


Review Article

Approaches to the systematic co-development of health education interventions on oral cancer: A literature review

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Received: 21 August 2025
Accepted: 04 December 2025
Epub Ahead of Print: 17 April 2026
Published:

DOI
[10.25259/JGOH_40_2025](https://doi.org/10.25259/JGOH_40_2025)

Quick Response Code:



Supplementary tables are
available at:
[https://dx.doi.org/10.25259/
JGOH_40_2025](https://dx.doi.org/10.25259/JGOH_40_2025)

ABSTRACT

Oral cancer remains a significant global health concern due to a lack of adequate awareness and knowledge of the disease. To address this, the use of comprehensive and inclusive health education interventions on oral cancer has been widely recommended. However, most of the current health education interventions (published between 2020 and 2024) on oral cancer were not highly impactful, and a major implicated factor was the lack of stakeholder engagement in the development process of those interventions. Due to the lack of stakeholders' engagement in those interventions, the quality of the educational content delivered in most of those interventions was neither comprehensive nor highly effective. The approach of co-development in health education interventions enhances intervention effectiveness through equity promotion, community empowerment, its contextual relevance, public trust and ownership, and long-term sustainability. In this review, key approaches that could be used to co-develop health education interventions on oral cancer were elaborately presented. This review explicitly describes the three common approaches – theory-based (theory of planned behavior, normalization process theory), model-based (Predisposing, reinforcing, and enabling constructs in educational/environmental diagnosis and evaluation-policy, regulatory, and organizational constructs in educational and environmental development model, and behavior change wheel model), and partnership-based approaches (community-based participatory research and experience-based co-design) – with a set of proposed steps which can be utilized for co-developing health education interventions on oral cancer.

Keywords: Co-development, Health education, Intervention, Oral cancer, Review

INTRODUCTION

Oral cancer ranks among the top 20 most common cancers worldwide and continues to pose a major public health challenge due to its increasing incidence and mortality.^[1,2] The disease is primarily linked to modifiable risk factors such as tobacco use, alcohol consumption, areca nut chewing, and human papillomavirus infection.^[3] Despite advances in diagnosis and treatment, late presentation remains common, particularly in low- and middle-income countries (LMICs), where health literacy and access to oral healthcare services are limited.^[4-8]

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Recent advances in oral cancer diagnostics have improved the potential for early detection and patient outcomes. Commonly used techniques include visual and tactile oral examinations, toluidine blue staining, brush cytology, and histopathological biopsy, which remains the gold standard.^[5,6] Emerging tools such as autofluorescence imaging, optical coherence tomography, and artificial intelligence-assisted image analysis have shown increasing accuracy in detecting premalignant and malignant lesions. However, these innovations remain largely inaccessible in LMICs due to high costs, low public awareness, and limited clinical expertise.^[7,8] This gap underscores the critical role of health education in promoting awareness, screening, and timely care-seeking behavior.

Health education plays a critical role in addressing these challenges by improving public awareness, promoting early detection, and encouraging preventive behaviors.^[9-12] Effective education interventions empower individuals and communities to recognise risk factors, seek screening, and adopt healthy lifestyles. However, many existing interventions have been designed without sufficient stakeholder involvement, which limits their cultural relevance, acceptability, and long-term sustainability.^[13] Co-development offers a participatory solution by engaging both researchers and stakeholders to collaboratively design and refine interventions that are contextually appropriate and more likely to be adopted in practice.^[14] Although several studies and reviews have explored oral cancer prevention and awareness strategies, few have focused on the integration of co-development principles into health education intervention design. By identifying research gaps and presenting structured frameworks, this review contributes a novel perspective to advancing oral cancer education research and policy.

