

Designing U-TRANS: A Behaviourally Informed Nutritional Intervention Targeting Ultra- Processed Food Reduction to Improve Overall Diet Quality in Individuals at Increased Cancer Risk

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Abstract

Background: Ultra-processed food (UPF) consumption has been associated with a lower nutritional status, and a higher risk of cancer and metabolic outcomes. Reducing UPF consumption has been suggested to improve overall diet quality. Behavioural science-based interventions may improve the effectiveness and sustainability of dietary changes. This paper describes the design of U-TRANS, a brief behaviourally informed nutritional intervention targeting reduction of UPF intake as a lever to improve global diet quality. This intervention will be delivered in an outpatient clinical setting within a multicenter cancer risk reduction program in individuals at increased risk of cancers (INTERCEPTION).

Methods: The U-TRANS intervention was developed using an established behaviour change framework, the Capability–Opportunity–Motivation COM-B model, in conjunction with the Behavior change Wheel described in 6 steps in Public Health Wales NHS Trust model framework, and co-designed with patients, citizens, dietitians, and program managers. We describe here the 5 firsts steps of the model framework, the sixth being the implementation of the intervention, which is the ultimate objective of U-TRANS.

Results include a structured manual, a conceptual model of theory of change, and a replicable 15-minute intervention to be integrated into the INTERCEPTION cancer prevention program using the mobile application Open fact food to support health behaviour change.

Conclusion: U-TRANS provides a pragmatic model of a co-designed behavioural science-based primary cancer prevention intervention to be implemented within an outpatient clinical setting. By promoting sustainable reductions in UPF consumption, this intervention seeks to improve overall diet quality and health benefits without stigmatizing specific foods. Implementing this brief, low-cost intervention within INTERCEPTION, an already existing risk-reduction program is expected to support feasibility and acceptability in real-world settings. Results will inform scalable public health strategies and provide a replicable framework for the prevention and management of other chronic conditions.

Background

The rising incidence of cancer poses a global challenge to health systems, underlining the need for effective primary cancer prevention strategies and their tailoring to specific target populations (1). Over the past decade, the burden of cancers associated with metabolic risk factors and excess body weight has shown the largest increase and is projected to continue rising, potentially exceeding the burden of tobacco related cancers (2). Alongside this, the consumption of ultra-processed foods (UPFs) has become a major public health concern due to its rapid global increase and its association with adverse health outcomes (3). In this context, interventions targeting specific dietary exposures are of growing interest as potential strategies for primary cancer prevention (3).

Based on their degree of industrial processing, UPFs are defined as Group 4 in the NOVA classification system (4). This group is described as “Formulations of ingredients, mostly of exclusive industrial use, that result from a series of industrial processes (hence ‘ultra-processed’), many requiring sophisticated equipment and technology”, and includes products such as carbonated soft drinks or breakfast cereals. UPFs are designed to be hyper-palatable and convenient to consume, which can foster continuous and unintentional eating (5).

UPFs are increasingly displacing healthier dietary patterns worldwide, accounting for up to 45% and almost 60% of daily energy intake in high-income countries like the United States and Canada, respectively (6). Across 22 European countries, the contribution of UPFs to energy ranges from 14% to 44%, with the lowest levels found in Italy and Romania, medium levels in France (31.1%) (7), and the highest levels in the United Kingdom and Sweden (6). Regular consumption of UPFs is associated with higher intakes of sugar, salt, fats and lower intakes of dietary fibres, as well as increased exposure to food additives and other compounds with potential adverse health effects (8).

Dietary patterns high in UPFs are associated with nutrient imbalance, increased energy intake driven by high energy density and hyper-palatability, reduced intake of protective phytochemicals, greater exposure to toxic compounds and endocrine disruptors, and a higher risk of multiple diet-related chronic diseases (9). UPFs promote weight gain compared with minimally processed diets matched for energy, macronutrients, sugar, salt and fiber (10). Moreover, UPF consumption has been consistently associated with increased risks of both overall and site-specific cancers, including colorectal, breast, and pancreatic cancer (8), although the overall level of evidence remains limited (5). Reducing UPF consumption, while empowering individuals to improve overall diet quality, represents an important public health priority.

The use of digital tools to support health behaviour change is well supported in the literature. Digital health interventions have been shown to be more effective in promoting behaviour change than traditional approaches such as printed materials or brief professional advice (11). Moreover, the adoption of digital tools in behavioural health interventions has increased since 2019, reflecting their growing acceptability and relevance in everyday health management (12).

