WHITE PAPER

Co-Designing Solutions for Better Oral Health:

A Collaborative Approach to Addressing Global Challenges

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Table of contents

Executive summary 3

Introduction 4

Understanding co-design in (oral) health 5

Design for oral health: seminar and workshop 6

Case studies: successful co-design in oral health 7

Conclusion 19

Future directions and opportunities 20

Acknowledgement 21

References 22

Appendix 1: workshop participants 23

Appendix 2: list of acronyms and glossary 25

Executive summary

Oral diseases affect over 3.7 billion people globally, disproportionately impacting vulnerable and underserved populations. Despite their preventability, these conditions continue to cause significant harm to individuals and societies due to persistent inequalities and systemic barriers. As global health strategies such as FDI's *Vision 2030* and the WHO Global Oral Health Action Plan (2023–2030) call for more person-centred and inclusive approaches, co-design has emerged as a powerful tool for transforming how oral health challenges are addressed.

This white paper explores the role of co-design—an inclusive, human-centred and participatory design method—in improving oral health outcomes. Co-design engages patients, professionals, and community members in collaboratively and iteratively defining and developing solutions that are context-specific, equitable, and grounded in lived experience. The paper outlines the key principles of co-design and demonstrates its application through case studies, workshops, and research projects across multiple countries and settings.

Key insights from a multi-stakeholder seminar and series of co-design activities highlight the value of design in navigating complex systems, fostering innovation, and prioritising user-centred solutions. Activities helped identify urgent priorities in oral health, including access and equity, sustainable practice, education and prevention, and integration of oral health into broader health systems.

The paper concludes by outlining future directions for embedding co-design into oral health policy and practice. These include capacity building, strengthening cross-sector collaboration, expanding digital methods, and developing robust evaluation frameworks. By adopting co-design approaches, oral health stakeholders can create more responsive, inclusive, and effective solutions that reflect the needs of all communities.

Introduction

Despite being largely preventable, oral diseases continue to affect some 3.5 billion people worldwide. Oral diseases includes preventable conditions such as dental caries, periodontal diseases, edentulism, oral cancers, congenital malformations and neglected diseases such as noma (1). Oral diseases have a negative impact on a person's quality of life and disproportionately affect the most marginalized and disadvantaged communities reflecting widespread social inequalities (2). Oral diseases share common risk factors with other noncommunicable diseases, including alcohol consumption, tobacco use and diets high in free sugars (3). Furthermore, oral diseases are associated with systemic diseases including cardiovascular diseases, diabetes, chronic lung conditions, rheumatoid arthritis, chronic bowel conditions and certain types of cancer (4).

Oral health is currently a global health priority. In 2021, FDI World Dental Federation (FDI) released their *Vision 2030: Delivering Optimal Oral Health for All (Vision 2030)* report, closely followed by the World Health Organization (WHO) landmark resolution on oral health. This further informed the WHO Global Strategy and Action Plan on Oral Health 2023–2030 (GOHAP) in 2024. Central to the FDI's *Vision 2030* report, is the integration of person-centred care into healthcare systems and communities, that delivers affordable and accessible oral healthcare for all. Through successful design and integration, communities can create oral healthcare services that prevent and manage oral diseases, as well as contribute to overall health and well-being for all members of society. To achieve this, engagement with all stakeholders is required to develop innovative approaches in oral health interventions. As such, the discipline of Design, with its inherently creative and generative approach to problem-framing and problem solving, has much to offer, in particular through its combination of human-centred, inclusive and systemic co-design principles and practices (5).

Human-centred design recognizes the values, needs and experiences of all stakeholders to produce contextualized and meaningful solutions to complex problems - which are useful, usable and desirable. Inclusive design recognizes both the 'extreme' and 'mainstream' users and scenarios of use, and aims to design with marginalized user groups who expose diverse access, quality and equity challenges as well as innovative opportunities to the design process (5). These human-centred and inclusive principles are embedded within co-design methods, which has emerged as a promising strategy to ensure the needs of all are considered when designing product, service and system interventions.

Understanding co-design in (oral) health

Definition and principles of co-design

Co-design is a non-hierarchical, collaborative and resource-intensive subset of participatory design in which designers, end-users and stakeholders engage as equitable partners, throughout the whole iterative design process, from exploring the initial situation and context discovery, to definition of brief and development of ideas, towards its application and delivery, using an expanding and evolving formal set of mindsets, methods and tools. Co-design is a process that engages multiple stakeholders alongside designers in the creative and iterative process and practice of designing (6). It seeks to address democratic imperatives that those affected by an issue or solutions have a right to be involved in designing it. It also recognizes that within the experiences of relevant stakeholders, particularly those with lived experience expertise, lies vital knowledge of what the needs, preferences and requirements are.

Appropriate stakeholder engagement

There are a wide range of approaches and frameworks for identifying and working with stakeholders. Of key importance is understanding that stakeholders are included not because of their representativeness but for their expertise (including lived experience expertise), and that there is often flexibility in stakeholder engagement across the life of a project (7). This flexibility is critical in a design research process, responding to issues that arise during the process, and in ensuring stakeholder groups are engaged at times when they are best able to contribute. Balancing between a desire for generalizability and the need for specificity, and the identification of edge-cases or lead-users is a challenge in all public health co-design research and requires careful planning and design research expertise to navigate.