The sources and the strategies used to retrieve literature are stated in this review to enhance the transparency and credibility of the review process.^[15] The literature used primarily consisted of peer-reviewed articles, identified through a systematic search of PubMed, Google Scholar, and the official websites of reputable health organizations, including the National Health Service, Centers for Disease Control and Prevention, World Health Organization, and Africa Centers for Disease Control and Prevention. Relevant peer-reviewed studies published between 2020 and 2024 were selected based on their focus on oral cancer health education, awareness, or preventive interventions involving human populations. Articles that did not address educational or awareness-based interventions for oral cancer were not considered for review. The search strategy incorporated a range of terms related to oral cancer, health education, interventions, and public health. These terms were combined using Boolean operators (“AND” and “OR”) and filtered by language to retrieve all relevant and up-to-date literature suitable

for inclusion in the review. In this review, literature published within the past 5 years (2020–2024) was considered current or contemporary.^[16]

Before identifying suitable approaches for co-developing health education interventions on oral cancer, it is essential to first examine existing interventions. This provides an understanding of the current status of educational efforts and highlights how co-development principles have been applied so far. This section presents and critically discusses the seven peer-reviewed studies on oral cancer health education interventions identified from recent literature.^[17-20] The analysis focuses on their geographical scope, study design, settings, target populations, intervention components (including educational tools and content), and the theoretical or developmental approaches that guided them. Table S1 summarizes the main features of these studies, while the following discussion explores key insights and limitations derived from their findings. Figure 1 outlines the structure used to present the synthesized results. The health education interventions on oral cancer published in the past 5 years were concentrated in South and West Asia, specifically India, Iran, and Sri Lanka [Table S1]. No recent interventions were identified from other regions. This indicates a marked paucity of contemporary evidence on oral cancer education globally. In contrast, education interventions for breast and cervical cancers have seen more recent activity over the same period.^[21-26] This pattern suggests unequal public health research attention across cancer types. Notably, the current empirical evidence on health education interventions on oral cancer adopting randomized controlled trial designs is very scanty [Table S1]. Only one of the reviewed articles used a randomized controlled trial design, while the others adopted the use of other designs. According to Hariton and Locascio,^[27] the randomized controlled trial design is

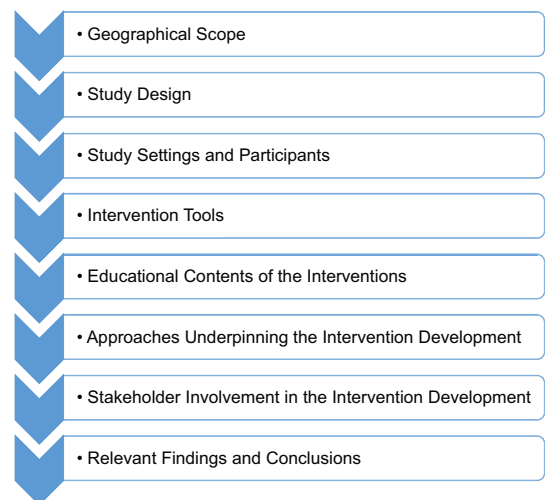


Figure 1: Description of the flow of the subsections discussing the current health education interventions on oral cancer.

regarded as the gold standard for testing the effectiveness on health interventions. This is because randomized controlled trials evaluate the cause-and-effect relationships between an intervention and its outcomes through the randomization of its study participants.^[27] The randomization of study participants in randomized controlled trials minimizes the risk of bias, unlike quasi-experimental designs and before-and-after studies, where randomization is not a mandatory process.^[27,28] Based on the above information, it can be inferred that an overwhelming majority of the current health education interventions on oral cancer have significant methodological weaknesses due to their non-adoption of a randomized controlled trial design [Table S1].

