Digital intervention for public health: searching for implementing characteristics, concepts and recommendations: scoping review

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Studying the impact of digital interventions on public health can help ensure that the offered services produce the desired results. In order to address these factors, the subsequent study uses a scope review to evaluate the state of the field while concentrating on ideas and suggestions that represent factors that have been crucial in the management of digital intervention for public health. To shed light on the traits, ideas and suggestions related to public health digital intervention, a scoping review was carried out. Five electronic databases were used to locate pertinent research that were published before February 2022. All texts were examined, and study abstracts were scrutinized to determine their eligibility. The last analysis of this study included fifteen publications; five reviews, four qualitative studies, two quantitative studies, one viewpoint study, one mixed-method study, one perspective study, and one interventional study. The key ideas for digital interventions in population management and health studies are presented in this overview. Many concepts, implementation characteristics and recommendations have been raised which highlight the future role of these interventions to enhance public engagement and health equity.

KEYWORDS

characteristics, concepts, digital interventions, implementation, public health

Introduction

The choice of an appropriate theory to administrator the implementation course and the technique selection, assuring that proper consideration is paid to planning implementation, and having a flexible tactic that allows for response to recently evolving obstacles are all of the utmost importance.

Public health professionals and academics have proposed a variety of responses in their search for solutions, including stepping up current initiatives to promote information and health literacy, coming up with plans for widely refuting distortion, and educating clinicians and public health professionals on how to discourse misinformation one-on-one (1).

Better data science ought to lead to healthier behaviors and wiser health decisions. In this way, technologically mediated health data processing might support patient empowerment and individual sovereignty (2, 3). However, because human decision-making is complex and influenced by environment and intellectual biases, mixing emotion and rational, the embracing of healthy habits does not occur linearly as a result of better health knowledge. In addition to being

the area of health care that is focused with promoting healthy behavior, health promotion is viewed as crucial to attempts to avoid diseases (4).

However, methods from all these fields are needed since these studies sit at the nexus of biological, behavioral, computational, and engineering research. Related research answers encompass identifying the issue and the expected assistance of the digital health intervention (DHI), which in flip necessitates determining the intervention's likely reach and uptake, the causal model outlining how the intervention will produce the optimally selected, key elements and how they socialize with one another, and assessing the actual advantage in terms of effectiveness, cost effectiveness, and harms (5).

Distinguishing the implication of digital technology in this expanse and in pandemic preparation planning has become crucial since the future of public health is anticipated to be more and more digital. Technology productions and other noteworthy players in the digital area ought to work together as longstanding allies in readiness rather than only through crises times (6).

DHIs, which are therapies given through digital technology like smartphones or websites, have a huge potential to provide efficient, affordable, safe, and scaled interventions to promote healthcare. DHIs can be used to optimize outcomes for those with longstanding conditions, such as cardiovascular disease, diabetes, and mental health issues, as well as to provide remote access to effective treatments. They are frequently intricate interventions with numerous parts, and many of them have multiple goals, such as empowering users to learn more about their health, connect with others in a similar situation, alter perceptions and beliefs about it, monitor certain health conditions or behaviors, titrate prescription, identify treatment priorities, and enhance patient-provider interactions (5).

This review aims to examine the series of digital inventions used universally to address public health challenges, as well as their restrictions and implementation footraces, such as those associated to the law, ethics, and privacy as well as legislative and personnel issues. The objective of the paper is to identify mechanism-based explanations for how and in what contexts digital intervention for public health achieved its effects.

Appraising digital health interventions

Integrating assessment from the start of the DHI progress process allows for the development of evaluation thinking, abilities, and tools. The resulting evaluation service gives non-academics and digital developers the ability to use evaluation approaches and thinking when designing, developing, and implementing their DHI. By doing this, it demystifies evaluation, which has historically been the purview of academia, and uses people's motivations to make sure that their DHI is as effective as it can be while enhancing the health and wellbeing of end users (7).

Diagnostic or population health interventions, digital product design, product and service design, as well as communication and health promotion, are all components of the interdisciplinary endeavor known as DHIs. Therefore, interdisciplinary approaches to evaluation are best for understanding the effectiveness of DHIs as well as their usableness and attractiveness, with success criteria that

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Abbreviations: DHI, Digital Health Intervention; DHIs, Digital Health Interventions; PPI, Patient and Public Involvement.

consider the various parties involved in the hiring, design, and growth of a DHI as well as its end users (8). To validate the appraisal enterprise path for a DHI, seven key ideas for evaluating DHIs have been identified; evaluation thought, review image, contract assistant, testing tools, progress history, data hub, and published health results.

Argue the structural and epistemic aspects

Along with the crucial problems of safety, data privacy, and the value of human caring touch, structural unfairness raises concerns. DHIs for "reporting and evidence building" urge users to actively recount their involvements and join with other survivors' tales, creating a shared epistemic space for people who have come into contact with violence. Users are encouraged to apply their epistemic capacity, are recognized as epistemic subjects, and are able to communicate and possibly advance their knowledge within the user community by allowing consumers to express their opinions, even if only digitally through a digital application.