Benefits of co-design in health interventions

Within a co-design process, participatory, non-hierarchical and generative mindsets, methods and techniques are used to facilitate collaboration and participation by all stakeholders helping to uncover diverse perspectives, gain insights and develop more inclusive, desirable, effective and user-centred solutions. Importantly, co-design recognizes the importance of contextual relevance, meaning that solutions are not developed as one-size-fits-all models, but as dynamic and adaptable patterns that can be adjusted to different contexts and cultures, by the people using them. While these approaches often require greater up-front investment of resources, they are critical in ensuring research addresses actual community needs (8).

Application of co-design in oral health contexts

The application of co-design in oral health offers a powerful means of developing interventions that are inclusive, contextually relevant, and better aligned with the lived realities of diverse populations (9). By involving stakeholders—such as patients, carers, dental professionals, policymakers, and community members—co-design enables the creation of solutions that go beyond generic guidelines to address specific challenges in meaningful ways, ensuring and embedding uptake and buy-in by target users and stakeholders (as co-designers).

Design for oral health: seminar and workshop

Amidst a wide range of complex challenges, design and co-design can help create new partnerships, develop innovative approaches and bring together people who would not normally collaborate, to generate new ideas and deliver interventions aimed at reducing oral health inequalities and improving overall well-being.

On the 19th of September 2024, a range of stakeholders involving researchers, clinicians, and design experts came together to explore how co-design practices could transform oral health behaviours, research, and practice.

Part one: mapping the existing landscape

In the first part of the workshop, we mapped the range of perspectives within the seminar and workshop on a positionality graph against two axes of *Discipline* (between design and oral health) and *Knowledge Domain* (between practice and research), as a way to acknowledge who was, and who was not represented on the day. Upon arrival participants were asked to place a paper person representing themselves on this graph (Figure 1).

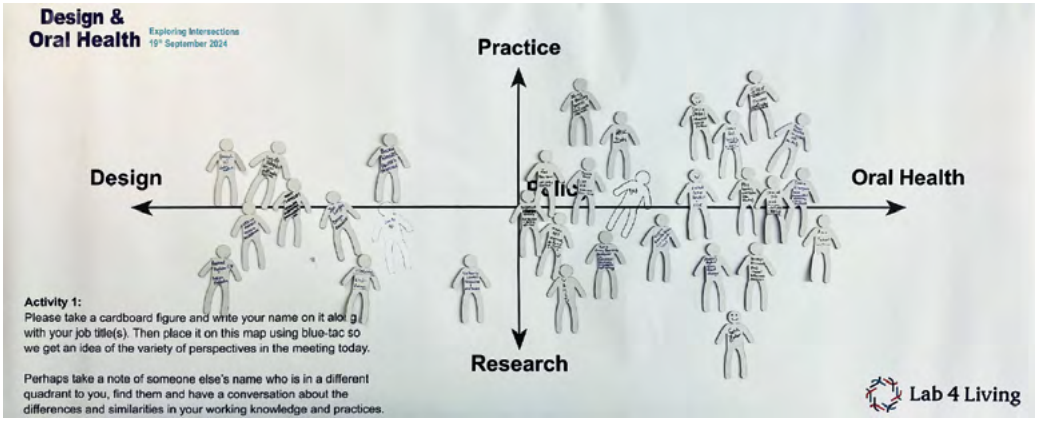

Figure 1: The in-person positionality map on the wall of the venue

Given the context of the workshop, it is no surprise that all participants mapped themselves within the oral health and design field. Within the field of design three participants were placed in Research, whilst three were in Practice and three were somewhere in the middle. Within the field of Oral Health eight participants were placed into Research, whilst six were in Practice and seven were somewhere in the middle. While people were not included exclusively for their lived experience, we recognized that all those in the room were also oral health services users and brought this experience alongside their professional expertise.

Case studies: successful co-design in oral health

Throughout the workshop, participants were provided an opportunity to socialise work they had been involved in or were aware of in oral health co-design and to explore where there was evidence of best-practice approaches that should be shared. Four case studies have been selected for presentation here that exemplify different contexts and learnings, summarized in the table below.

Case Study	Key focus areas
Improving the Oral Health of Older People in Care Homes: a Feasibility Study ("TOPIC" Study)	A context of older people and care home settings, this case study addresses ageing populations and preventative oral behaviours in the UK, demonstrating how co-design can be used to implement national policy guidelines effectively.
Whole Mouth Health. Oral health literacy and behaviour change	Across the life course and in five different countries, this case study addresses contextually relevant preventive oral care practices, and demonstrates co-design participation as an intervention.
Co-design for policymakers	A context of Welsh national policy, this case study addresses the use of data to direct appropriate health care resources to populations with greatest need, demonstrating how co-design can enhance and democratise these decision making processes.
Mapping design application and evolution in oral health through a first systematic review and interactive map	A systematic review of the published literature demonstrating the breadth and variety of ways in which design can be applied in the field of oral health.

Case Study 1:
Improving the Oral Health of Older People in Care Homes: a Feasibility Study ("TOPIC" Study) From Guidelines to Practice [The Importance of Context] (10-13)

Becky Wassall and Joe Langley

The National Institute for Health and Care Excellence (NICE) issued guideline NG48 which aimed to maintain and improve the oral health of care home residents. However, they were sterilized of context and prescribed for idealized situations with very little in the way of concrete specified acts that staff in care homes can take.

During June to September 2019, a co-design process used a range of creative design methods to elicit experiences, knowledge, ideas, and tangible refinements from and with care home staff who became design partners within this process. The purpose was to explore existing practices-in-context in relation to NG48, drawing upon contextual and experiential knowledge to develop practical and usable tools and content, with a particular emphasis on what to do in non-ideal situations; "when things went wrong". Building on familiarization visits to the care homes, design researchers led three co-design workshops exploring care home staff experiences of providing daily oral care, including challenges and coping strategies and the role of current guidelines. New resources were prototyped to enable the use of NG48 in practice-in-context.

