

The Use of Mobile Applications in Health Promotion and Disease Prevention

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Abstract

Thesis. Mobile health applications can support the prevention of noncommunicable diseases by facilitating self-monitoring, encouraging healthier behaviours, and extending preventive support beyond conventional healthcare settings; however, their public health value depends on sustained engagement, reliable evidence, data protection, and equitable access.

Concept. This narrative review synthesizes peer-reviewed studies and reports concerning mobile applications used to address major modifiable risk factors for noncommunicable diseases. It considers applications supporting physical activity, nutrition and weight management, and the monitoring of physiological parameters, while examining their functions, documented benefits, and implementation challenges.

Results and conclusion. The reviewed evidence indicates that mHealth applications can improve physical activity, dietary behaviours, weight management, and selected physiological outcomes, particularly when they incorporate goal setting, personalized feedback, reminders, gamification, and integration with wearable devices. Nevertheless, effects vary across interventions and populations, and long-term adherence frequently declines. Concerns

regarding measurement accuracy, limited clinical validation, privacy and security, unequal digital access, and the geographical concentration of the evidence restrict broader implementation and generalizability. Mobile applications should therefore complement rather than replace professionally delivered prevention and should be integrated into public health systems using evidence-based, interoperable, secure, and user-centred approaches.

Originality. The article provides an integrated public health perspective that connects the preventive functions of mHealth applications with the behavioural, technological, ethical, and equity-related conditions required for their responsible use in noncommunicable disease prevention.

Keywords: mHealth, mobile health applications, noncommunicable diseases, disease prevention, health promotion, digital health, lifestyle interventions

Introduction

Noncommunicable diseases (NCDs) such as cardiovascular diseases, diabetes, obesity, and mental health disorders continue to represent a major global public health challenge. The number of adults with hypertension increased from approximately 650 million in 1990 to 1.4 billion in 2024 (World Health Organization, 2025a), while the number of people living with diabetes rose from approximately 200 million in 1990 to 830 million in 2022 (World Health Organization, 2024). NCDs remain the leading cause of death worldwide, accounting for approximately 74% of all deaths globally (World Health Organization, 2025b). Many of these conditions are strongly linked to modifiable lifestyle behaviours, including physical inactivity, poor diet, inadequate sleep, consumption of tobacco and alcohol, and chronic stress. Consequently, effective strategies for health promotion and disease prevention are increasingly recognized as essential components of global public health, as they offer a proactive means of mitigating the rising prevalence of NCDs, reducing long-term healthcare expenses, and strengthening the capacity of health systems to manage expanding chronic disease burdens. In parallel, the rapid digitalization of society and the proliferation of smartphones have created new opportunities for delivering accessible, scalable, and personalized preventive interventions. Mobile health (mHealth) applications—defined as health-related tools operating on mobile devices—have emerged as one of the most rapidly expanding areas of digital health innovation (Klasnja & Pratt, 2012).

Health and fitness applications are now widely available across major mobile platforms, with users increasingly relying on them for monitoring physical activity, tracking diet, assessing mental well-being, and managing chronic health conditions. The integration of sensors, such as accelerometers, heart rate monitors, and GPS modules, allows these applications to collect detailed, real-time biometric and behavioural data (Piwek et al., 2016). This capability has positioned mHealth apps as valuable instruments for self-management and preventive behaviour change, enabling individuals to better understand their health status and adopt healthier habits. Evidence suggests that app-based interventions can support physical activity (Bort-Roig et al., 2014; Direito et al., 2017), dietary behaviours (Carter et al., 2013), weight-

management efforts (Chandrasekaran et al., 2020), and the self-management of chronic conditions such as diabetes and hypertension (Hou et al., 2018).

The aim of this article is to analyse the role, effectiveness, and limitations of mobile health applications in the prevention of noncommunicable diseases, with particular emphasis on their use in promoting physical activity, supporting healthy dietary behaviours, and monitoring key health parameters associated with chronic illness risk. Additionally, the article evaluates the mechanisms through which these applications influence behaviour, reviews evidence from current research, and examines the challenges that must be addressed to ensure their safe, effective, and equitable integration into preventive healthcare strategies.

Methodology

This article was developed as a narrative literature review aimed at synthesizing current knowledge on the use of mobile health applications in the prevention of noncommunicable diseases. The methodological approach consisted of the following components.