These DHIs can thus stress the need to respond not only on an interpersonal basis but also on a structural level and may aid in better comprehending patterns and clusters of violence (e.g., societies, regimes). These DHIs might also make people impress less alone in their involvements, teach them coping mechanisms, and help them locate guidance and support. Even if applications are created in a way that considers and reflects systemic factors of violence, their impact would be dubious if not everyone can use them. By endorsing digital intervention tactics that can only be opened by users with specific advantages, this runs the risk of highlighting and strengthening structural and epistemic unfairness.

The main epistemic circumstances and traits are recognized under the categorization: data and information structures are related to psychological effects in four ways: (1) they are caused by psychological properties, (2) they are caused by information features, (3) they are related to psychological properties, and (4) information features (co-) constitute psychological properties (9).

Additionally, as DHIs become more prevalent as an intervention strategy, problems like the loss of private contact in intervention settings (such as social workforces providing resident counseling) as a result of a change to digital technology, the possibilities for mistranslation of the details given owed to the absence of non-verbal cues, as well as matters with language and comprehension and access to technology, may crop up (10).

Meanwhile, social media usage for purposes related to health has the ability to create interpersonal networks that support specific epistemic positions on medical matters, which could have a negative impact on public health. Another illustration is the impact of technology-mediated interaction on the connection between the patient and the healthcare professional (11).

Personal agency and motivation

As patients and the general public tended to engross with and enroll in DHIs because they wanted to be healthy or have more influence over how they managed their welfare, the first topic that arose was personal agency and motivation. Information technology was believed that using technology could help people stay motivated to engage in physical activity, reduce their weight, and stay healthy (12,

13). As a result of having the freedom to obtain health information whenever and wherever they pleased, many people joined a DHI, which in some circumstances helped lower anxiety (14, 15). The level of regulating knowledge provided for tracking and comprehending health-related behaviors, such as food and exercise, or for managing chronic diseases on one's own, was also well-liked by users, which prompted registration (12).

Personal life and values

The recurring topic was how patients' and the general public's capacity to participate in and participate in DHIs was impacted by a busy personal life with many conflicting demands. People tended to sign up for new technology if they felt it was useful, could be customized to meet their needs, and was simple to integrate into their daily lives (15, 16). Additionally, individuals who were digitally literate (14, 16) and had experience with or were already familiar with utilizing technology (14) found it simpler to enroll since they possessed the necessary knowledge and abilities. Some people registered because they valued the privacy that online health services offered, being secure and protected from the discrimination and disgrace they occasionally encountered in the actual life (12, 16).

Perceived fit perceived

In contrast to a one-size-fits-all approach, perceived fit describes how much users handled the intervention was acceptable, applicable to their culture and values, and/or oriented at others who were similar to them. For instance, the information's applicability to their current circumstance (17, 18) and the ability to adapt or tailor the intervention (19, 20) made it more likely that it would fit. Users' ability to relate to the intervention's presenters, who may be coaches, teachers, or samples of people with comparable situations, was a facilitating element (21). Culturally appropriate material (22), level of literacy (23), and content given with little use of technical terminology (24) are all examples of elements that make the information pertinent and in a vocabulary suited for the user.

Perceived usefulness

The term "perceived usefulness" describes how a user feels about an intervention and how they judge if it will be helpful to them. Users' ability to comprehend the information presented to them (104,117,170), the clarity of the action they should take (17, 25), and the perception that the intervention offered a distinct advantage over previous or ongoing care received (17, 26) all contributed to this perception. Facilitators were identified as making it simpler for users to get services they would not otherwise have access to (26, 27) and removing the need for them to travel far to a health center (28).

Level of guidance

The amount of assistance a user receives when using an intervention—for instance, through reminders or a web-based supporter—determines how much accountability they receive to frequently engage with the information. If the intervention raised the level of control, leading to users perceived more responsibility over their own health, it would be a facilitating factor for utilizing DHIs (29, 30). Participants had trouble interacting with interventions that were entirely self-guided, and they occasionally failed to use the intervention (31). The demand for more structured use was voiced by the participants, for examples of this structured use include app alerts or routine human coaching checks (32, 33).

Social connectedness

User engagement was revealed to be facilitated by an intervention's impact on participants' feelings of social connectivity. Another facilitating element was if the intervention (34, 35) helped to mainstream lived perspectives by giving instances of others who had comparable experiences. Additional beneficial outcomes that could promote engagement included enhanced abilities (36, 37), a greater understanding of users' health (38, 39), and a sense of empowerment over having control over their wellness (40).

Iterative methods to adjust an intervention

Regular stakeholder involvement, new scientific information, evolving government directives, quick qualitative research (telephone interviews and open-text questionnaires), and usage data analysis all influenced the optimizations. All comments were quickly compiled, and potential improvements were prioritized according to their likelihood of having an influence on behavior change (41).