The workshops highlighted a number of key themes: time is the biggest constraint and tensions existed between the need to provide daily oral care at pace and build relationships with residents; the increasing population of residents with dementia require more time with staff making daily best interest judgements; the challenges of 'refusal behaviours' experienced by care home staff including scratches and bites was not recognized in current guidelines; a wide range of existing (yet undocumented) operational 'coping' strategies were compiled and further developed, refined and shared.

The co-design process led to the development of the care home oral care toolkit, a set of resources aimed at supporting care home staff to enact NG48 and overcome challenges. The resources embodied the principles of NG48 and the contextual 'knowing' of care home staff. These tools intended to support staff to enact the guidance in the complex reality of daily practice and plugging gaps in the most challenging aspects (i.e., refusal behaviours). Care staff were clear that NG48 guidelines were too general, passive, idealized and even patronizing. They knew that toothbrushing should happen twice a day but felt they needed practical suggestions when things didn't go smoothly. In this way NG48 did not reflect the contextual reality of the practice of oral care within care homes.

The driving imperatives of co-design are egalitarian and inclusive, starting with valuing the input of stakeholders in the working environment, holding their ways of knowing of equal value to that of researchers, managers, commissioners or other so called "experts." Regardless of economic or practical value, this is morally the right thing to do. Yet it also has practical benefits in terms of developing interventions that "fit" with professional practice-in-context; that are more easily assimilated, enabling the practical use and adaptation of general guidelines to specific actions in the midst of surrounding contextual "noise."

Case Study 2:
Whole Mouth Health. Oral health literacy and behaviour change (14-15)

Rachael England and Aaron Davis

The aim of the Whole Mouth Health project, supported by Colgate, is to develop regionally and community-specific resources that can build community oral health literacy. FDI members, National Dental Associations (NDAs), were invited to apply to take part in the Whole Mouth Health project. NDAs in Nigeria and Chile and design research laboratories at Sheffield Hallam University (United Kingdom) and the University of South Australia (Australia) were invited to take part.

Each country team worked with people at different life stages where oral health interventions could be the most effective. In the United Kingdom participants aged over sixty years and still living at home were engaged, whereas the Australian team worked with participants aged over sixty years but living in care homes. In Chile, expectant mothers were engaged, and in Nigeria, participants were school children.

The participating teams met for co-design training in Sheffield in January 2020. Following the workshop, the COVID-19 pandemic led to worldwide quarantine conditions. This prompted the design team to pivot to adapt to the new global climate. The co-design approach was broadly based on the four stages of the Double Diamond (17). Discover, Define, Develop and Deliver. Pre-COVID plans associated four face-to-face workshops in each country, each workshop aligned to one of the four stages of the double diamond. In order to continue the co-design plans, the workshop activities were developed into workbooks that could be delivered to participants without contact. All of the activities were developed in English, French and Spanish. Rather than view this as a deficit to face-to-face engagement, the research team identified the opportunity presented by asynchronous engagement and self-facilitation to explore participation in the co-design process as an intervention in itself. The result was a project that (1) engaged communities across the world with the concept of whole mouth health through participation in a series of co-design activities via the Whole Mouth Health platform and oral health exploration workbooks, and (2) developed unique and regionally-specific insights into attitudes and approaches to oral health that will inform future messaging.

Workbook 1: Discover

The first workbook was designed to appeal to all age groups from children to older adults. This workbook introduced the project and concepts of remote co-design. The activities explored people's experience of oral health across the life course, including when they stopped or started oral health behaviours, and their recollections, both positive and negative of various parts of the oral healthcare system.

Workbook 2: Define

Following synthesis by the research team, workbook 2 presented the data back to the participants from Workbook 1 to see how participants reacted to the data that had been collected by others in their cohort as well as other groups globally. Sticker packs were included to enable participants to sort and filter the data without needing to write too much with written responses focusing on "why" rather than "what". An emergent theme in the data that was generated in Workbook 1 was that there appeared to be generally low levels of literacy about oral health behaviours, and particularly about the relationship of oral health to whole body health. The research team developed quiz packs in partnership with dental researchers to test the participants assumptions about the connections between oral and general health. These were included in the workbook 2 package.

Workbook 3: Develop

Workbook 3 identified themes for development based on workbooks 1 and 2 and the digital responses. Key themes are “Mouth Positivity” and how can communities be empowered to share different versions of a “healthy mouth”? How can communities be encouraged to talk about mouth health? And how can we represent “mouthcare” that goes beyond simply brushing? This workbook challenged participants to enter into a generative frame, and to ideate independently, ready to share with others undertaking workbook 3.

Online platform: Deliver

The success of the gamified activities in the workbooks led the team to investigate how the activities could be developed into an online platform that would enable global reach, sharing both printable resources and native digital interactive experiences. The team modified the activities and translated these into a digital platform that FDI then shared throughout their global networks. The platform showed a high level of engagement as people spent on average 4.6 minutes undertaking activities. Across both the digital platform and the workbooks, a number of similar themes emerged from diverse communities. For example, across all participants, the most vivid memories are from childhood, getting braces, wobbly teeth and finding money under the pillow. However, participants all remarked on the perceived importance of “white teeth” over a “healthy mouth”, and indicated that there would be significant work required to shift social and traditional media-based narratives.

The project team included Joe Langley, Chris Redford, Aaron Davis, Ian Gwilt, Becca Partridge, Richie Khoo, Olushola Ibiyemi, Patricio Moncada, Sean Taylor, Paul Brocklehurst, Sarah Baker, and Rachael England.

