations, laughter, and informal bonding, sometimes creating a stiff atmosphere. This lack of in-person interaction could potentially hinder the development of personal relationships and networking opportunities among participants. Shy individuals, especially, may tend to remain in the background and contribute less to discussions in online environments compared to face-to-face meetings. This necessitated additional efforts from the lab management team and facilitators to engage those who might be inclined to hide or stay silent. Online workshops, in particular, required a comprehensive management and facilitation team.

Participants also faced distractions from other tasks during online workshops, such as checking emails, making phone calls, or browsing the internet, leading to reduced concentration on lab activities. Regarding the optimal duration for such online workshops, teams had varying experiences. For Lab Workshop 1, they discovered that adequate time was crucial. Initially concerned that a 1.5-day online workshop might be too lengthy, the management teams recognized the importance of careful consideration of the workshop format. Ultimately, they identified shorter sessions, sufficient breaks, and strict timing as essential factors for ensuring optimal engagement and effectiveness.

Consequently, the four distinct social lab teams made slight adjustments to the workshop formats based on their specific requirements. Some chose to leverage the online setting by breaking down long days into shorter sessions on different days, while others incorporated brief additional workshops to ensure alignment among participants. Nevertheless, all teams encountered the common challenge of fostering collaboration and effectively responding to group dynamics in their online workshops. The subsequent chapter will delve into the intricacies of group collaborations and dynamics in online co-creative lab workshops.

## 4.2 Collaboration processes and group dynamics in online workshops

The workshops were strategically crafted to stimulate active and inspiring discussions within an online environment, ensuring a seamless and productive participation experience for the majority of the attendees. Drawing on insights from virtual collaboration experiences, the teams adhered to a detailed guide (Schrammel & Marschalek, 2023) while planning their online workshops. Some methods, traditionally applied in face-to-face settings, were successfully adapted for this online collaboration. For instance, the “dialogue circle” emerged as a method to unite the team and instil commitment to the pilot and lab, proving effective in the online workshop setting as well. In these dialogues participants freely shared their opinions, suggestions, and recommendations regarding the pilot. Participants appreciated the creative process and open mind-set of their groups and emphasised the fruitful outputs of the workshop sessions. One lab participant summarised their experiences as follows:

> *“It was really a dynamic and collective learning process in an interdisciplinary team. […] Time passed so quickly without feeling as you were sitting alone in front of your computer. It was really like sitting physically within a group of people" (FSOL2_WS1).*

In our analysis of the four lab processes, we identified diverse collaboration styles and their potential impact on group dynamics. Overall, the experiences related to group collaboration in the FoodSafety4EU social labs were positive, with participants expressing gratitude for the friendly and supportive atmosphere within the groups. To address the challenges of virtual collaboration, lab

teams incorporated various online icebreaker activities, particularly at the beginning of the sessions. These activities aimed to acquaint team members with each other and familiarize them with the use of online tools. For instance, participants were tasked with pinning a sticky note with their names on a map, indicating their location on the Miro board to visualise their different origins.

Lab managers were eager to have everyone's ideas and viewpoints, fostering a constructive environment for discussions. Still, there were some challenges in achieving full participation and expression of opinions. To enhance the engagement and expression of opinions among introverted FSOLab participants, the FSOLab facilitator took deliberate steps during plenary discussions. These measures included directly addressing specific individuals, inviting them to share their thoughts, or redistributing more dominant personalities evenly among various breakout groups. The online workshops facilitated the easy creation of breakout groups and the seamless rearrangement of participants. Lab managers reported about differences in collaboration in their break-out groups. While managers consistently emphasised the allowance and consideration of all lab participants' opinions, and the collaborations were characterized as highly respectful, there were instances where facilitators chose to modify break-out teams to enhance overall group dynamics, as exemplified in the following quote:

> *"It was also noticeable that the collaboration in the very first break-out room was quite different between the groups. […] Since it could not be ruled out that individual participants did not feel that comfortable in the assigned group composition, the lab facilitator mixed the groups differently in the next break-outs, especially for group 1" (FSOL 2_WS1).*

All four lab managers reported the establishment of a sense of community within their social lab teams. The collaboration was characterised as creative, inspiring, engaging, and participative. Participants not only valued the programme, moderation, group discussions, and exchange of ideas, but also the development of new skills and understandings, including the use of the Miro application.