Scope and Research Focus

The review focused on four major thematic areas: (1) the impact of mobile technology development on public health; (2) key categories of preventive mHealth applications; (3) evidence-based outcomes associated with mHealth use in NCD prevention; and (4) technological, ethical, and practical limitations of current solutions. The guiding research questions addressed the effectiveness, capabilities, and limitations of mHealth applications in the context of disease prevention.

For the purposes of this review, preventive mHealth applications were defined as mobile applications designed to support the modification or monitoring of behavioural and physiological risk factors associated with NCDs. These included applications promoting physical activity, healthy dietary behaviours, and weight management, as well as applications supporting the monitoring of established cardiovascular and metabolic risk factors, such as elevated blood pressure and blood glucose. Applications supporting individuals with established NCDs were considered only where their functions were relevant to secondary prevention, risk-factor control, or the prevention of disease-related complications. Applications designed primarily for athletic performance, reproductive health, or clinical treatment without a clear NCD-prevention component were considered outside the scope of the review.

Literature Search Strategy

The analysis was based on scientific publications and health reports referenced within the article content. These included peer-reviewed original studies (randomized controlled trials, cohort studies, and cross-sectional studies), systematic reviews and meta-analyses, as well as technological and epidemiological reports related to digital health and chronic disease prevention.

Structured literature searches were conducted using PubMed and ScienceDirect to identify relevant publications. In addition, targeted searches were performed to identify recent systematic reviews and meta-analyses published in leading digital health journals, particularly

the *Journal of Medical Internet Research* and *JMIR mHealth and uHealth*. Sources published between 2012 and 2025 were considered. The final narrative synthesis included publications that met the thematic scope and inclusion criteria of the review, with particular emphasis on systematic reviews, meta-analyses, randomized controlled trials, and studies directly relevant to NCD prevention.

The following keywords were used in various combinations: digital health, mHealth, eHealth, mobile health applications, health apps, health promotion, disease prevention, noncommunicable diseases, NCD prevention, physical activity, diet, weight management, obesity, diabetes, hypertension, and cardiovascular risk.

Inclusion and Exclusion Criteria

Included sources were studies evaluating mobile applications relevant to NCD prevention; interventions targeting modifiable NCD risk factors, including physical inactivity, unhealthy diet, excess body weight, elevated blood pressure, and abnormal glucose control; applications supporting health behaviour change and preventive self-monitoring; and studies addressing secondary prevention or the prevention of complications in individuals with established NCDs.

Excluded sources were studies focused solely on telemedicine without a mobile application component; applications designed primarily for athletic performance or sports training without a clear health-promotion or NCD-prevention objective; reproductive health applications without an explicit relationship to NCD risk or prevention; clinical applications focused solely on diagnosis or treatment without a preventive or self-management component; and non-scientific or low-quality sources.

Analysis and Thematic Categorization

The collected literature underwent qualitative content analysis involving the identification of major categories of mHealth applications, the assessment of their effectiveness in promoting healthy behaviours, and the extraction of recurring benefits and limitations across studies. Findings were organized thematically to align with the structure of the article.

Synthesis of Findings

The final stage included synthesizing key themes into a cohesive narrative covering trends in mobile technology adoption; documented health benefits supported by empirical evidence; existing challenges in design, validation, privacy, and user adherence; and areas for future research and recommendations for public health practice.

Mobile Technology Development and Its Influence on Public Health

Mobile technology has become increasingly widespread worldwide, including in many low- and middle-income settings, creating new opportunities for delivering health information and preventive interventions at scale and facilitating the rapid development and uptake of mHealth applications (Brown et al., 2013; Galetsi et al., 2023). This proliferation has made mobile technology a critical instrument for accessing health services and information, and for facilitating individual health behaviours (Brown et al., 2013; Kaya et al., 2025). Mobile health technologies are increasingly used to promote healthy lifestyles and influence health behaviours.

Mobile fitness and digital health apps have been shown to facilitate the formation and maintenance of healthy lifestyles, including increased physical activity and improved dietary habits (Gür et al., 2020; Huang et al., 2022; Sepehri et al., 2025). These apps are recognized as effective tools for health promotion by providing accessible and inclusive means to encourage physical activity and health (Sepehri et al., 2025; Sousa Basto & Ferreira, 2025). Studies have reported associations between the use of fitness applications and higher levels of physical activity, while app-supported exercise interventions have also been associated with improvements in selected health outcomes (Gür et al., 2020; Pradal-Cano et al., 2020).