The resources from this project are available at https://mouthhealth.thedesignclinic.net

Case Study 3:
Co-design for dental policymakers

Paul Brocklehurst, Anup Karki, Anwen Cope

The Welsh Government mandated Public Health Wales (PHW) to undertake the systematic collection and analysis of information about the health of the people of Wales. Equally, the dental public health function in PHW is required to determine inequities in the provision and utilization of NHS dental services across the nation.

In March and April 2024, a series of co-design workshops were undertaken to determine the nature and format of population health indices that would meet these requirements. Directors of Public Health, Directors of Primary Care, Health Board representatives, Health Education and Improvement Wales and Welsh Government representatives were invited to participate. The all-day workshops were led by design engineers at Lab4Living. Attention was paid to issues of power, hierarchy and transparency to ensure that all participants could contribute equally, commensurate with co-design methods. The first workshop explored the decisions that key stakeholders make about oral health and dental service provision, whilst the second workshop explored what data they need and how this data should be presented.

The workshops highlighted a number of key themes: nature of the data; analysis; data as part of a change process; and, communication. Data has to be trusted, relevant and granular enough to facilitate decision-making processes of stakeholders. Equally, it only needs to be good enough. Prospective and non-siloed approaches to data analysis, linking across different clinical and methodological boundaries was seen as helpful. Data has the potential in itself to facilitate change if meaningful indicators are fed back to the target population and the inclusion of the lived experience can be a powerful adjunctive tool. Mapping and data visualization to help present complex data or complex relationships, whilst providing a geographic reference point were also considered key.

Taking this forward, a series of population health indices have been developed. The following tests were undertaken to ensure that the information could be mapped and analyzed prospectively: data is available; is consistently interpreted and recorded; will be collected into the future; doesn't overlap with metrics used for monitoring contracts and performance; has the potential to influence behaviour change; and, the data is at the level of Upper Super Output Area or above. The indices have been aligned with the Duty of Quality in Healthcare framework legislation, to facilitate traction across the Health Boards in Wales. Data transfer and protection processes are now being undertaken to facilitate the delivery of the project for 2025.

Case Study 4:
Mapping design application and evolution in oral health through a systematic review and interactive evidence map (18)

Farnaz Nickpour, Isobel Leason, Nick Longbridge

This activity introduced a first-of-its-kind systematic mapping review that documented the application and evolution of Design within Oral health. Conducted by cross-disciplinary researchers from the University of Liverpool Inclusionaries Lab for Design Research and School of Dentistry, the study investigates and characterizes how design is currently utilized in oral health, offering a comprehensive overview via an interactive evidence map (https://inclusionaries.com/portfolio/map-design-oral-health).

The motivation behind the study stems from growing recognition of Design's value in addressing complex, systems-level challenges in healthcare. However, its application in oral health remains significantly underexplored. This research aims to establish the current state of Design activity and its applications in the field of oral health, to identify key themes, trends, and gaps to inform strategic decisions on future research and collaboration.

Design is defined in the study not merely as a collection of tools and methods, but as a distinct knowledge-based and methodology-driven discipline (epistemology); as a process involving both problem framing and solving (praxiology); and as the generator of outcomes and contributions (ontology) across four orders of outcomes (visuals- products-services-systems) and four types of contributions (theoretical-methodological-empirical-interventional).

One hundred and nineteen design in oral health projects were identified through the systemic review with the majority of projects (79%) using design primarily as a problem-solving tool to develop interventions such as objects (27%) and graphical interfaces (23%). These outputs were often technology-driven. Findings highlight that design is frequently carried out without the involvement of trained designers - 48% of the projects lacked any design professionals, leading to risks of tokenism and diluted design outcome and impact. Additionally, theoretical contributions remain limited, representing only 6% of the work. Approximately half of the outputs identified were focused on the general population, with an additional 21% targeting paediatrics. In addition 47% of outputs were designed for use at, or within, the dental practice setting.

The study also highlights that patient and public involvement is relatively low, present in just 29% of the projects. Though increasing in recent years, engagement levels vary significantly, and there's a call to distinguish more clearly between patient and public collaboration to better inform design processes.

The interactive evidence map serves three purposes: documenting the chronological evolution of the field, enabling in-depth analysis of design contributions, and providing a strategic tool to shape future interdisciplinary collaborations.

Looking forward, the authors advocate for the integration of design experts in oral health initiatives, greater inclusivity in research practices, and the development of transdisciplinary, human-centred systems approaches. The goal is to leverage the full capabilities of design across all four orders of design outcomes (graphics, products, interactions, systems) and four contribution types (interventional, empirical, methodological, theoretical) to improve oral health outcomes and equity. Ultimately, the study recommends a reimagining of how design is conceived, applied, and valued in oral health, encouraging both critical reflection and proactive development of this emerging field.

Part two: what is the value of design in (oral) health?

In the second activity, participants were invited to engage in a reflective exercise on the principles and benefits of co-design. This initial reflection allowed them to consider how co-design fosters inclusive, user-centred solutions by leveraging diverse perspectives and expertise. Following this, participants worked in small groups to discuss and expand on the key themes and insights they identified, encouraging a deeper exploration of co-design's potential impact in their specific contexts.

Through this group work, participants were able to synthesize their ideas, uncover common challenges, and identify innovative approaches that co-design could offer to address these challenges. This activity not only facilitated knowledge sharing but also highlighted the collective value of co-design as a strategic, collaborative tool for enhancing project outcomes and fostering community ownership. This extends the use of co-design beyond the traditional notion in health of using co-design to develop an intervention, to deploying co-design as a way of working together with communities to effect change. In short, using co-design as an intervention. The following table summarizes the key questions and discussions that arose during this activity.