However, it is essential to acknowledge that the complex nature of the FoodSafety4EU social lab topics posed challenges to collaborative development, influencing the extent of co-creation moments in some labs. Additionally, there were individual voices expressing dissatisfaction with the online process, as exemplified by the following quote: "*The part I like least is about the FSOLab in an online format; maybe I would understand more of the process if we were together in the same room*" (FSOlab2_WS2).

## 4.3 Collaboration of diverse groups in an online setting

Participants argued that the online format makes the process more accessible and the participation more convenient. It eliminates the need for participants to travel, making it easy for them to attend workshops from their own locations, which additionally saved time on transportation and reduces environmental impact by minimizing travel-related emissions and resource consumption. Thus, online events make it easier to engage different stakeholders, they enable the integration of a diverse group of participants spread across Europe, making it possible to collect a variety of perspectives and expertise that might be difficult to assemble in one physical location. Moreover, this flexibility in scheduling also enables the inclusion of high-level experts whose availability usually is rather limited. However, analysis from the lab experiences revealed that these experts did not consistently partake in entire workshops due to their demanding schedules. This irregular participation resulted in a lack of continuity in their contributions and overall engagement. The

findings from the FSOLabs underscore the challenge of maintaining participant engagement throughout the entirety of each social lab workshop, despite the apparent advantages of virtual collaboration when inviting and involving high level experts. A comparable situation arises with participants who have family commitments or face travel restrictions. While the online setting facilitates their participation, it also presents the temptation to briefly exit workshops and disrupt the planned procedure.

Considering the different backgrounds of participants, in the specific case of the FoodSafety4EU social labs, participants' backgrounds varied, but all were somehow connected to the topic of food safety. Thus, participants appreciated the contact with other stakeholders and organizations, with many expressing that they learned significantly from each other. Nevertheless, the experiences also revealed that individuals lacking a connection to the theme are susceptible to disengagement.

FSOLab managers supported the good working atmosphere and exchange as well as the team building of the diverse group by encouraging participants - especially newcomers - to introduce themselves and providing room for reflecting on their valuable skills. At the outset of each workshop, warm-up sessions and introductions were carefully organized to allow participants ample opportunity to familiarize themselves with one another. The goal was to cultivate an open and inclusive atmosphere where all participants, regardless of their profession, felt free to raise questions, voice concerns, or share ideas and thoughts (Schrammel & Marschalek, 2023). Additionally, the interactive techniques presented to the lab managers, typically employed in traditional face-to-face workshop settings, could have been readily adapted to the online setting. Despite the inherent challenge of securing strong commitment, particularly crucial in the context of social labs, our lab managers found that, overall, online workshops were deemed more efficient in terms of participant engagement of diverse groups.

## 4.4 Collaboration in pilot implementation phase

Collaboration among team members in social labs, especially during the pilot implementation phase, presents a distinct challenge. It is crucial to emphasize that all pilot initiatives undertaken by the teams were intentionally designed to be independent of in-person execution. The teams identified pilot activities suitable for virtual implementation, thereby circumventing the need for in-person collaborations, a practice particularly pertinent during the COVID-19 pandemic (see section 3.1.1).

Our lab managers encountered challenges, particularly in maintaining participant engagement and ensuring timely updates. Managing pilots in a virtual environment posed additional complexities for lab managers. The FSOLabs showed, that effectively addressing these challenges necessitated diverse communication methods and tools to stay connected with participants while keeping them informed and engaged. Given that lab participants never met in person, the significance of interaction between group members became evident, particularly in virtual collaborations extending beyond workshops or meetings. Lab managers exerted specific efforts to develop and oversee communication processes to sustain collaborative efforts during this challenging phase.

The participants' familiarity with virtual collaboration offered a distinct advantage in this context. Lab participants were already well-acquainted with collaboration tools, albeit these tools needed to be supplied by the lab management teams. Consequently, lab managers played a crucial role in actively engaging in these events and assisting participants in their work processes during the pilot

implementation phase. In three out of our four labs, delegation of leadership to a pilot host was not a viable option, as detailed in section 4.5.