One of the advantages of mHealth applications lies in their ability to incorporate behavioural change techniques. Gamification elements (e.g., rewards, challenges, badges), personalized feedback, reminders, goal setting, and social support networks have been shown to increase user engagement and enhance the adoption of healthier daily routines (Edwards et al., 2016). Many leading mHealth applications incorporate social networking features, which play a significant role in reinforcing engagement. Social components—such as activity sharing, leaderboards, competitive challenges, and peer support—facilitate a sense of community and accountability. According to Kao and Liebovitz (2017), a substantial proportion of high-performing mobile health applications employ social networking mechanisms to enhance user motivation and encourage behavioural adherence. By fostering interaction and comparison with peers, these features can increase commitment to physical activity and promote higher levels of app use over time.

Mobile fitness applications increasingly integrate with wearable health-tracking devices, enabling comprehensive monitoring of users' physical activity and lifestyle behaviours. Several core features have been identified as particularly influential in shaping user engagement and promoting sustained utilization of these technologies. A foundational component of most fitness applications is self-monitoring and progress tracking, which allows users to observe their daily physical activity, nutritional intake, and advancement towards predefined health goals. These functionalities have been shown to be among the most effective mechanisms for maintaining user engagement, as they enhance awareness, accountability, and motivation for ongoing behaviour change (Hu et al., 2023; Kao & Liebovitz, 2017). Through regular self-assessment, users are better equipped to identify patterns, adjust behaviours, and make informed decisions regarding their health routines. Another feature supporting user adherence is automated data collection. By leveraging a range of embedded device sensors—such as accelerometers, GPS modules, and heart rate monitors—mobile fitness apps can automatically track diverse health metrics, including step count, distance travelled, caloric expenditure, and heart rate variability. This automation reduces the burden on users to manually record their activities, thereby improving data accuracy and minimizing friction in everyday use. The seamless flow of data from wearable devices into app interfaces also enables timely feedback and trend visualization, which further contributes to user motivation and long-term participation.

The main categories, functions, representative examples, and NCD-related preventive outcomes of the mHealth applications discussed in this review are summarized in Table 1.

Table 1*Main Categories and Functions of mHealth Applications Supporting NCD Prevention*

Category	Main functions	Illustrative examples	Relevance to NCD prevention
Physical activity	Step counting, exercise tracking, activity reminders, goal setting, challenges	Fitbit, Google Fit, Apple Health	Increased physical activity, improved cardiovascular fitness, and reduced sedentary behaviour and associated cardiovascular and metabolic risk
Nutrition and weight management	Food diary, calorie counting, meal planning, weight monitoring	MyFitnessPal, Lifesum, Yazio, Fitatu, Lose It	Improved diet quality and weight control; support for the prevention of obesity, type 2 diabetes, and cardiovascular disease
Physiological monitoring	Blood pressure, glucose, heart rate, and body weight monitoring	Omron Connect, mySugr, Withings Health Mate	Improved monitoring and control of hypertension- and diabetes-related risk factors and increased awareness of abnormal health parameters
Behaviour change support	Goal setting, reminders, gamification, personalized feedback, social support	Fabulous, Habitica, Noom	Improved adherence to health-promoting behaviours and sustained modification of behavioural NCD risk factors

Note. NCD = noncommunicable disease. Product names are given as illustrative examples of functional categories and do not constitute endorsements.

Categories of Mobile Applications Supporting Health Prevention

Mobile health (mHealth) applications designed for preventive purposes encompass a wide range of functionalities that address key behavioural and physiological determinants of noncommunicable diseases. These applications differ in their scope, technological complexity, and integration with external devices, yet all aim to support users in adopting and maintaining health-promoting behaviours. The following subsections present the major categories of preventive mHealth applications, along with representative examples and their relevance to public health.

Physical Activity and Fitness Tracking Applications

Physical activity tracking apps constitute one of the largest and most frequently used groups of mHealth tools. They enable users to monitor daily activity levels, including step count, energy expenditure, distance travelled, and exercise duration. Many of these apps integrate with wearable devices (e.g., Fitbit, Garmin, Apple Watch) that automatically capture physiological and movement data through embedded sensors such as accelerometers and heart rate monitors.

Consumer applications and wearable ecosystems such as Fitbit and Apple Health offer activity tracking, personalized goals, real-time feedback, and motivational mechanisms such as challenges and achievement badges. In a systematic review, Pradal-Cano et al. (2020) found that most evaluated mobile app interventions produced improvements in physical activity and health-related behaviours, supporting their potential as scalable tools for promoting active lifestyles.

Nutrition and Weight Management Applications

Nutrition-focused applications play an essential role in preventing obesity and metabolic diseases by helping users track dietary intake, calculate caloric balance, and monitor macronutrient distribution. Popular apps such as MyFitnessPal, Lifesum, and Yazio include food databases, barcode scanners, and automated nutrient calculators to support accurate documentation of dietary behaviours.

Many of these apps provide personalized dietary recommendations, meal planning tools, and progress visualizations, which facilitate self-monitoring and encourage healthier eating patterns. Evidence suggests that digital interventions can support healthier dietary behaviours and nutrition-related knowledge, although effects on anthropometric outcomes such as body weight are less consistent. A recent systematic review of randomized controlled trials in children and adolescents found positive effects for at least one outcome in approximately two-thirds of the included studies, with the strongest evidence relating to dietary behaviours and nutrition knowledge rather than anthropometric outcomes (Talens et al., 2025). However, evidence regarding clinically meaningful weight reduction remains uncertain. A Cochrane review of smartphone-based interventions for adolescents and adults with overweight or obesity found limited evidence of meaningful changes in BMI and emphasized the need for higher-quality and longer-term studies (Metzendorf et al., 2024).

Applications for Monitoring Physiological Health Parameters

A growing number of mHealth applications enable the continuous or periodic monitoring of physiological metrics associated with chronic disease risk. When paired with medical devices such as glucometers, blood pressure monitors, or digital scales, these apps allow for more comprehensive tracking of indicators relevant to cardiovascular and metabolic health.

Examples include mySugr for glucose and diabetes-related self-monitoring and Omron Connect for blood pressure monitoring. By providing real-time data, visual analytics, and personalized alerts, these tools can support risk-factor control, early identification of abnormal patterns, adherence to preventive recommendations, and users' understanding of their cardiovascular and metabolic health status. Evidence is particularly promising for blood pressure self-monitoring. In a systematic review and meta-analysis, Kassavou et al. (2022) found that smartphone app-based self-monitoring of hypertension-related behaviours was associated with reductions in blood pressure, particularly when applications incorporated behavioural support alongside monitoring functions.

Evidence-Based Benefits of Mobile Health Applications

Evidence from systematic reviews and intervention studies suggests that mHealth applications can support preventive health behaviours, self-monitoring, and selected health outcomes, although effectiveness varies across intervention types and populations. Evidence is most consistent for selected cardiovascular and metabolic outcomes. In hypertension, smartphone-based self-monitoring interventions have demonstrated modest but measurable reductions in blood pressure, although the magnitude of benefit varies according to intervention design and accompanying behavioural support (Kassavou et al., 2022). Recent systematic evidence

indicates that the effectiveness of mHealth interventions depends not only on their technological functionality but also on sustained user engagement, intervention design, personalization, and integration of behavioural change strategies (Jakob et al., 2022).

Beyond measurable health outcomes, mHealth interventions may support patient engagement and self-management by enabling health monitoring, tailored feedback, education, and communication with healthcare providers. However, these benefits vary substantially according to intervention design, target population, and level of user engagement.

Mobile health apps are accessible, convenient, and customizable, which may facilitate the delivery of preventive interventions across geographically dispersed populations and support individuals who face barriers to regular access to preventive healthcare. Design considerations such as larger text, instant feedback, and evidence-based content are important for older users, improving usability and access to healthcare services (Hall et al., 2021; Khamaj & Ali, 2024).

Limitations and Challenges

Despite their substantial potential, mHealth applications face several limitations that constrain their effectiveness and broader integration into preventive healthcare. A primary concern relates to data accuracy. Consumer-grade sensors—such as step counters, heart rate monitors, and GPS modules—vary widely in precision, often producing inconsistent or unreliable measurements depending on device type, physical environment, or user behaviour (Evenson et al., 2015). This variability can undermine the validity of health recommendations generated by the apps.

Another limitation is the lack of standardized clinical validation. Many commercial health and fitness applications are released without rigorous testing, and only a small percentage adhere to evidence-based guidelines for physical activity, diet, or chronic disease prevention (Paganini et al., 2021). As a result, users may receive inaccurate or inappropriate advice, which limits the clinical credibility of such tools. This concern is also evident in cardiovascular prevention. In a systematic review of mobile applications for cardiovascular risk assessment, Chavez-Ecos et al. (2024) identified 18 applications, but only a minority achieved high scores for quality and functionality, highlighting a gap between the availability of digital risk-assessment tools and their suitability for clinical use.

Privacy and security concerns constitute additional barriers to adoption. mHealth applications commonly collect sensitive personal and biometric data, yet many lack transparent privacy policies, strong encryption standards, or safeguards against third-party data sharing (Papageorgiou et al., 2018). These issues are particularly significant in low- and middle-income countries, where legal protections and regulatory frameworks may be less developed.

Sustained user engagement also remains a challenge. Although apps can generate short-term increases in activity levels, adherence often declines over time, with many users discontinuing use within weeks or months (Baumel et al., 2019). Factors such as notification fatigue, limited personalization, or cumbersome interfaces contribute to disengagement. A systematic review specifically addressing adherence to mHealth applications for NCD prevention and management similarly identified engagement as a multidimensional challenge

influenced by app usability, personalization, perceived usefulness, social factors, and the characteristics of the target population (Jakob et al., 2022).

Finally, digital divides—related to age, socioeconomic status, rurality, and technological literacy—may limit equitable access to mHealth tools, potentially widening health disparities rather than reducing them (Brown et al., 2013; Kaya et al., 2025).

The geographical distribution of the evidence base should also be considered when interpreting current findings. Although mHealth research has historically been dominated by the United States, the United Kingdom, Australia, and other high-income countries, research output from China has increased rapidly in recent years. This geographical heterogeneity should be considered when generalizing findings across populations with different healthcare systems, digital infrastructures, and patterns of technology use (Alanzi et al., 2024; Cao et al., 2021). Collectively, these challenges highlight the need for regulatory oversight, improved clinical validation, stronger privacy protections, and user-centred design to ensure that mHealth applications fulfil their potential as effective, safe, and equitable tools for NCD prevention.

Several limitations of this review should also be acknowledged. As a narrative rather than systematic review, it was intended to provide a broad synthesis of the current evidence and does not constitute an exhaustive assessment of all available mHealth applications or studies. The rapid evolution of the commercial mHealth market also means that individual applications, their functionalities, and their availability may change over time. Furthermore, the evidence base is heterogeneous with respect to study populations, intervention duration, outcome measures, and the degree of clinical validation of the applications evaluated. Consequently, the representative applications discussed in this review should be interpreted as examples of broader functional categories rather than as endorsements of individual commercial products.

Conclusion

Mobile health (mHealth) applications represent a rapidly expanding and increasingly influential component of contemporary public health, offering new opportunities to support the prevention of noncommunicable diseases (NCDs). The evidence reviewed in this article suggests that these tools can support healthier lifestyle behaviours, including increased physical activity, improved dietary habits, and enhanced monitoring of key physiological parameters associated with chronic disease risk. Their accessibility, scalability, and capacity for personalization make them particularly valuable in addressing the growing burden of chronic diseases and supporting sustained preventive behaviours, risk-factor monitoring, and long-term self-management aimed at reducing NCD-related complications.

Importantly, mHealth applications also have the potential to become embedded in users' everyday lives, supporting continuous self-monitoring of health behaviours and relevant physiological parameters between interactions with healthcare services. Where appropriately validated and integrated with healthcare systems, patient-generated data may also complement traditional approaches to preventive monitoring.

Despite these benefits, several limitations hinder the full realization of mHealth applications' preventive potential. Issues related to data accuracy, inconsistent clinical validation, privacy risks, and declining long-term user adherence remain significant challenges.

Additionally, digital inequalities and varying levels of technological literacy contribute to uneven access and may exacerbate existing health disparities. These concerns underscore the need for stronger regulatory frameworks, standardized quality assessments, enhanced data protection mechanisms, and user-centred design approaches that account for diverse populations.

Overall, while mHealth applications hold considerable promise as tools for motivating health-promoting behaviours and supporting early prevention strategies, their effective integration into public health systems requires further research, technological refinement, and coordinated policy action. Addressing the identified challenges will be essential to ensuring that mHealth solutions evolve into reliable, safe, and equitable components of preventive healthcare in the years ahead.

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