Despite evidence supporting digital dietary interventions (i.e. using mobile application) for disease prevention, low participant engagement remains a barrier to effective and real-world implementation (13). Awareness of health risks alone does not guarantee sustained behaviour change and behavioural and environmental challenges (14) often limit the long-term effectiveness of interventions, such as mobile applications targeting unhealthy eating habits (13, 15). Interventions grounded in behavioural science and established theoretical frameworks are more likely to be effective and sustained (16). Health education initiatives should therefore draw on this evidence while (17) incorporating the lived experiences of target populations to achieve meaningful impact (18, 19). Co-designing an intervention with individuals at increased risk of cancer may enhance relevance by anticipating expectations and needs and addressing barriers regarding UPF.

While interventions targeting UPF consumption have been developed with different target groups i.e. parents and children (20) and with adults (21) none had been specifically designed to reduce UPF intake to improve overall diet quality in a broad adult population at increased cancer risk.

The U-TRANS intervention addresses this gap and aligns with primary cancer prevention strategies to improve global diet quality measured by the World Cancer Research Fund (WCRF) score. The study will evaluate whether a co-designed intervention can effectively reduce UPF consumption and improve overall dietary behaviour. U-TRANS is being implemented and tested within the primary prevention INTERCEPTION outpatient clinical pathway in several clinical settings across France, targeting individuals at increased risk of cancer (22). In this article, we outline the intervention design, grounded in behavioural science such as Public Health Wales NHS Trust framework (behaviour change wheel). We hypothesise that a behavioural science informed

intervention can reduce UPF intake and enhance overall diet quality among individuals at increased risk of cancer, and that co-designing the intervention with users and healthcare professionals will integrate needs and overcome behavioural barriers, in order to improve diet quality and adherence to nutritional recommendations.

Methods

We developed the U-TRANS intervention by following a systematic, behaviour change theory-driven and community

-based participatory approach. We used the COM-B model (23), a widely used framework for understanding behaviour change mechanisms, specifically guided by the Behaviour Change Wheel (BCW) framework using the “Evaluating Behaviour Change Interventions” version described by Public Health Wales NHS Trust (24). Of the six steps outlined in this framework (Fig. 1), the present paper reports on the implementation of the first five steps, which include defining the target population, conducting a behavioural diagnosis, selecting intervention functions, choosing implementation strategies, and developing the intervention. The research team followed the guidelines GUIDED and TIDieR (Supplementary material 1 and 2)

Step 1: Deciding on a target behaviour and target population (WHO, WHAT, WHEN, WHERE)

Meetings with all stakeholders involved in the U-TRANS intervention (researchers, clinicians, project manager, app developers and dieticians) were conducted to define the core target behaviour and translate it into concrete, observable actions. The behaviour was specified in terms of who needed to change (target population), what actions were required, when and for how long they should be performed, and where they would take place. Additional clarification of by whom and how the intervention would be delivered was done to clarify roles and operational limits.

Step 2: Conducting behavioural diagnosis

To identify the most relevant Mechanisms of Action (MoAs) for U-TRANS, we conducted a behavioural diagnosis using the COM-B model, combining a literature review with contextual insights from a group of patients and citizens. The COPRICA (community of citizens in cancer primary prevention) group, dedicated to participatory approaches within CANCEPT (25), a national primary cancer prevention research network, was consulted during an online meeting to provide their feedback on the content of the U-TRANS intervention.

We then applied the BCW framework to identify barriers and facilitators to reducing UPF consumption. Generic questions from this framework (24) were translated into French, adapted to this context and answered through literature review and discussion with stakeholders, such as: “How confident are you that you could choose unprocessed foods most of the time?” (Motivation) and “How well do you understand the benefits of limiting UPFs?” (Capability). These insights informed the selection of relevant MoAs for the target behaviour.

Step 3: Selecting intervention functions

At this stage, the barriers and facilitators identified in Step 2 and categorised using the COM-B model were used to determine the most appropriate intervention functions. Guided by the BCW, functions such as education, persuasion, training, enablement, modelling, environmental restructuring, incentivisation, and restriction were selected based on their relevance for addressing the identified barriers and strengthening existing facilitators.

Step 4: Selecting implementation types

After defining the intervention functions, the research team identified the most effective implementation strategies. Using Public Health Wales' implementation table (24) which compares the relative effectiveness of different approaches, we prioritised strategies best suited for integrating the U-TRANS nutritional intervention into the cancer primary prevention INTERCEPTION outpatient clinical pathway.

Step 5: Building the intervention

Identifying and Applying Behaviour Change Techniques (BCT)

The research team identified relevant BCTs via a review of effective techniques for dietary behaviour change, highlighting instruction, practice, and demonstration (26–29). Selection was further informed by the BCW, the Theory and Techniques Tool (TaTT), and the Behaviour Change Intervention Ontology (BCIO), which link mechanisms of action to BCTs (30–32). BCTs were reported with TaTT references for transparency and replicability for other studies.

Construction of intervention actions

The COPRICA participatory group contributed to the co-construction and refinement of the intervention through discussions and prototype testing during an online meeting and follow up discussion. Finally, the EAST framework (Easy, Attractive, Social, Timely) (33) which designates that a behaviour should be Easy, Attractive, Social, and Timely, guided the translation of selected BCTs into practical, acceptable actions for professionals and participants.

Testing feasibility and acceptability

Feasibility and acceptability were assessed using APEASE criteria (24) (Supplementary material 3), based on a literature review and feedback from the COPRICA group, dietitians, and project managers (34). Two feasibility tests were conducted in two centers to test the feasibility and refine the intervention accordingly (one with dietitians and one with dietitians and patients within the INTERCEPTION program).

Results

Table 1 summarizes the outcomes of implementing the first five steps of the Behaviour Change Wheel, following the "Evaluating Behaviour Change Interventions" guidance developed by Public Health Wales NHS

Trust and the U-TRANS behaviorally informed nutritional intervention.

Table 1
Co-design of the U-TRANS behaviorally informed nutritional and digital intervention

Step	Method	Results
Step 1: Deciding on a target behaviour and target population	Defining Who, What, Where, When	Reducing UPF consumption among individuals at increased risk of cancer during a 15-min workshop delivered by dieticians in INTERCEPTION one stop day.
Step 2: Conducting behavioural diagnosis	Behavioural diagnosis based on COM-B model, literature and stakeholders' feedback to determine facilitators, barriers and Mechanisms of Actions (MoA)	Facilitators: support from relatives, literacy, feeling capable of eating less UPFs.
		Barriers: lack of work/life balance, habits
		1- Social Influence <i>BCIO:050776</i>
		2- Beliefs about capabilities <i>BCIO:006154</i>
		3- Knowledge <i>BCIO:006052</i>
Step 3: Selecting intervention functions	Selection based on barriers and facilitators	Education and training; modelling; enablement
Step 4: Selecting implementation types	Defining the policy type	Providing a service (combining human-delivered and digital components)
Step 5: Building intervention by -	Selection of BCTs from the TaTT* framework to design the intervention based on the selected MoA. * https://theoryandtechniquetool.humanbehaviourchange.org/tool	1.1 Social support (practical) BCT3.2
		1.2 Information about others' approval BCT6.3
		2.1 Behavioural practise/rehearsal BCT8.1

Step	Method	Results
		2.2 Demonstration of the behaviour <i>BCT6.1</i>
		2.3 Graded tasks <i>BCT8.7</i>
		3.1 Instruction on how to perform behaviour <i>BCT4.1</i>
		3.2 Information about health consequences <i>BCT5.1</i>
	Design of the intervention based on the previous BCTs.	1.1 Show how to use the app with relatives
		1.2 Ask a question about relatives
		2.1 Comparison practice
		2.2 App demonstration
		2.3 Select a product to replace
		3.1 Explain scan and comparison
		3.2 Share preventive message
	Co-construction of the intervention with co-researchers and dieticians	Development of the Theory of change diagram to illustrate the intervention (Fig. 2)
		Refinement of the intervention based on COPRICA's feedback: - Expand ultra-processed food examples to reflect everyday foods.

Step	Method	Results
		- Use familiar products to support recognition. - Replace group discussion with a brief individual task to maintain feasibility. - Reinforce key messages through simple visual supports.
	Acceptability and feasibility testing in two centers using APEASE criteria	Confirmed as acceptable and feasible by dietitians and COPRICA participatory group

Below, we detail the implementation of each of the five steps and explicit the decisions undertaken at each step.

Step 1: Deciding on a target behaviour and target population (WHO, WHAT, WHEN, WHERE)

WHO: The target population will include adults aged 18–74 years at increased risk of cancer due to genetic predispositions, a family history of cancer, or the presence of pre-cancerous lesions and with a WCRF score < 5 (poorer nutritional habit).

WHAT: The initial objective - limiting UPF consumption to improve overall diet quality - was confirmed as an observable and measurable behaviour: choosing a diet with fewer UPFs. The selected tool is the Open Food Facts application which operates on a collaborative model and relies on a global, crowd-sourced database that provides detailed information on food products, including ingredients, nutritional quality (using the front-of-pack label Nutri-Score), and processing level, as measured by the NOVA classification. Its scientific validity is supported by prior use in nutritional epidemiology research, including collaborations with the EREN team (Nutritional Epidemiology Research Team).

BY WHOM: The intervention will be delivered by registered dietitians trained for this intervention and familiar with the psychosocial and clinical characteristics of the INTERCEPTION population.

WHERE: The U-TRANS intervention will be implemented within the INTERCEPTION outpatient clinical pathway, which is deployed across several outpatient clinical settings in France. More specifically, the intervention will occur during the program's dedicated "One-Stop Day," a standardized outpatient visit during which participants attend both educational and medical prevention consultations. As a result, all U-TRANS participants will already have completed INTERCEPTION's group-based nutritional education session, which introduces healthy eating principles based on WCRF recommendations, explains the concept of ultra-processed foods (UPFs),

and outlines their association with cancer risk. U-TRANS session will be face to face and in group of 1 to 4 participants.

WHEN and HOW LONG: The U-TRANS intervention will be delivered during the INTERCEPTION “One-Stop Day” described previously. It is designed as a brief 15-minute session to fit seamlessly within the structure and timing of this outpatient prevention visit while minimizing participant burden. Following the intervention, participants will be followed for a total of 12 weeks, during which outcome measures related to dietary behaviour and UPF consumption will be collected.

Step 2: Conducting behavioural diagnosis

The behavioural diagnosis highlighted knowledge, beliefs about capabilities, and social influence as key determinants of dietary behaviour (Table 1 for the MoA). Consistent with the COM-B model in nutrition, the literature similarly identifies these mechanisms of action as central drivers of dietary behaviour (MoA) (35, 36):

- Knowledge provides the foundation for behaviour change. Both declarative knowledge (understanding what is healthy) and procedural knowledge (understanding how to act) support healthier eating, though motivation and environmental factors remain critical determinants (37, 38).
- Beliefs about capabilities refer to the perception that engaging in healthy behaviours depends on confidence in one’s ability to perform them. Evidence suggests that dietary self-efficacy is a central determinant of behaviour change, and that effective behaviour change interventions often target this mechanism (39–41).
- Social influence plays a major role, as eating is frequently a socially embedded activity. Perceived norms and interpersonal dynamics strongly shape adult eating behaviours, while support from family, friends, or partners with healthy habits facilitates healthier dietary choices (42–47).

Nutritional knowledge and food literacy were identified as modifiable levers for change, while social and contextual influences, including family dynamics and work–life constraints, favoured UPF consumption. Higher self-efficacy facilitated healthier choices, whereas low perceived willpower emerged as a major barrier.

Step 3: Selecting intervention functions

Guided by the BCW, we prioritised the intervention-functions of Education and Training to improve nutritional literacy by increasing knowledge and skills. To address the influence of relatives, Modelling (i.e., providing examples for imitation) was selected to provide salient examples for imitation. Finally, Enablement was incorporated to reduce barriers or increase resources, thereby strengthening participants’ confidence in their ability to change behaviour.

Step 4: Selecting implementation types

The intervention was categorised under the “Providing a service” implementation type, as it combines a digital component (i.e. the Open Food Facts application) integrated with structured theory-informed support delivered by trained dietitians. This approach operationalises the selected intervention functions by

systematically delivering educational content behavioural modelling, and tailored guidance to strengthen the individuals' capacity to act and facilitate behaviour change. Dietitians serve as the primary intervention agents, providing contextualised support and fidelity of delivery, core characteristics of service-based implementation. The mobile application alone was considered insufficient effect sustained change; rather, its effectiveness relies on structured interaction with health professionals to embed learning, reinforce self-regulatory processes and sustain behaviour change.

Step 5: Building the Intervention

Identifying and Applying Behaviour Change Techniques

The BCTS selected are described in Table 1. BCTs were adapted to the “One-Stop” INTERCEPTION day and operationalised through actions such as demonstration of the Open Foods Fact application and food-label reading, leveraging evidence on mobile applications to implant interventions into daily life (48). All the BCTs are reported to facilitate replicability, using their references from the TaTT framework to link them to the corresponding MoAs.

BCT 4.1 (Instruction on how to perform the behaviour) is used to explain the purpose, ease of use, and supportive role of the app, while BCT 6.1 (Demonstration of the behaviour) is delivered by dietitians through live barcode scanning and interpretation of visual indicators. Participants then engage in BCT 8.1 (Behavioural practice/rehearsal) by scanning food products themselves and identifying UPF. A social component is incorporated through BCT 3.2 (Social support – practical), encouraging participants to involve relatives in app use and food-related activities such as shopping or meal preparation. Visual cues, including pictograms displaying the NOVA classification, are used to enhance clarity and attractiveness of the message. To facilitate progressive change, BCT 8.7 (Graded tasks) is operationalised through simple tracking sheets prompting participants to identify and replace one ultra-processed food with a healthier alternative. Motivation is further reinforced through BCT 5.1 (Information about health consequences), highlighting the relevance of dietary change for individuals at high cancer risk. Finally, BCT 6.3 (Information about others' approval) is introduced at the end of the session to activate social norms by prompting reflection on relatives' perceptions of app use.

Co-construction of the intervention with co-researchers (patients and citizens) and dietitians

Feedback from the COPRICA participatory group directly informed several modifications to both the content and the delivery of the intervention. In particular, examples of UPFs were diversified to better reflect habitual consumption patterns and to avoid overemphasis on a single product category. To accommodate the 15-minute session format, the group discussion was replaced with an individual activity in which participants identify one UPF they regularly consume and could realistically substitute, thereby reinforcing understanding of the concept and personalisation. The intervention content was condensed into one or two sentences per step to facilitate delivery by a dietitian. Additionally, a visual guide to customise nutritional profiles within the Open Food Facts application was incorporated into the facilitator's manual, alongside technical refinements such as downloading the application prior to the session. While suggestions for peer-based support were

discussed during co-construction, they were not implemented to maintain fidelity with the U-TRANS study protocol. Table 2 presents the steps of the intervention in relation to the three MoAs.

Table 2
Steps in the implementation of the 15 minutes intervention

Steps of the intervention	Duration	Mechanisms of Action (MoA)		
	15 min	Knowledge	Beliefs about capabilities	Social influence
1. Installation and profile personalisation	4 min			
2. Guidance on using the app	3 min	Demonstrate main functions (scanning, lists, product comparison)		
2.1 Comparison of a UPF and a substitute product	2 min	Read aloud and interpret Nutri-Score and NOVA labels, highlight additives		
2.2 Preventive message	1 min	Explain that lower UPF intake reduces cancer risk and that the app helps users replace them		
2.3 Distribution of the monitoring sheet	1 min		Guide participants to record one product to be replaced on a monitoring sheet	
2.4 Sharing with relatives	1 min			Encourage participants to share substitute products with family/friends
2.5 Turn-Taking	1 min			Ask: “What benefits could this tool have for your relatives?”
3. Conclusion and follow-up	1 min			

Test feasibility with pilot test in 2 centers and APEASE Criteria

A theory of change diagram (Fig. 2) was co-designed with stakeholders to summarise the intervention design and intended functions of the U-TRANS intervention. The diagram illustrates the theoretical foundations, MoAs, and outcome pathway of the U-TRANS intervention, explicitly linking intervention delivery to improvements in dietary behaviours and reduction of cancer risk. A stepwise implementation guide (Table 2 and Supplementary Material 4) was developed to ensure consistent delivery of the intervention. The final conceptual model of the intervention (Fig. 2) was validated according to APEASE criteria (Supplementary material 3) and deemed acceptable and feasible by dietitians, who endorsed the clarity of instructions and the

practicality of the 15-minute session format. A feasibility test of the U-TRANS intervention conducted within the INTERCEPTION program with nine participants, showed a high participation rate (90%: 9 out of 10 subjects invited). Post-intervention satisfaction was unanimous, with all participants reporting that the Open Food Facts application was easy to understand, informative, and useful. Adherence to using the application after the intervention was also high (100%), with several participants expressing intention to involve family members and highlighting the “compare” function as helpful for identifying healthier alternatives. Based on this pilot feedback, additional explanatory materials, including guidance on the NutriScore, NOVA classification, and a FAQ section, were incorporated to support implementation (Supplementary material 4).

Discussion

As part of the U-TRANS study, we developed a brief, 15-minute behaviorally informed nutritional intervention targeting ultra-processed food reduction intervention targeting adults at increased risk of cancer. This intervention brings together established behaviour change models (COM-B and BCIO)(49), a community-based participatory approach and a co-construction process involving users, citizens and professionals. Its design explicitly addresses organisational constraints and real-world conditions, ensuring alignment between intervention objectives and participants’ everyday contexts. While some behavioural studies have already examined ways to reduce UPF consumption in the general population (21, 50), to the best of our knowledge, none have combined the use of a nutritional mobile application with the structured methodological approach used in U-TRANS.

Within the broader domain of nutritional intervention research, several approaches provide relevant conceptual and methodological points of comparison with U-TRANS. Digital interventions based on games or social media (51) have shown some impact on nutrition knowledge and attitudes, but their effects on sustained behaviour change remain limited. More comprehensive psycho-nutritional approaches, such as the NutriSOS study (52), have combined behavioural, environmental and sustainability components, however, their intensity and duration raise challenges for scalability and integration into routine outpatient clinical settings, such as the primary prevention INTERCEPTION program. In the domain of cancer prevention, mobile and web-based tools have been developed to promote diet and physical activity among women at risk of breast cancer (53, 54). While these studies confirm the feasibility of embedding digital tools into cancer prevention pathways, none has specifically targeted reduction of UPF consumption. U-TRANS addresses this gap through a brief, clinically integrated intervention tailored for adults at increased risk of cancer, offering a pragmatic and potentially replicable model within the existing landscape of nutrition and cancer prevention strategies.

The intervention focuses on improving overall diet quality rather than avoiding all UPFs. Recent discussions in nutrition research emphasise the importance of prevention strategies that are realistic and compatible with real-world food environments. When nutrition recommendations are perceived as overly restrictive or impractical, they can undermine motivation and engagement with sustained dietary change. (55, 56). By promoting a pragmatic reduction in UPF consumption, the U-TRANS intervention supports achievable and sustainable improvements in dietary behaviour.

Moreover, delivered by dietitians within the One-Stop Day of the primary prevention INTERCEPTION outpatient clinical pathway, the intervention targets adults at increased risk of cancer. Emphasising feasibility and

integration into routine clinical pathways is particularly important in the context of a study design, which aims to demonstrate how the intervention can be realistically implemented and subsequently evaluated in practice.

The development of the U-TRANS intervention has several strengths. It combines behavioural science, community-based participatory approaches and co-design methodology, and a digital component, representing an innovative methodologically that extends beyond traditional, single-method interventions. Evidence indicates that the quality, scalability and effectiveness of public health interventions depend on the rigour, coherence and complementarity of the methods used, with integrated and systematic approaches enhancing both feasibility and impact (57, 58). The present design was structured in accordance with this evidence-base, with the objective of optimising adaptability, implementation fidelity, and effectiveness across heterogeneous settings (59, 60). The use of the free and widely accessible Open Food Facts application reduces economic and logistical barriers,

Co-construction with citizens aligns with participatory research principles that promote equitable partnerships to address complex health determinants (61), and has been associated with greater relevance, acceptability, and contextual fit of interventions (62, 63). In this study, the COPRICA group, including citizens and cancer survivors, contributed experiential knowledge into food purchasing and consumption practices, informing pragmatic refinements to the intervention's content, usability, and delivery to better reflect real-world contexts. The multi-stakeholder co-construction enhanced organisational alignment, technical optimisation, and integration of the digital component within existing care pathways, thereby strengthening implementation readiness.

Despite these strengths, several should be acknowledged. First, the 15-minutes format of the educational component may constrain behavioural learning and implementation, although it was selected to ensure feasibility within routine clinical workflows, without imposing additional burden on participants already attending a full day at the hospital. However, evidence suggests that longer or repeated exposures may better support sustained behaviour change (64, 65). Second, relying on mobile applications may risk digital exclusion, particularly among older adults or socioeconomically disadvantaged populations with limited digital literacy (66), underscoring the need for monitoring engagement, and considering hybrid delivery methods.

Robust, longer-term multi-time point evaluations are needed to assess the durability of dietary changes and their potential effects on intermediate cancer-related risk markers (67). If the digital component demonstrates feasibility and effectiveness, the design framework could be extended to other chronic disease prevention contexts. Finally, future studies should examine how individual perceptions of ultra-processed foods shape engagement and behavioural responses, to inform strategies that promote realistic, achievable, sustained dietary improvements.

Conclusions

In conclusion, the U-TRANS intervention represents a theory-informed, co-constructed, and pragmatically designed strategy to reduce ultra-processed food consumption and improve overall dietary quality in individuals at increased risk of cancer. The intervention design process illustrates both the challenges and opportunities of integrating behaviour change science into primary cancer prevention. By combining

behavioural science, participatory approaches, and an accessible technological tool, it offers a scalable and transferable model for nutrition-based cancer prevention within outpatient clinical settings. Pending confirmation of its effectiveness and sustainability, this approach holds promise for contributing meaningfully to dietary risk reduction and strengthening preventive strategies in public health.

Abbreviations

BCIO

Behaviour Change Intervention Ontology

BCT

Behaviour Change Technique

BCW

Behaviour Change Wheel

COM-B

Capability (C), Opportunity (O), Motivation (M) and Behaviour (B)

EREN

Nutritional Epidemiology Research Team (Inserm 1153/Inra 1125/Cnam/Université de Paris - Paris 13)

TaTT

Theory and Techniques Tool

UPF

Ultra-processed food

WCRF

World Cancer Research Fund

Declarations

Ethics approval and consent to participate

The co-researchers involved in this project collaborated as full partners in the co-construction of the intervention. Their involvement was characterised by voluntariness, informed consent, and the provision of compensation (gift vouchers) in acknowledgement of their time commitment. As the project did not collect sensitive data or pose any risk to participants, formal approval by an ethics committee was not deemed necessary.

Consent for publication

Not applicable. This manuscript does not contain individual person's data in any form (including individual details, images, or videos).

Availability of data and materials

No datasets have yet been generated or analysed. Data resulting from the methodology of the study will be made available from the project manager on reasonable request, in accordance with institutional and funder requirements.

Competing interests

The Authors declare that they have no competing interests.

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Authors' contributions

Conceptualization: PO, SM, CB, BR, SD, BF

Methodology: SM, PO, CB, BR, SG, CL, BS, MT, LV, NMR, MCA

Project administration: PO, SM, CB, PS

Resources: SG

Funding acquisition: CB, SD

Supervision: PO, BF

Writing – original draft: SM

Writing – review & editing: PO, CB, NMR, MCA, BR, SG, CL, PS, LV, SD, MT, BS, BF

SM and PO designed the manuscript plan. SM wrote the first draft of the manuscript and PO wrote the subsequent versions and revisions. All authors critically revised the manuscript, approved the final version, and agree to be accountable for all aspects of the work.

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Figures

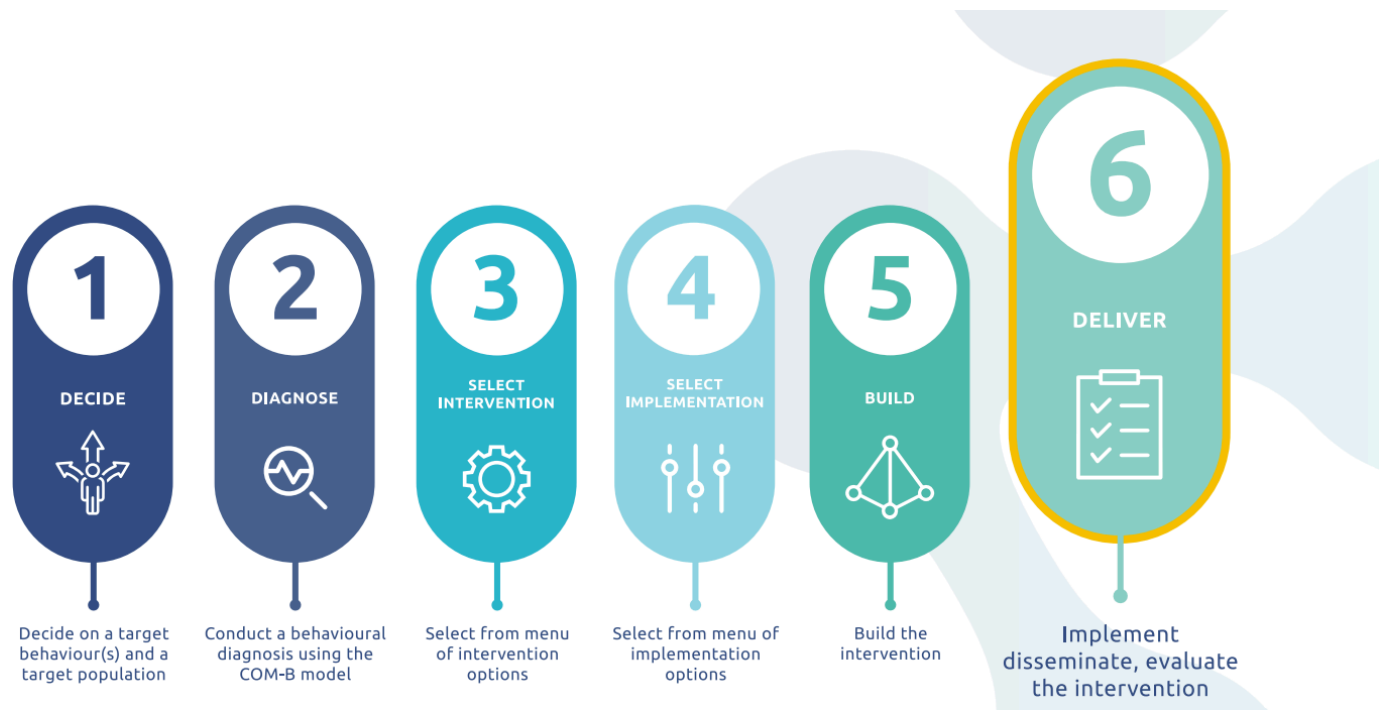


Figure 1

The six steps for developing a behaviour change intervention from Public Health Wales (24)

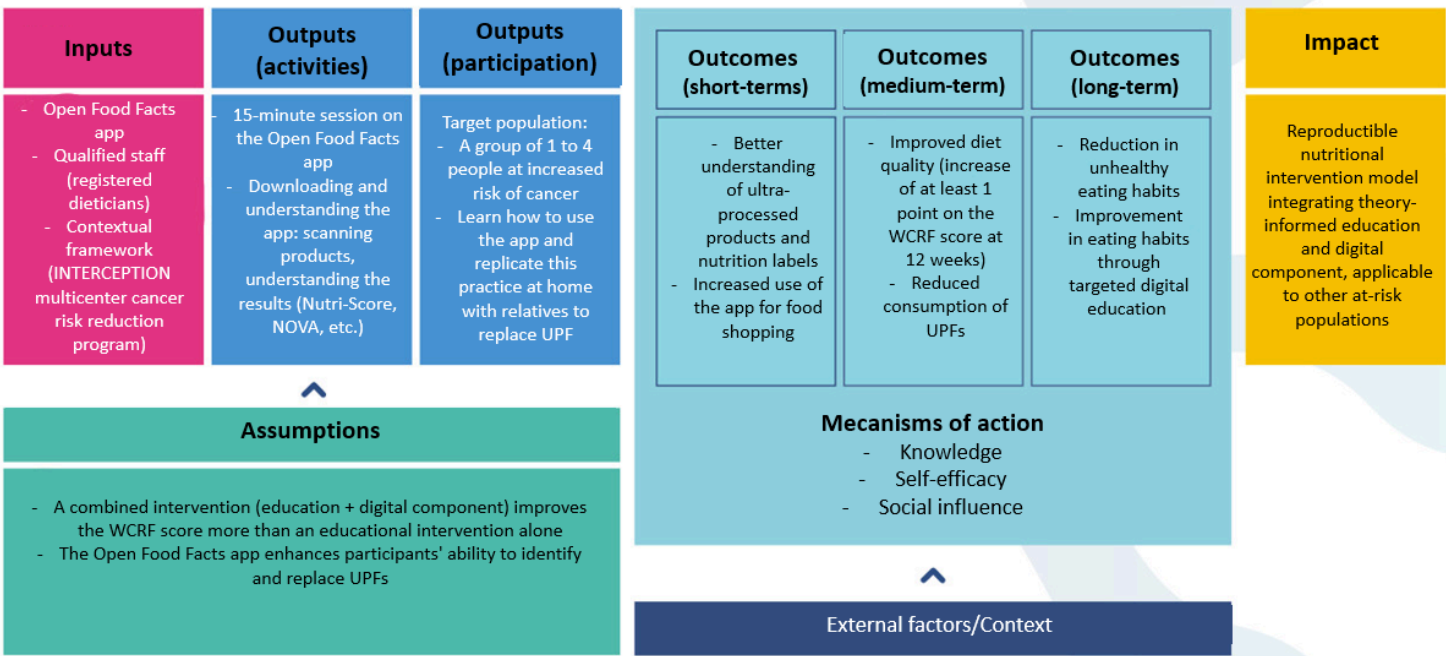


Figure 2

Conceptual Model (Theory of Change) of the Intervention based on Public Health Wales (24)

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