The FSOLab teams illustrated that not all participants had the opportunity to engage in collaboration between workshops, with some being exclusively involved during the workshop sessions. In the two labs where core teams or steering committees were established, a subset of participants within these groups undertook extensive collaboration with the lab management teams. Their involvement encompassed meeting preparations and the implementation of pilot actions, demanding significant efforts from them. Consequently, the lab teams encountered challenges in sustaining consistent participant engagement and commitment throughout the pilot activity. The management teams reported difficulties in keeping participants motivated and engaged between workshops, as exemplified by FSOLab2:

> *"A disproportionate[ly] high number of rather "in-active" lab participants left the FSOLab2 team during the course of the project or stopped responding to email communications" (FSOLab2_WS3).*

However, the guidance and ongoing support provided by lab managers played a crucial role in facilitating participant contributions, ultimately leading to overall positive experiences by the project's conclusion.

## 4.5 Roles in a virtual social lab

As aforementioned, social labs typically involve specific roles. However, the virtual process has led to a certain flexibility in these roles. For instance, managers and facilitators collaborated more closely due to the increased need for moderation in online workshops. The technical handling, such as creating breakout rooms, polls, or interactive workspaces, required additional resources alongside the usual moderation tasks. Furthermore, unforeseen technical difficulties had to be anticipated, ranging from issues with individuals opening a board or finding a room to unstable internet connections and poor sound or audio quality. Here, the lab managers and facilitators had to intervene to minimize participant frustrations and ensure a successful participation for everyone equally.

Identifying a suitable host for the pilot activity proved challenging for some labs, requiring additional efforts to address the issue. Consequently, two labs utilized core teams instead of individual hosts, another employed a steering committee for overall organization, with the lab manager taking charge in the piloting phase. In another lab, hosts' roles were explicitly embraced. A reason could be that there was an explicit interest from a company to take over the host of this pilot. The other labs addressed more principal topics, which led to participants' common interest in the implementation of the pilot actions. However, the struggle of identifying a host and the linked limited engagement from some participants resulted in higher workload for lab managers.

## 4.6 Technical constraints and online tools

The overall experiences with online tools, particularly Miro, Zoom or Microsoft (MS) Teams, in the FSOLabs were positive, with participants expressing appreciation for their ease of use, effectiveness in facilitating collaboration, and role in enhancing the efficiency of the lab process. However, lab participants as well as lab organisational teams sometimes struggled in using the different tools. The lab teams emphasised the importance of well experienced facilitators and one additional person who is responsible for technical support and assistance to help people who are not familiar with the tools.

Some lab management teams decided to offer a so-called workshop Zero or to organise an online pre-meeting, where a training for the online tools and results from the prior lab diagnosis were provided. Participants were actively wishing for such a pre-meetings addressing potential technical challenges. Thus, the Miro boards and the provision of the training contributed to a smooth and fruitful lab experience for the participants:

> *"The whole co-creation procedure (including the programme, task instructions, actual tasks, synthesis of findings, etc.) was depicted clearly as a pathway on the Miro board, so we could stay on the Miro board without switching for PowerPoint presentations and screen sharing." (FSOL1_WS1).*

The work with the Miro boards was generally well-received. Participants found the boards user-friendly and effective in supporting the co-creation process. During the workshops, only some minor challenges were encountered, such as accidental copying of whole boards and difficulties with writing on sticky notes for some participants, but these issues could be effectively managed within the workshops, also with the help of other group members. In all FSOlabs the online tools played a crucial role in facilitating interaction and collaboration among the working groups, ensuring a smooth exchange of ideas and insights.

The lab teams faced the challenge how to deal with newcomers, who were not yet familiar with the technical settings. To address this challenge, extra technical sessions with newcomers to introduce and practice the tools used within the specific lab had to be planned for each of the workshops. FSOLab1, for instance, took proactive measures to aid teams in comprehending the process and effectively utilizing digital tools. They created concise instructional screencasts outlining the upcoming steps. This approach garnered a positive response. Furthermore, lab management teams planned ice-breaker sessions that were combined with tasks that enabled participants in using and working with digital tools, such as Miro boards and ZOOM features.

Additionally, digital tools played a crucial role in facilitating communication and sharing the results of the previous cycle in a well-organized manner before the subsequent workshop:

> *"To aid in this, we posted the outcome of cycle 1 on the Miro-board for cycle 2 on top of the board and made it available before cycle 2 started. The output of cycle 1 was processed by the lab management team to identify key-elements in the pilot, such as sub-tasks, milestones, and deliverables." (FSOL1_WS2).*

The experiences showed that the application of online tools in the FSOLabs required a lot of preparation by the management teams, but the experiences with them by the participants were overwhelmingly positive. Overall, the online tools used represented more of a support than a burden for online collaboration and were not reported as a cause for dropouts by any of the lab.