In order to improve a health intervention and/or its execution to achieve stakeholder-specified public health benefits within supply limits, optimization can be defined as a purposeful, iterative, and data-driven procedure. This study sought to characterize the core ideas, procedures, or processes of selected frameworks to maximize the efficacy of health interventions and/or their administration (42).

The optimization step's goal was to test and perfect the intervention's reasoning and program theory in order to comprehend intervention mechanisms and increase its effectiveness. This frequently happened by doing numerous or repeated "little experiments." If the "experimentation" step was unsuccessful, the intervention may then go back to the preparation or "theoretical/ literature base" phase (42).

An intentional, iterative, and data-driven effort to enhance a health intervention is what is meant by optimization (43). In-depth qualitative research pinpoints obstacles to behavior and intervention adoption and iteratively improves the intervention to get around them (44, 45). The theory- and evidence-based behavioral analysis is integrated into this strategy to choose the most suitable set of efficient behavior change strategies (46).

A live intervention's effectiveness was improved quickly and iteratively to keep pace with the terrifying and continuously changing environment of an international crisis. Making sure the intervention's contents is inspiring, credible, and convincing may be more crucial for fostering involvement than making changes to the intervention's design (41).

Key principles of intervention development

Important guidelines for developing interventions should follow certain key tenets, including being dynamic, iterative, innovative, adaptable, and forward-looking in terms of evaluation and application in the future. When developing an intervention, developers are likely to switch back and forth between redundant tasks including examining the available data, using preexisting theory, and interacting with stakeholders. Iterative cycles will also be used to establish a rendition of the intervention, with feedback from stakeholders used to identify issues, possible alternatives put into action, their appropriateness evaluated, and the cycle repeated until evaluation of subsequent iterations of the intervention shows rare variations.

The need for the intervention, its style, substance, or method of delivery may be strongly held beliefs when the intervention is first being developed. Throughout the design process, keeping open to various alternatives may result in abandoning the project or moving both backward and forward. Being adaptable is a good idea since it could lessen the likelihood that you produce an intervention that fails in a later evaluation or is never used in practice. In order to prepare for this and highlight lessons learned and significant uncertainties that need to be addressed in future evaluations, developers may also gain from anticipating how the intervention will be appraised (47).

Monitoring and iterative evaluation should be prioritized to the greatest extent possible, and results should be regularly discussed and understood in collaboration with stakeholders, as well as thoughtfully and continually implemented in any system redesign or anticipated adaptations/modifications (48). The iterative method of data collection, assessment, evaluation, review, and change responds to the dynamic nature of evidence and the requirement for learning from and with stakeholders, such as populations and field workers (49).

Patient and public involvement

By raising disease understanding and recognizing patients as active participants in their own conditions, patient and public involvement (PPI) can support patient empowerment (50). However, PPI varies significantly between nations and research organizations, and even today, many patients and the general public do not participate in or have access to study protocols (51). Cohort studies are increasingly including digital resources like websites, social media, and connected gadgets, which could be used to boost PPI (52). Digital tools can also help PPI by facilitating feedback and communication between study collaborators and patients (53). PPI is an effective strategy for raising the relevance of research efforts. We have demonstrated that PPI must be designed from the early stages of the construction of a original epidemiological study and then deliberated as the research project progresses. The most successful technique for raising the caliber of research appears to be combining various PPI approaches (54).

Contextual indicators

The contextual indicators basis was created to offer direction on the interdependent context, implementation, and setting characteristics that may have an impact on the efficient delivery of complex interventions (55). What is crucial is that the framework explains how ambitious contextual factors outside of the administrative environment may affect how a complicated intervention with community-facing components is implemented. The seven dimensions that contextual indicators consider are; geographical, epidemiological, sociocultural, socioeconomic, ethical, legal, and political setting. Here, researchers look into the interactions between the political (healthcare infrastructure), epidemiological (blood pressure, body mass index, and older population) and geographical (region, urbanicity) domains of the contextual indicators (56).

Share viewpoints and knowledge from public health experts

The deeper understandings into participants' involvements, opinions, views, and tips helped the researchers produce more detailed data and also helped others. Focus group involvement provided community members with new perspectives on issues they were discussing as well as a sense of insertion and community development, according to their reports (57).

Future studies should concentrate on a few unanswered problems about the use of digital forms in community-based health promotion interventions. If digital forms potentially take the place of outdated setups for health promotion and prevention actions, notably in vulnerable groups, this should be seriously evaluated. One of the most pressing unknowns, in our opinion, is whether the use of digital health promotion interventions results in an extra enlargement of a selection bias or whether such interventions combat this bias and are utilized and recognized by vulnerable groups and environments where inclusion struggle (58).

The researchers came to the conclusion that emphasizing participation in DHIs and utilizing standardized metrics to describe DHIs will aid future research and potentially open up more possibilities for meta-analyses of DHI results. This is further confirmed by Zanaboni et al. (59), who state that more emphasis should be given to clinical research in the form of high-quality randomized controlled trials in order to run a credible evidence base about the use of digital health and health results. According to Blandford et al. (8), established health research methodologies need to be flexible and modified in order to evaluate DHIs in study.

Methodology

By using scoping review approach, this study investigates DHIs for public health. A review of the literature known as a "scoping study" or "scoping review" has the goal of "fastly mapping the major concepts driving a research topic and the main sources and forms of evidence available, notably where a subject is intricate or has not been studied thoroughly before" (60).

This kind of scoping review may not go into individual study findings, but rather maps and visualizes the body of knowledge that exists within the confines of the research field (61). Data were gathered and evaluated throughout five stages, as per the scoping review process delineated by Arksey and O'Malley (61), which is described below.

According to the stated rules for writing systematic reviews, peer reviews, and research articles, a systematic review was planned and

carried out. The literature on digital interventions for public health has undergone a thorough assessment. The articles' quality was not evaluated because it is not a part of the typical scoping review technique.

The main review interrogation was; "what are the implementing characteristics, concepts and recommendations of the digital interventions for public health considered." In addition to updates in five databases, an electronic search of digital interventions for public health was conducted. We searched databases from EBSCO, PubMed, ScienceDirect, Scopus and the Cochrane Library. We looked for the words "digital intervention" and "public health" in the article titles. In relation to the objective of the study, it was determined that these terms should be used the most. Duplicate articles were removed, and articles had to have been released in English before February 2022. All scholarly investigations underwent a thorough search of the peer-reviewed literature.

Four main inclusion criteria were defined (Figure 1):

- Published papers as peer-reviewed.
- Original research articles.
- Papers with full access possibility.
- Not targeted mental, sexual or productive health research.
- Papers written in the English language.
- Published before February/2022.

Studies that did not match the aforementioned requirements were excluded, while those that did were listed and subjected to further evaluation. Studies were assessed and given a critical review. Extraction of the key conclusions from each repossessed study and literature screening (a three-stage technique involving exclusion by reading the title, the abstract, and the full text). The following details were taken from each of the studies that were included (Table 1): title, authors, country, study design, research objective, and key findings.

Results

The following research question was developed:

What implementing characteristics, concepts and recommendations that encourage digital intervention in public health? The terms "digital health intervention" were recognized as the use of digital, mobile, and wireless technologies to support the achievement of health objectives (71), encompassing both mHealth and eHealth. Arksey and O'Malley (61) advise using a broad definitional approach and propose that search words can be modified and reduced later to manage bibliographic references after the entire breadth of information within a given field has been attained. Given that it applies a uniform analytical framework to all studies, which is considered as a standard practice in scoping reviews, this methodology reflects a "descriptive-analytical" approach to charting.

From the publications, this study obtained both qualitative and quantitative data. This study's major objective was to conceptually clarify the characteristics of digital intervention for public health.

The results of this study may have also been exaggerated by other search parameters, such as restricting results to English-language articles. The current study's goal was to regulate the existing status of digital intervention for public health and make recommendations. The methodology was suitable for a policy analysis topic like this one. The limitations found in the literature highlight the need for public health practice information and more rigorous study approaches.

Concepts of digital intervention for public health in the context of the reviewed articles

The articles focused on diverse concepts for the digital intervention for public health and also on different methods on the topic. Article
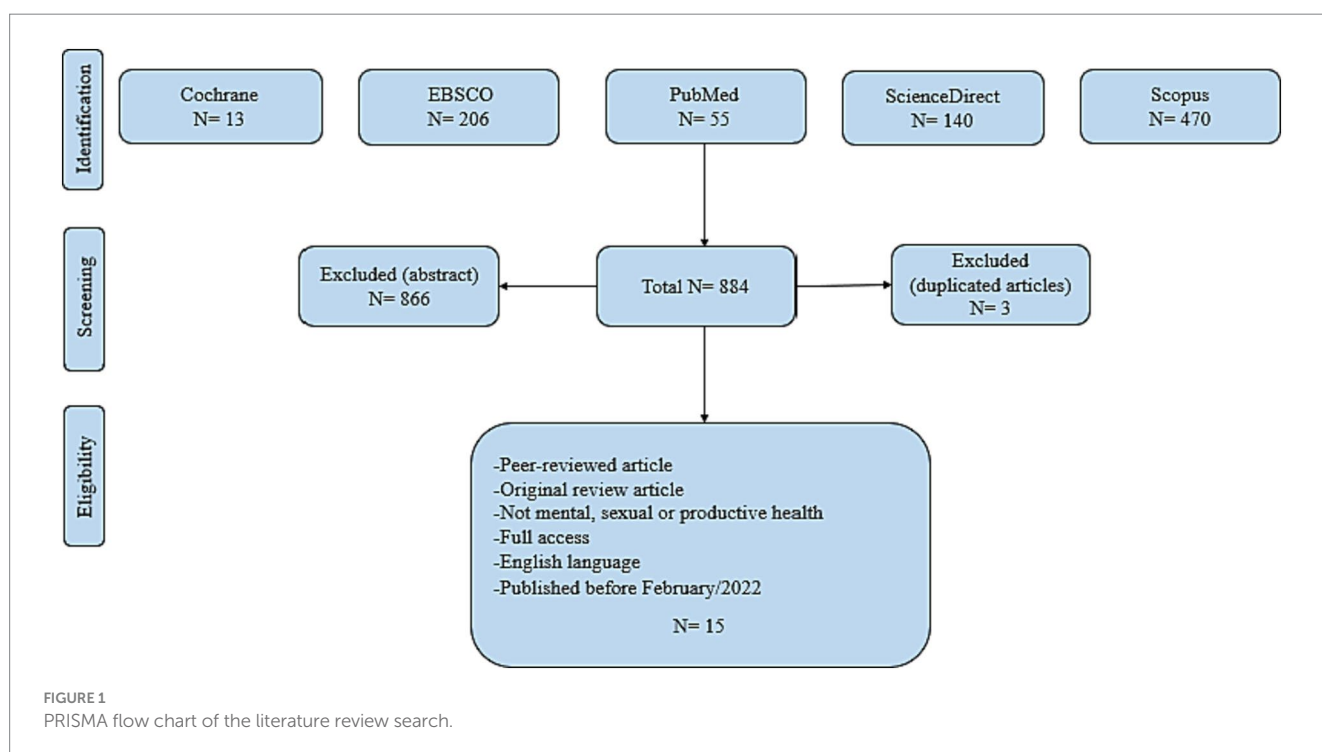

FIGURE 1
PRISMA flow chart of the literature review search.

TABLE 1 A summary of reviewed studies.

Author	Setting/design	Aim	Study focus and findings	Recommendation
Burke and Bloss (62)	United States viewpoint	To hire commercial corporations to adopt cutting-edge technologies that monitor and manipulate students' social media activities	There is a need for creative answers to the problems of student health and safety. The assertions made by social media monitoring firms and the schools that employ them that these technologies can solve the wide range of public health issues affecting pupils are unsupported by any evidence	The issues that young individuals already confront, particularly those from historically oppressed groups, may only be made worse by these digital surveillance tools
Susser (63)	United States perspective	Various strategies have been proposed by officials and public health experts, including; stepping up current initiatives to advance information and health literacy, coming up with plans for publicly refuting falsehoods, and training clinicians and public health authorities to deal with falsehoods one-on-one	Dealing with ethical challenges successfully will require balancing difficult tradeoffs. The vast amounts of personal information that have been gathered about each of us are tremendously illuminating, and the instruments for using that information to target digital communications are strong and easily accessible. It is simple to comprehend why academics and professionals in public health are keen to investigate the potential good they may do with them. The ethical costs of targeted digital public health initiatives may be high	Targeting technologies frequently infringe the security of personal information by using data that has been collected in this way. With these technology, disadvantaged populations could be targeted with discriminating messages. Targeted digital public health interventions pose a risk of interfering with our autonomy by influencing our decision-making. Each situation should be evaluated individually to determine whether the advantages of these interventions exceed the disadvantages. Practitioners should weigh the seriousness of the health problems they are addressing as well as their ability to reduce potential effects when making these decisions. It proposes a starting point for conversations on the morality of targeted digital public health interventions
Karpathakis et al. (7)	London multidisciplinary project team user-centered qualitative research	A framework for evaluation that integrates biological and digital methods was intended to be operationalized as part of the Public Health England (PHE) effort. Shows how effective, affordable, and beneficial DHIs are for improving public health	Seven key ideas for evaluating DHIs have been identified: evaluation thinking, evaluation canvas, contract assistant, testing tools, development history, data hub, and publish health outcomes. The planned PHE evaluation service for public health DHIs was developed after additional testing and refinement of three concepts that were given priority	PHE was able to integrate the skills of academic and biomedical fields with the knowledge of non-academic and digital developers through the use of an iterative, user-centered design methodology. Using design-led techniques in public health settings can be beneficial. The following service is now offered by health organizations in the UK and is called evaluating digital health products
Sauerborn et al. (10)	Germany evaluation content and functions apps	Constructed on an awareness of structural, societal, and individual dimensions of violence against women and girls as a multidimensional, global public health concern, and positioning it within the theoretical framework of structural injustice	Make the case that while technical tools like apps may be helpful in the battle against violence against women and girls, they must be positioned within the larger context of public health that takes into account the structural aspects of such violence. Along with major considerations for safety, data privacy, the value of human supportive touch, and other issues, structural injustice concerns are significant features in the ethical evaluation of such apps	Research on the function and applicability of apps as tactics to deal with the structural and epistemic aspects of violence is still lacking

(Continued)

TABLE 1 (Continued)

Author	Setting/design	Aim	Study focus and findings	Recommendation
O'Connor et al. (64)	UK systematic review	In order to guide future implementation efforts, it is important to identify and integrate the qualitative research on the factors that influence recruitment and involvement in DHIs	Four major topics that influence the participation of patients and the general public in DHIs emerged: (1) Individual agency and motivation; (2) the individual's life and values; (3) the recruitment and engagement strategy; and (4) the DHI's level of quality. Outlines the recruitment and engagement techniques used. To highlight the crucial steps, a draft digital health engagement model (DIEGO) was created. Future research recommendations are created after identifying existing knowledge gaps	Summarizes and elucidates the complexities of the recruitment and participation processes in digital health, as well as the problems that must be resolved before patients and the general public commit to digital health. It will take more effort to develop personalized, higher-quality digital solutions that are clinically accredited and endorsed when necessary. Additionally, more money is required to boost computer literacy and make sure that technologies are available and cheap for individuals who want to subscribe to them
Holst et al. (65)	Norway mixed methods (nonrandomized controlled trial and qualitative interviews)	To evaluate the DHI's impact on rural communities' long-term acquisition and retention of health knowledge	(1) Compare the intervention group's knowledge ratings at baseline and immediately following the intervention. (2) The baseline knowledge score disparity between the intervention and control groups	Analyzing a DHI's results in light of pertinent health messages
Budd et al. (66)	United Kingdom review	To document the range of technological developments for the global public health response to COVID-19 and its shortcomings	To identify obstacles to its execution, such as those posed by the law, morality, and privacy concerns, as well as those posed by organizations and the workforce	Examine the necessity of coordinating global strategies for the control, assessment, and application of digital technology to improve pandemic readiness and future COVID-19 and other infectious disease preparedness
Morton et al.(41)	United Kingdom review	Offers a collection of iterative techniques for quickly modifying and improving an intervention as it is being implemented	The intervention was clinically correct thanks to tight collaboration with clinical stakeholders. Contributors to patient and public involvement (PPI) recognized critical clarifications to the intervention's content and made sure that data concerning challenging behaviors (such self-isolation) was encouraging and practical	According to calls for more expeditious, practical health research techniques, quick optimization techniques of this kind may be utilized in the future to enhance the speed and efficiency of adaption, refinement, and implementation of interventions
Ross et al. (67)	United Kingdom implemented intervention (HeLP-Diabetes)	Give an illustration of how to create a theoretically based implementation strategy and how to openly disclose it	For the purpose of integrating HeLP-Diabetes into everyday practice, a new implementation strategy was created. The normalization process theory served as a guide for the selection and development of specific component techniques. These tactics included involving local opinion leaders, distributing instructional materials, hosting educational visits and meetings, conducting audits, receiving feedback, and reminding people. Barriers that surfaced during deployment were iteratively addressed with additional solutions. Having trouble allocating funds to put the intervention into practice within ordinary treatment was a major barrier	Others who are working on planning and carrying out implementation activities in regular healthcare can benefit from the knowledge gained from this study. The choice of an acceptable theory to direct the process of implementation and the choice of tactics; making sure that adequate attention is paid to planned implementation and a flexible approach that permits responsiveness to developing hurdles

(Continued)

TABLE 1 (Continued)

Author	Setting/design	Aim	Study focus and findings	Recommendation
Bevens et al. (68)	Australia a practical overview	Aims to share information and thoughts from public health academics who have taken part in the process of digitally transforming a face-to-face lifestyle management training program	Information on the digital transformation of lifestyle education programs is scarce, and this is especially true for initiatives focused on chronic conditions. Higher education has produced a significant body of work that has experienced fast digital transition. Much can be learned from this area of study. Additionally, academics looking to design, develop, and implement DHIs have access to a well-established area of design approaches and frameworks	Gives a detailed explanation of how the processes of higher education's digital transformation can be combined with the use of a current development model for DHIs
Patel et al.(56)	USA cross-sectional analysis	It assessed the current healthcare system's ability to support digital health treatments and looked at the correlates of the system's epidemiological, socioeconomic, and geographic contexts	The availability of critical personnel was lower than the availability of IT infrastructure for all locations except subcenters. Higher blood pressure, body mass index, and urban residents were associated with better infrastructure for all hospitals except district hospitals	When compared to apex facilities in India, lower and mid-tier healthcare facilities more commonly lack the IT infrastructure needed to facilitate digital health initiatives. Physical infrastructure gaps were typically higher than staffing ones, indicating that, in addition to IT infrastructure, shortages of key personnel place serious restrictions on the adoption of digital health solutions
Schroeer et al. (58)	Germany a scoping review	Seeks to map the body of research on digital platforms that encourage community meeting in the field of health promotion and prevention	There were two studies on interaction with peers, five studies that used qualitative participatory research, one study on empowerment, and five studies that used crowdsourcing. The digital tools employed ranged greatly and included social networking sites, message boards, websites for online forums, and specialized web hosts and applications. The majority of research cited convenience, flexibility, and anonymity as advantages of digital interventions. Some articles noted drawbacks, such as issues with interpreting data that can only be read in writing or the potential for selection bias brought on by the digital divide	There is a study gap on this subject, as the review only found a few studies that were pertinent to our goal. It was discovered that digital formats are especially well suited for activities where confidentiality and adaptability are advantageous, like online peer-to-peer assistance programs
Harte et al. (46)	USA exploratory	Explains the purpose and plan of a trial that examines the combined impact of community health worker and digital health support on hemoglobin and glucose self-monitoring	The population of interest was low-income people, the study purpose was explicitly to advance knowledge beneficial for increasing health equity, and the study protocols were developed in partnership with frontline community health professionals	It enhances understanding of whether integrating community health worker interventions with digital health can enhance glucose self-monitoring and outcomes related to diabetes in a high-risk group

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TABLE 1 (Continued)

Author	Setting/design	Aim	Study focus and findings	Recommendation
Chen et al. (69)	China public surveys	Analyze the circumstances and important players in China's quick deployment of digital health solutions in response to COVID-19, and record and disseminate the lessons collected	The wide adoption of digital health technology revealed contextual elements and important enabling mechanisms in case studies that were identified under each category	The prosperous digital health expanse before COVID-19, the public sector's flexibility in introducing regulatory flexibilities, and incentives to energize the private sector are among the contextual factors and key permitting mechanisms through the practice of policy instruments to encourage DHIs for COVID-19 in China. These factors also include the route of policy advices affecting the private sector using a regionalized approach
Batta and Iwokwagh (70)	Nigeria inductive content analysis	It examines how Nigerian teaching hospitals make use of social media and new media. It examines whether new and social media are used as public relations tools (to increase their visibility, promote their services, and enhance their corporate image), educational tools (to provide health information, revelation, and education in order to prevent disease and promote health), and social tools (to facilitate communication between people) (to deepen interactions and exchanges between healthcare providers and healthcare recipients)	Nigerian teaching hospitals mostly use new and social media to solicit customer input (100%), provide their vision and mission statements (65%), post details about their administrative and staff structures (65%), and provide contract information (60%). For financial transactions (10%) and the promotion of health (25%), these media are seldom ever used	Teaching hospitals should make more use of social media and new media to give patients and family members a platform to share their stories and to give informed advice on medical and health issues

focus on commercial corporations to adopt cutting-edge technologies (62), advance information and health literacy (63), framework for evaluation that integrates biological and digital methods (7), multidimensional, global public based on an awareness of structural, societal, and individual extents of violence against women and girls (10), factors that influence recruitment and involvement in DHIs (64), DHI's impact on rural communities' (66), range of technological developments for the global public health (65), collection of iterative techniques (41), theoretically based implementation strategy (67), share information and thoughts from public health academics, healthcare system's ability to support digital health treatments (68), encourage community engagement (56), digital health support on hemoglobin (46), circumstances and important players in China's quick deployment of digital health solutions (69) and teaching hospitals that make use of social media (70).

Discussion

This scoping review only discovered uncommon studies that used a digital platform to empower substantial community involvement in health promotion and prevention, highlighting a research gap in this area. Digital formats were discovered to be appropriate for situations where obscurity is advantageous. This was evident in the included studies' qualitative participatory research investigations, notably in the virtual focus groups where contributors had to discuss difficult topics. Additionally, it indicated that anonymity and ease of access were helpful in assisting marginalized and disadvantaged communities, such as through interaction with peers and social exchange programs (58).

With the help of this scoping study, we were able to map the body of research on digital platforms that encourage community involvement in the field of health promotion and prevention. In addition, we obtained a deeper awareness of the fundamental ideas in this field in terms of the sorts of involvement that can be facilitated, the ways to use digital forms, and the advantages and drawbacks associated with them (58).

DHIs are provided through digital channels, such as websites and mobile applications, with the goal of providing care or promoting health (5). Such DHIs are anticipated to combine the effectiveness of individualized therapies with the influence of large-scale population campaigns. DHIs are also meant to expand access and capacity for

public health efforts by offering services in places where face-to-face choices are absent or inadequate to satisfy demand (7).

However, it is also important to analyze how institutional inequality, particularly epistemic injustice, affects the content and purposes of the DHIs utilized in public health treatments. They outline and emphasize the significance of violence against women and girls as a global public health concern and briefly evaluate its multifaceted character on structural, societal, and personal levels (10). According to the author, technical solutions like DHIs may be a useful tool in the battle against violence against women or gender inequality, but they must be placed within the larger context of public health that recognizes and the structural components of such fierceness.

The vast amounts of personal information gathered are highly illuminating, and the means for using that information to target digital communications are strong and easily accessible. It is simple to comprehend why academics and professionals in public health are keen to investigate the potential good they may do with them. Such technologies run the risk of discriminatory message targeting against disadvantaged groups. Targeted digital public health interventions pose a risk of interfering with our autonomy by influencing our decision-making. Each situation should be evaluated individually to determine whether the advantages of these interventions exceed the disadvantages. Practitioners should weigh the seriousness of the health risks they are targeting (e.g., promoting a healthy diet as opposed to intervening in suicide cases or eradicating health misinformation during a pandemic) as well as their ability to lessen probable harms (e.g., whether messaging can be clear and collected data respect entities' privacy) (63).

Collecting the quantitative and qualitative results will produce a strong set of data that can be used to adapt the intervention's execution with access to the digital health platform as well as to evaluate the DHI. The study illustrates a participatory and community-based component that has the opportunity to have an improved, context-specific influence on local communities' digital health education by leveraging upon conclusions from both research techniques to enhance the intervention (65).

In addition to a list of the hurdles and implementors that patients and the general public encounter while appealing with and enrolling in DHIs, this review gives an overview of reported engagement and recruitment tactics. In line with the findings of our review, literacy abilities (72) and financial resources (73) do have an impact on people's capacity to interact with and use DHIs.

Digital technologies must be integrated into the current public healthcare systems since they cannot function alone (74). For instance, as one of many approaches, South Korea and Singapore effectively implemented contact-tracing DHIs to support massive teams of manual contact tracers (66). The digital infrastructure and public health systems' readiness, which include secondary, primary, and social care systems, will be key factors in the analysis and utilization of these data. With multiple symptom-reporting sites in a single nation, coordination of therapies is especially difficult and runs the danger of fragmentation (66).

The intervention, however, was clinically correct since tight collaboration with clinical stakeholders guaranteed that the information concerning transmission and exposure was compatible with the available data, for instance. Contributors to patient and public involvement (PPI) identified crucial justifications to the intervention's content, such as whether epidemics can spread through the air as well

as surfaces and made sure that evidence about challenging behaviors (like self-isolation) was encouraging and practical (41).

Furthermore, the author has created knowledge about some of the enablers and barriers to putting DHIs into reality. In a system with limited resources, we discovered that requiring personnel to assist patients in registering to use a DHI was a barrier (67). A live intervention's effectiveness was improved quickly and iteratively to keep pace with the terrifying and continuously changing environment of an international crisis. A rich approach for swift stakeholder assignation was crucial for apprising decisions about how to discourse these obstacles, and the variety of methods assisted in developing a thorough grasp of the potential hurdles to the target behaviors (41).

Conclusion

Understanding the variables connected to digital interventions for public health begins with this scoping review of the literature. The review has given ideas about the factors that contribute to success and insight into some of the techniques used to identify high achievers, but it has also highlighted the need for new approaches to understanding what counts as high impact and how to enhance elements that are crucial to population health. As, the public health is likely to become more and more digital in the future, the author examines the requirement for the synchronization of global approaches for the regulation, assessment and use of digital technologies in order to improve population health supervision and imminent alertness for diseases.

The author contends that elements that go beyond the inter-individual level must be considered for any intervention technique to be successful and long-lasting. There is little research on the function and importance of DHIs as tactics for addressing the structural and epistemological components. The participants and those around them will gain more awareness about health issues by receiving health messages in a digital format, which may change how they seek out health care. More work is required to develop effective engagement tactics, significantly greater, individualized digital solutions, and to obtain clinical accreditation and support where necessary.

The choice of an appropriate theory to direct the course of implementation and strategy selection is essential. The reporting of implementation strategies using terms that are clear and defined, and using a flexible approach are all important considerations. In addition, physical infrastructure gaps were typically indicating that beyond information technology infrastructure, shortages of indispensable staff enforce significant barriers to the adoption of DHIs.

To sum up, the author's work outlines an iterative, cross-disciplinary, participatory progression for creating, implementing, and appraising DHI, emphasizing the adjacent collaboration between behavior scientists, designers, data engineers, software developers, and data scientists as well as on a constant reaction circle from end users. A defined approach for swift stakeholder involvement was crucial for guiding decisions about how to discourse these obstacles, and the variety of ways contributed to the development of a deep consideration of the potential barriers to the target behaviors. Making sure the intervention's content is inspiring, reliable, and convincing may be more crucial for fostering engagement than making changes to the intervention's design (66).

DHI offers a viewpoint that emphasizes a considerable larger series of issues related to the sociotechnical system involved by a specific digital health technology and the health of the numerous communities. This study could be used in other areas of public health policy and practice and will attend as a source for enduring discussion in this area.

Author contributions

HA held the main parts of the research, writing, collecting the data, and results and discussion. AA helped HA in reviewing the paper and gave notes. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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