Most of the contemporary health education interventions on oral cancer were conducted in clinical and academic settings, with only a few in community settings [Table S1]. This identified paucity of contemporary evidence on such interventions in community-based settings reveals the need for further studies in this direction. Furthermore, from the analysis of the characteristics of the participants involved in these reviewed studies, it was identified that most of them were individuals with a positive history of oral cancer (e.g., hookah users), physicians, students, patients, and vulnerable youths of low socio-economic backgrounds, the majority of whom were aged between 16 and 40 years [Table S1]. None of these studies specifically investigated highly vulnerable-to-oral-cancer populations (such as commercial sex workers and farmers), for whom extensive research has shown that they stand a high risk of developing oral cancer in their lifetime.^[29,30] This shows that the focus of current health education interventions on oral cancer is lopsided as per its target population; this therefore indicates the need for further interventions that are more inclusive of the diverse global populations.

The intervention tools reported in the reviewed empirical studies could be broadly classified as digital tools and non-digital tools [Table S1]. The digital tools adopted in some of these studies include PowerPoint®, educational films, images, social media messaging platforms (WhatsApp), and mobile health applications [Table S1]. On the other hand, the non-digital tools reported in the other reviewed studies include the use of structured educational modules, health counseling, Information Education Communication materials (e.g., pamphlets), interactive discussions, advocacy, and community mobilization [Table S1]. Pertinently, these itemised non-digital tools largely require human interface, and they have limited coverage due to their relative inability to speedily reach a wider population at a time, unlike digital tools that can be ubiquitous with farther and quicker reach.^[31-33] Furthermore, of all the above-identified digital tools, the mobile health application was the only rarely used tool.^[34,35] Notably, these findings corroborate the findings

synthesized in existing literature, where it was identified that emerging technologies (including mobile health applications and generative artificial intelligence) are largely utilized sources of information on oral cancer.^[35,36] Considering the existing fact that emerging technologies are largely more effective than other sources/tools for educating the public on oral cancer, the use of such technologies should therefore be widely encouraged for future health education interventions on oral cancer.^[34-36]

Based on the analysis of the reviewed empirical studies, it was observed that the majority of the educational contents of the recent health education interventions on oral cancer reported in the peer-reviewed literature were scanty [Table S1]. For example, in the intervention study by Subramanian *et al.*,^[17] the educational content of their intervention solely focuses on oral cancer screening. Another example was the study by Chowdhury *et al.*,^[19] where their educational content was focused on tobacco cessation and healthy diets only. Only very few studies, such as the studies by Khani Jeehooni and Afzali Harsini^[16] and Ghasemian *et al.*,^[9] had robust educational content, focusing on diverse aspects of oral cancer, such as the definition/meaning of oral cancer, and its epidemiology, risk factors, clinical features, diagnosis, and prevention. Based on the above syntheses, it can be concluded that the educational content of contemporary health interventions on oral cancer is not comprehensive and inclusive.

Reports seldom described the developmental approach that guided the intervention [Table S1]. Where specified, authors most often used a theory-based approach, such as the theory of planned behavior or a model-based approach, such as the PRECEDE-PROCEED model.^[9,20] PRECEDE stands for predisposing, reinforcing, and enabling constructs in educational/environmental diagnosis and evaluation, and PROCEED stands for policy, regulatory, and organizational constructs in educational and environmental development.^[37] Both the theory and the model are well established in health behavior research and have been used to co-develop education interventions.^[9,20,37-39] Later sections provide a fuller overview of these and other approaches. Stakeholder involvement is increasingly recognised as good practice in public health intervention research.^[40,41] Stakeholders include individuals, groups, or organizations affected by or interested in policies, programs, or outcomes.^[40,42,43] Engagement supports inclusion and partnership, and can enhance relevance, rigor, acceptability, and feasibility.^[43,44] Typical individual stakeholders include patients, people at heightened risk, older adults, clinicians, family members, and community members; group stakeholders include public or patient groups; organizational stakeholders include government agencies, community-based organizations, non-governmental organizations,

and academic institutions.^[40] Most contemporary oral cancer education studies did not explicitly report whether stakeholders were involved in intervention development [Table S1]. Where experts were named, it was unclear whether they were authors or external stakeholders, and lay end-users were rarely mentioned.^[9,16,17] There was also no clear involvement of groups or organizations. These gaps suggest limited inclusivity in development processes and highlight an opportunity for more systematic stakeholder engagement.^[40,41]