# 5. Discussion

In the following chapter, we reflect on the results of our analysis of the 4 FSOlabs with the existing literature on social labs and virtual team collaboration. We follow the same structure as in the results chapter. At the end of the chapter, we focus in particular on the limitations of the study, as we did not encounter all aspects of social labs in the FSOlabs and did not take certain aspects into account in our analysis.

## 5.1 Workshop structure

Prior investigations into social labs underscored the significance of workshop environments (Marschalek et al., 2022). Participants highlighted the value of a welcoming and comfortable space with a pleasant atmosphere. This led to the belief that both the physical room itself and the opportunity for informal interactions during breaks are essential prerequisites for effective social lab processes. The study says, that informal encounters were seen as a key factor for the social lab teams to grow and to collaborate (Marschalek et al., 2023). Thus, these aspects were deemed instrumental in sustaining participant engagement and fostering team cohesion (Marschalek et al., 2022; 2023). Interestingly, the experiences from the FSOLab processes unveiled a distinct pattern: participants scarcely raised concerns about the absence of in-person collaboration spaces. This suggests that our lab participants either did not encounter challenges in online collaboration or did not perceive any issues arising from the online setting. Essentially, a virtual room functions similarly to a physical one, provided it is thoughtfully organized and prepared. In this virtual room, online platforms and collaboration tools offer a high degree of flexibility, which is perceived as a significant advantage.

Another distinction specific to the virtual social lab compared to in-person social labs pertains to the duration of workshops. In in-person social labs, workshops typically spanned between one and two days, with participants emphasizing the significance of informal interactions during breaks, meals, and other occasions (Marschalek et al., 2023). Engaging in an online workshop throughout an entire day presented challenges for certain social lab participants. Lab managers could easily respond to this feedback by, for instance, dividing workshops into multiple shorter sessions over two or more days. Moreover, participants are not constrained by travel, enabling workshop segments to be spread across different days for enhanced participant engagement. Nevertheless, our findings indicate that apart from shorter workshop days and efficient time management, incorporating suitable breaks and adhering to a strict schedule are essential factors for ensuring optimal engagement and effectiveness during online workshops.

## 5.2 Collaboration processes

Examining collaboration within workshops in more detail, the online format demands additional efforts from facilitators to effectively manage participant dynamics. Social dynamics also undergo changes in online meetings, differing from in-person interactions as explored by Kuzminykh and Rintel (2020). The fact that virtual team members possess limited means to directly observe each other's contributions (Morrison-Smith & Ruiz, 2020) underscores the importance of facilitators aiding group communication. This involves ensuring that quiet individuals have a voice and moderating the involvement of more dominant participants, particularly in breakout groups, as the experiences of the examined labs have shown.

Additionally, our cases illustrated that virtual social labs need increased staffing to maintain the required level of support for working teams, crucial for an effective process. In addition to robust facilitation and well-prepared assistants, the selection of appropriate workshop and co-creation methods plays a significant role in fortifying the virtual team collaboration and sustaining productive engagement from all participants. In online workshops, facilitators (along with assisting staff) can readily respond to challenging group dynamics and consider adjusting participant allocations for breakout groups.

## 5.3 Diverse groups

As mentioned earlier, social labs demand a carefully curated group makeup, guaranteeing the engagement of relevant stakeholders aligned with the particular topic. The composition of the group, encompassing diverse perspectives and individuals connected to the lab's theme, is pivotal for fostering high-performing teams essential to social labs. Especially in the complex food safety social labs, it was crucial to identify the appropriate actors who were not only relevant to the respective theme but also held a certain influence. Following a comprehensive diagnosis of each lab theme, the lab managers conducted thorough stakeholder mapping exercises to identify the appropriate individuals. The topics are highly specialized and challenging, thus requiring specific expertise. Our study showed that individuals who have no connection to the theme are at risk of dropping out. Furthermore, without the necessary expertise, their input would be lacking in discussions and decision-making processes.