Domain	What does design bring?	When is it useful?	Why would you bring a designer on board?	How do you collaborate?
Complexity Management and Systems Thinking	Design expertise provides "sense-making of complex systems with multiple players" and helps "make complex systems manageable."	This approach is particularly helpful at the outset of planning, problem framing, and tackling complex issues.	Design expertise adds multidisciplinary approaches and novel perspectives to navigate complex systems.	Collaboration should begin early, with design expertise on board from the start.
Innovative Approaches and Problem Solving	Innovation is highlighted repeatedly, along with "new approaches and methods," "different way of approaching a problem," and "solutions for wicked problems."	Innovation is valuable at all stages, from defining problems to interpreting visually and tackling "wicked problems."	Design expertise helps facilitate research design, offer creative solutions, and provide high-quality outputs.	Design experts can visually interpret ideas and approach problem-solving with flexibility ensures innovative results.
User-Centred and Community-Focused Design	Elements such as "acceptability," "unique perspectives," and "different skills and expertise" emphasize designing with the user or community in mind.	Essential when working with hard-to-reach populations, strengthening existing programmes, or developing community-centred solutions.	Design expertise offers new perspectives particularly on lived experience, and facilitates a deep understanding of user needs.	Engage with design experts who prioritize working within community complexities rather than oversimplifying.
Challenging Traditional Approaches	Design expertise encourages "criticality to traditional approaches" and "challenge to current thinking."	Particularly useful during the implementation phase and at every stage where traditional methods may be insufficient.	Design expertise provides new ways of thinking and mobilizes knowledge in novel ways.	Collaborate to implement user-centred elements and embrace non-traditional, system-thinking approaches.
Creativity and New Perspectives	Creativity is repeatedly noted as a key contribution, alongside "different point of view" and "different way of thinking."	Creativity is crucial when developing services, resources, and solutions that are tailored and impactful.	Design expertise brings fresh perspectives that can reshape understanding and broaden options.	Working with design expertise allows for an infusion of diverse perspectives and a move towards practical, community-centred solutions.
Holistic and Tailored Approaches	Design expertise offers "tailored, holistic approaches" that consider individual and community needs.	Digital or community-focused projects benefit from understanding at both individual and community levels.	Design expertise helps in understanding and applying a broad perspective across varied project stages.	Collaborate in a manner that values incremental progress and learning before advancing stages.
Tacit Knowledge and Experiential Learning	Access to "tacit deep knowledge" and similar approaches to "participatory research" allows for learning through experience.	Valuable for projects that involve learning through doing and adapting through iterative processes.	Designers bring expertise in experiential learning and facilitating knowledge exchange.	Engage in collaborative practices that prioritize hands-on, iterative processes to deepen understanding.

In summary, design expertise contributes significantly to managing complexity, fostering innovation, incorporating user-centred insights, challenging the status quo, infusing creativity, applying holistic approaches, and leveraging experiential knowledge. These contributions highlight the need for early and continuous collaboration with designers, ensuring that projects are informed by diverse perspectives and responsive to both individual and community needs.

Part three: what problems should we be addressing?

In the third part of the workshop, participants were encouraged to reflect on critical issues that need addressing across various levels, from individual to global, and within the broader research agenda. This activity facilitated a structured exploration of key problems, where co-design might play a particular role in addressing, allowing participants to consider both personal and systemic challenges and prioritize them for future research. The table below summarizes the key findings from this activity, linking future research agendas with challenges at different scales of action.

Domain	Research agenda	Individual level	Community / school / family level	Regional / national level	Global level
Patient-Centred Care and Accessibility	Research into how to improve accessibility, reduce dental fear, and address barriers for vulnerable populations was emphasized.	Participants identified the need for simpler pathways for patients to access care, manage dental fear, understand preventive practices, and receive guidance for self-care.	Encouraging healthy habits, like toothbrushing and healthy eating, within school environments was highlighted as essential for instilling lifelong oral health practices.	Addressing systemic access issues, such as dental deserts, equitable access to services, and increasing services in rural areas, was seen as critical for ensuring that all patients can obtain the care they need.	-
Education and Prevention Initiatives	Research could focus on the effectiveness of preventive education, especially in underserved populations, and ways to integrate these programmes into school curricula.	Training dental professionals to prioritize preventive care and valuing prevention over treatment in vulnerable populations were viewed as essential educational improvements.	Schools and local communities were identified as key settings for implementing preventive measures, like toothbrushing programmes and promoting oral health education.	Embedding preventive care within the curriculum and ensuring that future dental professionals are trained in prevention for high-needs populations was highlighted as essential.	-
Sustainability and Quality in Dental Practice	Research that examines sustainable practices in dental care, risk-based recall safety, and the development of high-quality care standards is necessary to inform policy and practice.	Encouraging sustainability in practice, discouraging low-quality care, and retaining skilled staff were seen as ways to enhance the quality and longevity of dental services.	-	Policies to embed risk-based recalls, discourage sugar consumption, and encourage sustainable product use are needed to support high-quality, sustainable practices.	-
Integration and Policy Support	Research to inform evidence-based policies, particularly regarding integration with general health services, was seen as essential for systemic improvement.	-	Supporting patients in accessing the right care when needed, understanding health pathways, and navigating complex systems.	Enhancing the integration of oral health within general health policies, improving data accuracy for health assessments, and creating supportive conditions for dental services.	-

Domain	Research agenda	Individual level	Community / school / family level	Regional / national level	Global level
Addressing Health Inequities and Systemic Barriers	A focus on decolonizing the research agenda, including marginalized groups, and addressing social determinants were noted as essential for a more inclusive approach to oral health research.	-	-	Addressing oral health inequities, improving affordability, and ensuring equitable access to specialist services were seen as essential for reducing disparities in care.	There were calls for policies to address social determinants of oral health, tax sugar-sweetened beverages, and expand dental care coverage globally.
Global and National Policy Advocacy	Research focused on universal dental care, evaluating policy efficacy, and supporting global oral health initiatives was seen as valuable for broader impact.	-	-	Participants emphasized the need for policies on antimicrobial resistance, water fluoridation, and standardized recall intervals based on risk.	Encouraging universal dental care and global advocacy for oral health policies reflects the need for a coordinated approach to public health and dental care.

In summary, these responses reflect a comprehensive view of oral health issues that span from individual patient needs to global policy priorities. Key themes include improving accessibility and sustainability, promoting prevention and education, addressing health inequities, integrating oral health within general health policies, and advocating for supportive national and global policies. These insights provide a foundation for prioritizing both immediate and systemic changes within the research agenda and healthcare frameworks.

Part four: prioritizing challenges

In activity four, participants were tasked with prioritizing a range of identified oral health challenges, considering different criteria and perspectives to determine which issues should take precedence in research, policy, and practice, particularly where co-design might play a role. This exercise aimed to explore the impact, feasibility, and scalability of various health challenges, from immediate clinical needs to systemic issues affecting access and equity. Rather than describing a universal set of priorities, this activity enabled an exploration of a series of prioritizations. Prioritization 1 presents the initial prioritization during the workshop session, while Prioritizations 2 and 3 resulted from asking participants to challenge their assumptions or reframe their priorities based on different underlying social, cultural, political, or economic assumptions. Taken together, these prioritizations offer three pathways toward action that may be more or less applicable in different contexts.

1 Impact and feasibility

- *Prioritization 1:* Issues were prioritized based on their "large impact at the population level" and "feasibility and scalability." Recalls, for example, were seen as relatively low effort but impactful in freeing up clinician capacity and improving access.
- *Prioritization 2:* Focus shifted to feasibility and generalizability. Higher-effort issues with lower population impact but significant individual impact (e.g., accessible information for those who cannot read) were considered here.
- *Prioritization 3:* Scalability and potential for policy-level solutions were prioritized, such as tackling antimicrobial resistance (AMR) and addressing NHS waiting lists due to dentist shortages. Solutions were chosen based on their ability to create widespread change.

2 Access and inclusivity

- *Prioritization 1:* Ensuring access for vulnerable groups and addressing high-impact areas such as antibiotic resistance and dental pain. Addressing accessibility (e.g., information for non-literate people) was crucial in this tier.
- *Prioritization 2:* Access to services for vulnerable groups remained a priority, with an emphasis on projects that improve accessibility across the board. Issues like resistant microbes and the delivery of accessible information featured prominently.
- *Prioritization 3:* Focused on addressing systemic access issues, such as "dental deserts" and ensuring care availability across geographic regions. The prioritization aimed at making health services more inclusive at the national policy level.

3 Catalysts for systemic change

- *Prioritization 1:* Catalysts to improve access and free up clinician capacity were seen as necessary for broader systemic changes.
- *Prioritization 2:* More complex and challenging issues that could drive systemic improvements, such as antibiotic prescriptions and handling resistant microbes, were considered.
- *Prioritization 3:* Larger, more systematic shifts were prioritised, such as curriculum changes in dental education, recruiting more dentists in underserved areas, and aligning social norms with healthy behaviours.

4 Health disparities and equity

- *Prioritization 1:* Efforts to address health disparities, such as prioritizing vulnerable groups and focusing on the impact of social determinants (e.g., caries as a symptom of deprivation).
- *Prioritization 2:* Addressing inequalities through changes in curriculum and recruitment in dental schools to ensure diversity and inclusion.
- *Prioritization 3:* Projects aimed at improving quality of life and specific interventions for underserved populations were given priority, focusing on systemic disparities and intersectionality.

5 Long-term prevention and behaviour change

- *Prioritization 1:* Preventive measures like reducing sugar consumption and promoting accessible information for sustainable practices.
- *Prioritization 2:* Emphasized fluoride and accessible information to encourage preventive behaviours.
- *Prioritization 3:* Systemic changes that promote preventive care, such as addressing social norms around white teeth and broader policy to encourage healthy behaviours.

6 Workforce and policy-level interventions

- *Prioritization 1:* Focused on increasing workforce capacity, including the dental workforce and projects that were fundable for grants.
- *Prioritization 2:* Interest at the government and policy level, with a focus on addressing broader social determinants of health and engaging with the political landscape.
- *Prioritization 3:* Emphasized recruitment to dental school, addressing inequalities within the workforce, and improving specific group-focused interventions.

In summary, the priorities across these categories reflect a balanced approach, addressing immediate, high-impact issues while also recognizing the need for systemic and long-term changes. This prioritization framework helps target resources and efforts to maximize both immediate and lasting impact across population health, equity, accessibility, and workforce sustainability.

Conclusion

Through the series of activities, participants engaged in a comprehensive exploration of the role of design in addressing complex oral health challenges, from individual patient needs to systemic, national-level issues. Each activity provided a unique lens through which participants could reflect on and discuss the most pressing priorities in oral health, the potential of co-design in developing solutions, and the criteria that should guide future interventions.