The findings reported in the reviewed articles were insightful. First, it was observed in these articles that those public health education interventions that were developed using theory- or model-based approaches were consistently found to be significantly effective compared to those that did not use such an approach. Specifically, in the study by Khani Jeihooni and Afzali Harsini,^[16] where the PRECEDE-PROCEED model was used, it was found that health education on oral cancer significantly improved the knowledge of participants in the intervention group at a rate higher than their counterparts in the control group ($P < 0.05$). Furthermore, in the articles by Najafi *et al.*,^[20] and Ghasemian *et al.*,^[9] where their interventions were developed based on the theory of planned behavior ($P < 0.05$) [Table S1]. Second, those interventions delivered using digital tools were generally found to be effective in improving participants' knowledge of oral cancer, and the use of multiple health approaches in the delivery of health education interventions on oral cancer has far-reaching impacts compared to those interventions delivered through a single approach. Overall, based on the conclusions reached in those reviewed articles [Table S1], it can be summarised that educational interventions on oral cancer are much more effective if: (i) they are delivered using multiple digital tools; (ii) they are developed using an appropriate theory or model; and (iii) their development is aided by inputs from relevant stakeholders.

Oral cancer is a chronic disease with multiple causes, and its effective prevention requires comprehensive and collaborative public health strategies.^[45] Health education interventions that improve awareness and knowledge have been widely recognised as essential tools for reducing the global burden of the disease.^[46-49] Recent evidence, as shown in Table S1 and the preceding discussion, indicates that such interventions achieve greater effectiveness when their development actively involves relevant stakeholders. Co-development, which refers to a collaborative process where researchers and stakeholders work together to design, plan, and implement interventions, provides a valuable framework for enhancing both the quality and impact of public health initiatives.^[50] Through this approach, interventions become more inclusive and responsive to the needs of the communities they serve. Co-development offers several interconnected benefits. It promotes equity by ensuring that underserved or

marginalized populations are included in decision-making, empowers communities by giving them a voice in shaping programs that affect their health, and enhances cultural and contextual relevance by aligning interventions with local social, economic, and political realities. Moreover, it strengthens public trust and ownership, leading to greater engagement and acceptance, while fostering sustainability through long-term community support.^[51-53] Overall, co-developed health education interventions represent an effective, inclusive, and sustainable approach for improving global awareness and knowledge of oral cancer, ensuring that prevention strategies are evidence-based, contextually grounded, and collectively owned.

APPROACHES FOR CO-DEVELOPING HEALTH EDUCATION INTERVENTIONS ON ORAL CANCER

Within the past few years, several literatures have been published on the approaches that guide the co-development of interventions in public health.^[50] These approaches are diverse, and the common ones, with two examples each, are summarised in Table S2.^[50] These common approaches were broadly grouped into theory-based, model-based, and partnership-based approaches [Table S2]. Public health interventions based on theories commonly use two theories for their interventions' co-development: The theory of planned behavior and the normalization process theory (NPT).^[39,54,55] For those interventions adopting a model-based approach for their co-development, the two common examples of the models they adopted include the PRECEDE-PROCEED model and the behavior change wheel (BCW) model.^[37,56] For those interventions adopting a partnership-based approach for their co-development, its two common examples include the community-based participatory research approach and the experience-based co-design approach.^[57-60] All these approaches can be adopted for the co-development of health education interventions on oral cancer, and notably, some of them have been used in contemporary interventions of such [Table S1].

As stated in the preceding text in this review, there are diverse theories on which the co-development of a public health intervention is based [Table S2]. However, only two notable ones will be critically discussed: the theory of planned behavior and the NPT. The theory of planned behavior was developed by Ajzen,^[61] and since then, the theory has been adopted globally by researchers across diverse academic disciplines.^[62] This theory posits that human behavior is driven by three determinants: Behavioral beliefs, normative beliefs, and control beliefs [Figure 2].^[62,63] Behavioral beliefs are those beliefs an individual has concerning the likely consequences of their behavior.^[62] Normative beliefs refer to an individual's perceptions concerning how they are expected

by others to behave.^[62] Control beliefs refer to an individual's beliefs about the presence of factors that may impede or facilitate behavioral performance.^[62] Favorable or unfavorable attitude toward a behavior is produced by behavioral beliefs, subjective norms, or social pressures, which are produced by normative beliefs, and self-efficacy or perceived behavioral control is produced by control beliefs [Figure 2].^[62,64]

Overall, the theory of planned behavior focuses on human behaviors, and it has been used over the years to inform the process of development of a health education intervention package in oral cancer and other disease conditions.^[9,20,38,39] An example of a set of proposed steps for co-developing a health education intervention on oral cancer using the theory of planned behavior is depicted in Table S3 and these propositions were based on the information synthesised from the works of Godin and Kok,^[65] Glanz *et al.*,^[66] Cargo and Mercer,^[67] French *et al.*,^[68] and Wright and Kongats.^[69] The advantages of using the theory of planned behavior in the co-developing of health education interventions on oral cancer are related to its structuredness and flexibility of use (as the theory provides a theoretical foundation which can adapted to local contexts), its behavioral specificity (as the theory helps to ensure that the intervention targets those social and behavioral factors that are most influential on the target population), and its ability to empower communities (as stakeholders are involved in the identification and addressing of issues that will increase uptake and utilization of the intervention).^[65-69]

Normalization process theory is a sociological framework that helps explain how new interventions, technologies, or practices become routinely integrated into everyday work within healthcare, education, and other complex systems.^[70,71] Developed by May *et al.*, in 2009,^[70] the theory has been widely adopted to understand how innovations are implemented, adopted, and sustained across different disciplines.^[70,72,73] NPT identifies four key constructs that determine the success of implementation: Coherence, cognitive participation, collective action, and reflexive monitoring.^[71] Coherence, or sense-making, relates to how individuals and groups understand and interpret a new

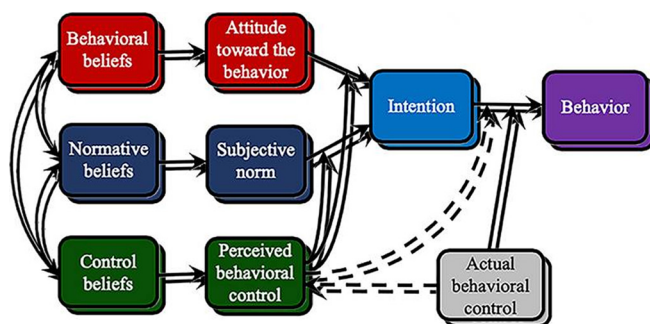


Figure 2: Graphical illustration of the theory of planned behavior.

practice. Cognitive participation, or engagement, describes who becomes involved and the extent of their commitment. Collective action, or operationalization, focuses on the practical work needed to deliver the intervention, including coordination, resources, and training. Reflexive monitoring, or appraisal, involves assessing the value, impact, and sustainability of the new practice over time.^[70,71]

Overall, NPT provides a valuable lens for examining how interventions are introduced and embedded into routine practice. It highlights the social and organizational processes that shape implementation success and long-term sustainability.^[55,74] Table S4 outlines proposed steps for co-developing an oral cancer education intervention using NPT, based on prior studies.^[70,75-79] The use of NPT in the co-development of health education interventions on oral cancer has its benefits, and they include improved stakeholder buy-in and ownership (which is achieved through the involvement of diverse stakeholders who contributed to the co-development process), enhanced relevance and acceptability of the intervention (which is achieved through the inputs of the stakeholders to co-develop an intervention that is culturally sensitive and contextually appropriate), practical fitness of the intervention with real-world settings (which is achieved through the inputs of the stakeholders to co-develop an intervention that fits with existing systems and workflows), and greater likelihood of long-term sustainability of the intervention (which is achieved through the inputs of the stakeholders in the championing, reviewing, and modification of the interventions).^[70,75,76,78,79]