The FSOLab managers highlighted the effectiveness of virtual collaboration in engaging the necessary high-level experts. However, our analysis revealed a noteworthy challenge in the form of multitasking behaviour, particularly prevalent in online workshops (Karl et al., 2022). This phenomenon was observed across all four FSOLabs, particularly among high-level experts and participants juggling family responsibilities. While the online setting facilitates access to high-level experts and enhances their involvement in the process, it also introduces challenges. The online workshop format creates a temptation for participants to exit them prematurely. To tackle this issue, the structure and design need to remain adaptable to maintain seamless collaboration among participants.

## 5.4 Pilot implementation and social lab roles

Creating effective teams, promoting collaborative efforts, and ensuring accountability are key aspects explored in social lab research. The integration of participants into the lab team, sustained involvement, and clearly defined roles are crucial factors in driving successful lab processes (Marschalek et al., 2023). Our study revealed challenges regarding the identification of pilot hosts. These struggles faced by all four virtual labs in finding pilot hosts suggest that the virtual environment complicates role assignment and the establishment of individual accountability for project initiatives. Similar challenges have been highlighted by researchers such as Breuer et al. (2016), Choi and Cho (2019), Karl et al. (2022), and Morrison-Smith and Ruiz (2020), indicating that virtual teams encounter difficulties related to engagement, motivation, trust, and overall team performance. Also, Marschalek et al. (2023) argued that physical meetings are key to drive pilot actions forward. Keeping participants engaged, especially during the interim period between workshops, proves to be a significant challenge. This has also been observed in previous social lab processes where teams conducted their workshops in physical locations (Marschalek et al., 2023). In those earlier instances as well, management teams supported the lab teams in organizing calls, establishing mailing lists, utilizing collaboration platforms, and leveraging social media networks to facilitate virtual communication (Marschalek et al., 2023). Considering these insights, the virtual social lab experiences demonstrated that the sense of physical and psychological distance among participants – which Morrison-Smith and Ruiz (2020) highlight as a particular challenge for virtual teams – did not become evident during the intervals between workshops. In both virtual and in-person labs, lab managers noted the need for significant additional efforts to maintain effective communication.

Regarding the pilot activities within the complex food system, all four labs succeeded in addressing aspects and challenges of the European food safety system described above. Within their respective domains, they were able to take further steps forward.

## 5.5 Technical constraints

Based on the literature review and participant experiences, it is evident that online formats present unique challenges (Breuer et al., 2016; Cheng et al., 2015; Choi & Cho, 2019; Karl et al., 2022; Kuzminykh & Rintel, 2020, 2020; Morrison-Smith & Ruiz, 2020). These challenges can be addressed by utilizing conference tools, as well as whiteboarding, or visualization tools, which provide valuable support. Nevertheless, it's important to note that participants may have varying levels of familiarity with these tools, making it essential to carefully consider their needs and skills when planning a virtual social lab. These tools are designed not only to mitigate the common problem of multitasking during online interactions (Karl et al., 2022) but also to assist workshop participants in interpreting each other's non-verbal cues (Rae et al., 2015). While technology is continuously advancing, it is important to note that addressing these challenges require more than just the platforms and tools (Glikson et al., 2019).

Through an examination of four virtual social labs in this study, it became evident that the presence of facilitators and support teams played a critical role in successfully making use of such technologies. For instance, the study revealed that merely providing a communication platform without active moderation leads to underutilization by participants, even when the platform could offer the benefit of easy communication between workshops. This finding aligns with prior studies (Marschalek et al., 2022) that underscore the persistent challenge of effective communication between workshops, even in the virtual realm.

The landscape of virtual collaboration has been significantly influenced by the evolution of meeting tools, which have expanded their offerings to encompass virtual rooms and video conferencing capabilities. However, as emphasised by Glikson et al. (2019), these tools, while beneficial, require further augmentation to fortify team dynamics, participant commitment, and counteract social loafing. Consequently, within our lab processes, a diverse array of supplementary features including voting mechanisms, screen sharing, breakout groups, polls, and visualizations on Miro boards were integrated. Despite these advancements, some participants encountered challenges when navigating these tools, and certain lab organizational teams grappled with technical obstacles. However, these impediments were not insurmountable, as inventive strategies were devised to tackle them head-on. The strategic application of digital tools emerged as a pivotal factor in fostering efficient communication and the systematic sharing of past work results. Furthermore, the integration of digital ice-breaker sessions proved instrumental in two-fold: cultivating participants' familiarity with the tools and nurturing interpersonal connections among attendees.