Part one set the foundation by allowing participants to identify what design brings to the table in the context of oral health. They recognized design as a powerful tool for managing complexity, fostering innovation, and challenging conventional approaches. This initial reflection helped highlight how design can unlock fresh perspectives and catalyze solutions that are inclusive and responsive to user needs. This also encouraged oral health professionals to engage with the wider discipline of design and its multiple specialities including inclusive, human-centred, systemic and speculative design alongside co-design, adopting a more combinatorial approach to advanced design approaches.

Part two furthered this exploration by inviting participants to delve into the value of co-design and work collaboratively on themes they had identified. This activity underscored the importance of engaging diverse stakeholders in the design process, reinforcing that co-design not only enhances the relevance and acceptability of solutions but also empowers communities and improves overall project outcomes.

Part three prompted participants to reflect on the specific oral health problems that should be addressed at individual, community, and national levels, as well as within the research agenda, and particularly those challenges that co-design was best placed to address. By identifying issues like access barriers, health inequalities, and the need for preventive approaches, participants outlined a robust set of priorities that reflect the needs of various populations. This step emphasized that effective oral health strategies require alignment across levels of influence and a commitment to addressing both immediate clinical needs and broader, structural challenges.

Part four culminated in a structured prioritization exercise, where participants ranked the identified challenges based on impact, feasibility, inclusivity, and potential for systemic change, where co-design could play a significant role. This activity helped participants crystallize their understanding of which challenges should take precedence in research, policy, and practice, considering both short-term impact and long-term sustainability.

Collectively, these activities equipped participants with a nuanced understanding of the intersection between design and oral health. They recognized that addressing oral health challenges requires a multifaceted approach—one that combines innovative, user-centred design with strategic prioritization of high-impact issues. By engaging in these activities, participants have laid a strong foundation for actionable insights that can guide future research, inform policy decisions, and inspire the development of equitable and effective oral health interventions.

Future directions and opportunities

As the field of oral health continues to confront complex global challenges, the integration of co-design offers a unique and underutilized avenue for innovation, inclusivity, and improved outcomes. The following future directions and opportunities have been identified to advance the co-design agenda in oral health:

1 Embedding co-design into policy and strategic planning

To mainstream co-design, its principles must be embedded into national oral health strategies, funding frameworks, and professional guidelines. Policymakers should be encouraged to mandate co-design in the development and implementation of oral health initiatives, particularly those targeting underserved communities. Where possible, co-design should be embedded as both a development and implementation strategy.

2 Strengthening transdisciplinary collaboration

There is significant opportunity to deepen collaboration between oral health professionals, designers, community members, and researchers from diverse disciplines. Future efforts should aim to build permanent, cross-sector partnerships and create shared language and methodologies to enhance co-design's impact, alongside providing more clarity and granularity on the critical roles that designers, dental professionals and end users play in each stage of the co-design process, and some expected healthy disciplinary and lived experience tensions.

3 Capacity building and education

Training programmes that equip dental professionals, public health practitioners, and community leaders with co-design knowledge and skills are essential. Developing toolkits, continuing professional development (CPD) courses, and embedding co-design in dental education curricula can foster a workforce capable of leading participatory approaches, and supporting better transdisciplinary collaboration.

4 Expanding digital and asynchronous co-design methods

Building on the success of remote co-design during the COVID-19 pandemic, there is potential to scale asynchronous and digital methods. This can increase inclusivity by engaging populations with barriers to in-person participation, such as rural communities, those with disabilities, or individuals with limited time.

5 Elevating lived experience

A critical future focus must be to ensure that people with lived experience of oral health issues are central to design processes. This includes developing ethical frameworks for engagement, paying participants for their expertise, and creating safe spaces for open dialogue and shared decision-making.

6 Developing metrics and evaluation frameworks

There is a need for robust evaluation tools that can measure the effectiveness, equity, and sustainability of co-designed interventions. Future research should explore both process and outcome indicators, including community empowerment, intervention uptake, and long-term health outcomes.

7 Creating a global knowledge exchange platform

To foster shared learning, an international platform or repository could be established to host case studies, design tools, training materials, and evaluation data. This could enable ongoing dialogue, comparison of approaches, and dissemination of best practices across different contexts and countries.

8 Prioritizing inclusion and intersectionality

Future work should explicitly address how co-design can be used to tackle health inequalities by applying advanced inclusive design and intersectional approaches. Engaging diverse voices—particularly from marginalized, minoritized, and low-income communities—can help ensure that oral health services are equitable, culturally relevant, and socially just.

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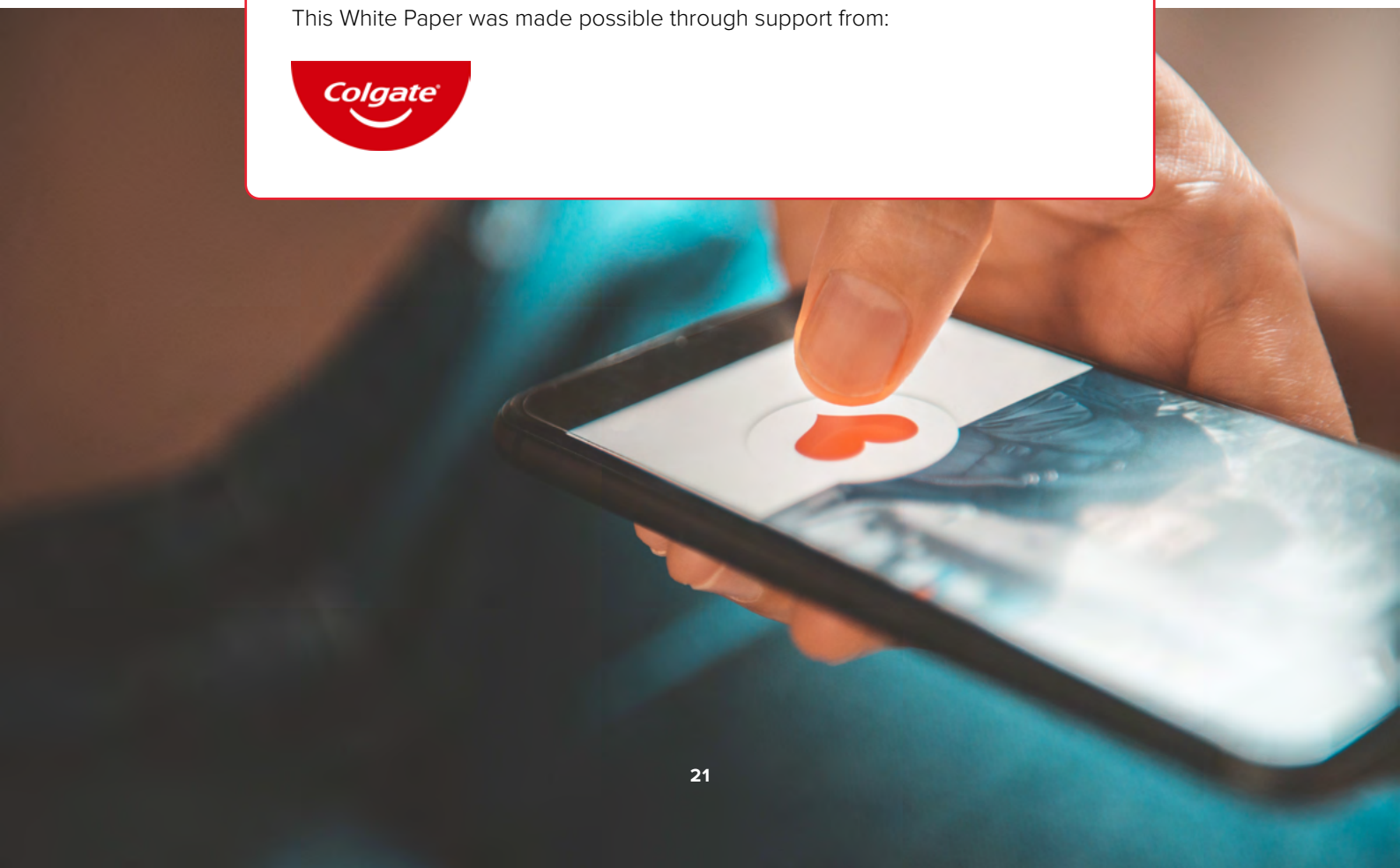

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Appendix 2: list of acronyms and glossary

List of Acronyms

- **AMR** - Antimicrobial Resistance
- **BASCD** - British Association for the Study of Community Dentistry
- **CDO** - Chief Dental Officer
- **DCP** - Dental Care Professional
- **ED&I** - Equality, Diversity, and Inclusion
- **FDI** - FDI World Dental Federation
- **ISDH** - International Symposium on Dental Hygiene
- **NHS** - National Health Service
- **SSB** - Sugar-Sweetened Beverages

Glossary

- **Antimicrobial Resistance (AMR):** The ability of bacteria, viruses, and other microbes to resist the effects of drugs, making infections harder to treat. In the context of oral health, it relates to the over-prescription of antibiotics in dental care.
- **British Association for the Study of Community Dentistry (BASCD):** An organization focused on advancing community dentistry and public oral health through research, education, and policy influence.
- **Chief Dental Officer (CDO):** A senior government advisor on dental matters, often involved in shaping national oral health policy and regulations.
- **Co-design:** A collaborative approach to designing solutions that involves stakeholders (e.g., patients, community members, professionals) in the process to ensure the outcomes are user-centred, relevant, and effective.
- **Dental Care Professional (DCP):** A licensed dental practitioner who provides a range of services to support oral health, including dental hygienists, therapists, and dental nurses.
- **Dental Desert:** Areas or regions with limited or no access to dental services, resulting in underserved populations and a lack of adequate oral health care.
- **Equality, Diversity, and Inclusion (ED&I):** Efforts and policies aimed at ensuring fair treatment, diverse representation, and an inclusive environment within organizations and institutions.
- **FDI World Dental Federation (FDI):** An international organization representing the dental profession worldwide, focused on global oral health improvement.
- **International Symposium on Dental Hygiene (ISDH):** A biennial conference that gathers dental hygiene professionals to share research, best practices, and innovations in oral health.
- **National Health Service (NHS):** The publicly funded healthcare system of the United Kingdom, providing a range of health services, including dental care, to residents.
- **Oral Health Inequality:** Disparities in oral health outcomes across different population groups, often influenced by socioeconomic, geographic, or systemic factors.
- **Public Health Dentistry:** A field focused on preventing dental diseases and promoting oral health at a community or population level, often through education, policy, and community-based programmes.
- **Recall Intervals:** Scheduled check-up intervals for patients in dental care, traditionally every six months, though evidence-based risk assessments may support personalized intervals.
- **Sugar-Sweetened Beverages (SSB):** Drinks that contain added sugars, such as soda and juice, which are associated with an increased risk of dental caries and other health issues.
- **Sustainability in Dental Practice:** Practices in dentistry aimed at reducing environmental impact, promoting resource efficiency, and ensuring long-term health benefits.
- **Vulnerable Populations:** Groups at higher risk of health issues due to factors like socioeconomic status, limited access to care, or language barriers. In oral health, this may include migrants, children, or people with disabilities.

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