Model-based approaches are also alternative ways that could be used to co-develop health education on oral cancer.^[50] Although there are diverse models that could be used for co-developing such interventions; however, in this sub-section, only two models – the BCW model and the PRECEDE-PROCEED model – are discussed [Table S2]. The justifications for focusing on these two models were that they are popular in the scientific world and extensive reports have been documented on them.^[37,80-82] The behavior change wheel model was developed by,^[83] and since then the model has gained global popularity among researchers across diverse academic disciplines.^[80-82] This model was developed from a synthesises 19 behavior frameworks, and with the rationale of establishing a foundation for understanding human behavior and for developing effective public health interventions.^[83] The BCW model has three “layers” which are depicted in Figure 3. The first layer is called the inner hub, and it is depicted in the figure with multiple shades of green.^[83] The second layer is called the middle ring, and it is depicted in the figure with multiple shades of red.^[83] The third layer is called the outer ring, and it is depicted in the figure with a single shade of light grey.^[83]

The BCW is a comprehensive framework designed to explain and influence human behavior in health and social contexts.

At its core lies the COM-B (C: Capability; O: Opportunity; M: Motivation; B: Behaviour) model, which identifies behavior as the outcome of dynamic interactions between capability, opportunity, and motivation.^[83] Capability represents an individual's physical and psychological capacity to engage in a specific behavior, such as having the necessary knowledge, skills, and confidence. Opportunity includes the external physical and social factors that enable or prompt behavioral performance, while motivation encompasses the automatic and reflective mechanisms that drive an individual to act or refrain from acting.^[84,85] Together, these three components provide a foundation for understanding what needs to change for a particular behavior to occur and be sustained. The middle ring of the BCW specifies nine intervention functions that can be used to modify behavior: Education, persuasion, incentivization, coercion, training, restriction, environmental restructuring, modelling, and enablement.^[83,85] These intervention functions represent practical methods that can be applied alone or in combination to address behavioral determinants identified through the COM-B analysis. They guide practitioners and policymakers in designing interventions that are contextually relevant and behaviorally specific.

The outer ring of the BCW contains nine policy categories, including communication or marketing, guidelines, fiscal measures, regulation, legislation, environmental or social planning, service provision, modelling, and training that provide the structural and institutional support necessary for effective implementation.^[83] Together, the three layers of the BCW link theory, intervention design, and policy planning, ensuring that both individual-level and environmental factors influencing behavior are addressed.^[83] The BCW has been successfully applied across multiple health domains, including oral health promotion, to design, implement, and evaluate behaviorally informed education interventions.^[86-90] Table S5 presents key steps for co-developing an oral cancer education intervention using this model, guided by earlier work.^[86,87,91] The use of the BCW in co-developing a health education on oral cancer has multiple benefits. These benefits include its systematic and structured approach (which ensures that all relevant behavioral factors are considered), robust understanding of human behaviors (which is based on the COM-B model), evidence-based design, and its holistic and multi-layered considerations of factors that influence behavioral change.^[83,87,91,92]

The PRECEDE-PROCEED model provides a structured and comprehensive framework for planning, implementing, and evaluating public health interventions.^[37] Developed by Lawrence W. Green in 1974, the model has been widely applied by public health researchers and practitioners in designing effective health programs.^[37,93,94]

The PRECEDE component focuses on the planning and assessment stages, which involve a series of diagnostic steps.

These include social assessment to identify community needs, epidemiological assessment to determine disease burden and risk factors, ecological and educational assessment to examine available resources, and administrative and policy assessment to review organizational or policy barriers to implementation.^[37,93-96] The PROCEED component guides implementation and evaluation, covering process, impact, and outcome evaluation. This helps to assess not only how well an intervention was delivered but also its short and long-term effects on target populations.^[37,93-96] Overall, the model provides a practical guide for developing structured, evidence-based, and participatory interventions. Table S6 outlines proposed steps for co-developing an oral cancer education intervention using this model, adapted from Green,^[97] Green and Kreuter,^[95] Gielen *et al.*,^[98] and Petersen.^[99]

The use of the PRECEDE-PROCEED model in co-developing a health education on oral cancer has multiple benefits. These benefits include its cultural appropriateness and community relevance (as its approach starts with social assessment, which ensures the health education intervention reflects the local needs, values, and beliefs through crucial inputs from relevant stakeholders from the targeted community), its evidence-based and data-driven approach (as its approach involves the use of administrative, ecological, behavioral, educational, and socio-epidemiological data in making informed decisions in the planning and co-development of the intervention), its flexibility and scalability (as its approach is adaptable to different settings and populations), and it fosters community ownership, trust, and sustainability (as its approach involves inputs from stakeholders from the targeted community in the planning, designing, implementation, and evaluation of the intervention).^[95,97-99] The partnership-based approaches are also alternative ways that could be used to co-develop health education on oral cancer.^[50] Although there are diverse partnership-based approaches that could be used for co-developing such interventions; however, in this sub-section, only two approaches – the community-

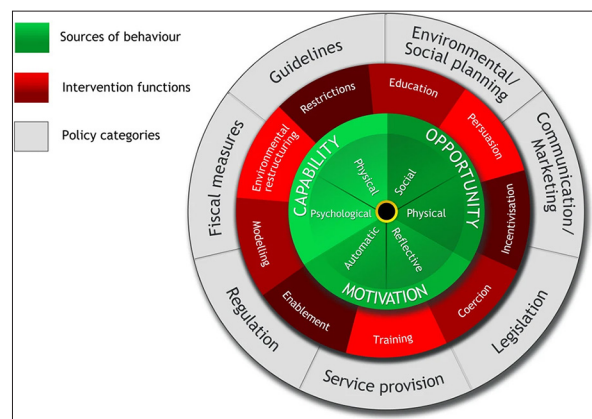


Figure 3: Graphical illustration of the behavior change wheel model.

based participatory approach and the experience-based co-design approach – are discussed [Table S2]. The justifications for focusing on these two approaches were that they are popular in the scientific world and extensive reports have been documented on them.^[100-107] The community-based participatory research approach is a collaborative and equity-driven research-based approach for health intervention development which involves researchers, community members, and other stakeholders as equal partners in all stages of an intervention development process.^[67,100,105,108] Community-based participatory research approach has six core principles which include co-learning and mutual respect (where both the stakeholders and the researchers learn from one another), equitable involvement (where both the stakeholders and the researchers share decision-making and sense of ownership of the intervention development process), capacity building (as the approach builds the resources and skills of all stakeholders involved in the intervention development process), balance between research and action, cultural relevance, and sustainability.^[67,100,107,108]

Overall, the community-based participatory research approach focuses on the use of an equitable and collaborative approach, using participatory action research techniques, to co-develop health interventions.^[100,102,105,107] An example of a set of proposed steps for co-developing a health education intervention on oral cancer using the community-based participatory research approach is depicted in Table S7, and these propositions were based on the findings synthesised from the works of Wallerstein and Duran,^[100] Leask *et al.*,^[107] Suarez-Balcazar *et al.*,^[102] and Campbell *et al.*,^[105] The use of a community-based participatory research approach in co-developing a health education on oral cancer has multiple benefits. These benefits include its ability to build trust between researchers and the involved stakeholders, its ability to produce interventions based on data-driven evidence and insights from stakeholders, its ability to empower communities to take ownership of their health, and its equitability in intervention co-development.^[67,100,107,108] The experience-based co-design approach is a collaborative and research-based approach for developing health interventions through active engagement of researchers with service users (e.g., clients and patients).^[101,103,104,106] A typical example of this approach is the PRODUCES (Problem, Objective, Design, (end-) Users, Co-creators, Evaluation, and Scalability) framework, which was developed by Leask *et al.*,^[107]

The experience-based co-design approach adopts the use of participatory research methods, and it is iterative and inclusive, focusing on lived experiences, emotional touchpoints, and collaborative improvement.^[107,109] An example of a set of proposed steps for co-developing a health education intervention on oral cancer using the experience-based co-design approach is depicted in Table S8, and

these propositions were based on the findings synthesised from the works of Locock *et al.*,^[110] Leask *et al.*,^[107] and Bate and Robert.^[109] The use of an experience-based co-design approach in co-developing a health education on oral cancer has multiple benefits. These benefits include its patient-centeredness (as interventions developed through this approach reflect real needs, emotions, and concerns of people affected/at risk of oral cancer), its cultural sensitivity (as insights based on the lived experiences of stakeholders help to shape the appropriateness of the educational content and its mode of delivery), its ability to build trust and empathy (as the intervention development process is done in collaboration with researchers and relevant stakeholders), its equity and inclusiveness (as the intervention development process actively involves stakeholders of diverse backgrounds, including persons at risk of developing oral cancer), and its potential to boost the effectiveness of the intervention it develops (as educational contents developed through this approach are more likely to be understood by diverse populations, which will make it highly acceptable, encouraging oral cancer preventative practices).^[101,103,104,106,107]

LIMITATIONS AND FUTURE DIRECTIONS

This review has some limitations that should be acknowledged. Being a narrative review, it did not employ the systematic selection and quality appraisal procedures commonly used in scoping or systematic reviews.^[63,104] As a result, some relevant studies may have been unintentionally excluded due to publication bias, inconsistent indexing, or language restrictions across databases.^[105] Despite these constraints, the review provides a valuable synthesis of recent evidence and highlights existing gaps in oral cancer education research. A key observation is the limited use of co-development approaches in the design of current interventions, particularly those involving the active participation of community stakeholders and end users.^[72-79,106] To address these gaps, future research should prioritise well-organized and methodologically rigorous studies, such as randomized controlled trials, quasi-experimental investigations, and mixed-method co-developmental designs, to ensure validity and comparability of results.^[107] Furthermore, cross-country collaborations and multi-stakeholder partnerships are strongly recommended to enhance global evidence, promote culturally sensitive health education models, and ensure the long-term sustainability of oral cancer prevention strategies.^[100-107]

CONCLUSION

Most of the current health education interventions on oral cancer were not comprehensive, and a major implicated factor was the lack of stakeholder engagement in the development process of those interventions. Due to the

lack of stakeholders' engagement in those interventions, the quality of the educational content delivered in most of those interventions was neither comprehensive nor highly effective. To address this identified lapse, it is imperative that future health education interventions on oral cancer should be co-developed through active and meaningful engagement with relevant stakeholders. The adoption of co-development approaches in health education interventions on oral cancer would enhance the relevance, acceptability, effectiveness, and sustainability of such interventions.

Ethical approval: Institutional Review Board approval is not required.

Declaration of patient consent: Patient's consent was not required as there are no patients in this study.

Financial support and sponsorship: This study was funded by Teesside University. However, the funder played no influential role in the study design, collection, analysis, and interpretation of data, writing of the report, and the decision to submit the study report for publication.

Conflicts of interest: There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation: The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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How to cite this article: Kanmodi KK, Jayasinghe YA, Jayasinghe RD, Okeke EB, Nkhata MJ, Nyanzi LA. Approaches to the systematic co-development of health education interventions on oral cancer: A literature review. *J Global Oral Health*. doi: 10.25259/JGOH_40_2025