Nevertheless, while participant experiences with online tools within FSOLabs were predominantly positive, their effective application necessitated significant preparatory efforts by management teams.

## 5.6 Limitations of the study

It should be said at the outset that FSO labs did not include the problem-setting and reframing phases typical of social labs, so the results do not reflect these phases. Furthermore, it should be noted at the outset that the comparisons we can make in this study are limited. This study does not compare in-

person with virtual pilot activities. All of the processes we examined took place in the virtual space. Planning in-person activities was not an option at that time of the pandemic. Thus, the teams chose pilot ideas suitable for this virtual collaboration. Furthermore, the pilot implementing teams had to organise their meetings online and conduct the process virtually. Us, the authors did not participate in all these meetings and have received only indirect information. Further research could pick up the question on how pilot teams collaborate in virtual piloting phases. The four FSOLabs engaged stakeholders with different backgrounds. However, it must be noted that all participants were actors in the food safety system. Interest conflicts or lack of trust among stakeholder groups, as often observed in social lab processes, were not evident in the FSOLabs. Demographic data, such as age, was not examined in the labs. Moreover, we did not have the possibility to gain insight on tackling language barriers in such virtual collaboration processes, as all participants engaged in the labs were used to working in English and were able to understand the topic specific language. Even though the labs took place virtually artificial intelligence did not emerge in the context of the themes they worked on or their collaboration processes during our study period.

# 6. Conclusions

Previous research indicated that in-person interactions have a positive impact on collaboration, with the assumption that such interactions are particularly important in social labs (Marschalek et al., 2023). Prior to the COVID-19 pandemic, virtual implementations of social labs were not seriously considered. With experiencing the implementation of social labs in the FoodSafety4EU project, this view however changed.

Our study explored the requirements and limitations of online settings to be effective in a virtual social lab process. It provided insights regarding structure and design of online workshops, virtual team collaborations, social lab roles and their meaning in a virtual social lab, as well as the capabilities and constraints of online tools.

The study reveals challenges in virtual social labs, particularly in role assignment and engagement. Virtual teams encounter hurdles related to motivation, trust, and performance, echoing prior research. Maintaining engagement during intervals between workshops, regardless of the setting, demands proactive strategies, while facilitators in online workshops must navigate altered social dynamics. Adequate staffing and skilled facilitation are essential for success. The duration of online workshops differs, enabling adjustments for engagement. In both virtual and in-person contexts, adept facilitation and suitable methods are key to achieving effective social lab processes.

Moreover, this study underscores the importance of conducive workshop environments in effective social lab processes. Prior research emphasises the value of comfortable spaces and informal interactions for participant engagement and team cohesion. Virtual social labs exhibited comparable effectiveness to physical ones, revealing the significance of well-structured virtual spaces. Online collaboration tools offer flexibility, addressing challenges like limited interaction and non-verbal cues, but also enable increased participation particularly among participants with limited time resources. However, success depends on more than just technology; facilitators and support teams play a pivotal role in maximizing these tools' benefits. As technology advances, this research highlights the need for a holistic approach that combines well-designed virtual spaces with effective facilitation. Thus, the study also highlights that online formats in social lab processes come with unique challenges that can be effectively addressed by integrating tools like conferencing and visualization

platforms. While these tools have been beneficial, they require ongoing improvement to enhance team dynamics and counteract issues like social loafing. The study underscores the need for preparatory efforts by management teams to effectively apply these tools, showcasing their positive impact on participant engagement and collaboration.

Our results showed that virtual social labs can effectively be implemented across many phases, but not without meeting certain requirements, which we will describe below. Virtual social labs require:

1. a designated space for interaction and collaboration in the virtual space. These virtual spaces must be thoughtfully organized and crafted to ensure participants' comfort.
2. experienced facilitators, well-versed in the specific challenges of virtual environments, and equipped with a suitable array of methods for fostering team building and collaboration.
3. comprehensive preparation, involving both the lab management teams adept at handling technical tools and participants well-guided and supported throughout the process.
4. a well-balanced group composition, which relies on a comprehensive stakeholder map, ensuring the involvement of pertinent stakeholders aligned with the specific topic and the system possible solutions aim to influence.
5. a selection of appropriate online tools that facilitate and enhance participants' interaction and collaboration.

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## Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used chatGPT in order to rephrase for better readability and grammar check. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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**Declaration of interests**

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: