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Review Article

Emerging digital health approaches for the detection of undiagnosed type 2 diabetes mellitus in underserved populations: A scoping review

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ABSTRACT

Background & Aim: Undiagnosed type 2 diabetes mellitus continues to pose a major global health challenge, especially in underserved populations facing limited access to screening. Digital health technologies present scalable alternatives to improve early detection and prevent complications. This scoping review aims to map digital health approaches for detecting undiagnosed type 2 diabetes mellitus in underserved adult communities and analyze screening outcomes, feasibility, and key implementation factors.
Materials & Methods: The review followed the Arksey and O'Malley scoping framework and was reported using PRISMA-ScR guidelines. Systematic searches were performed in PubMed/MEDLINE, Scopus, Web of Science, and CINAHL for studies published in English from 2015 onward. Two reviewers independently screened articles, with conflicts resolved through consensus. Data were synthesized narratively to identify digital modalities, screening strategies, effectiveness indicators, and enablers or barriers.
Results: Nineteen studies were included, identifying five categories of digital interventions. Electronic health record–driven screening was reported in 5 of 19 studiesand was the most frequently reported modality, alongside mHealth applications, SMS-based detection support, telehealth platforms, and wearable tools. Digital risk-based screening integrated within community or primary care pathways demonstrated the widest reach and highest identification of undiagnosed dysglycemia. Simpler digital solutions showed greater acceptability and feasibility than complex systems, particularly in settings with limited digital literacy or connectivity.
Conclusion: Digital health technologies show strong potential to expand early detection of undiagnosed type 2 diabetes mellitus in underserved populations. System-integrated, low-burden, and equity-centered screening models are most promising. Strengthening linkage to care and improving digital accessibility remainpriorities for future research.

Introduction

Type 2 diabetes mellitus (T2DM) represents one of the most significant global public health challenges of the 21st century. According to the International Diabetes Federation, approximately 537 million adults worldwide were living with diabetes in 2021, with nearly half of these cases remaining undiagnosed, particularly in low- and middle-income countries (1). Undiagnosed T2DM substantially increases the risk of long-term complications, including cardiovascular disease, nephropathy, neuropathy, and premature mortality, thereby contributing to a substantial global health and economic burden (2,3,4). Early identification of individuals with undiagnosed diabetes is therefore critical for preventing disease progression and reducing long-term complications.

Conventional approaches for detecting T2DM primarily rely on facility-based screening methods such as fasting plasma glucose, oral glucose tolerance tests, and glycated hemoglobin (HbA1c) measurements (5). While clinically effective, these strategies often fail to reach underserved populations due to barriers such as limited access to healthcare

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services, financial constraints, geographic isolation, and low health literacy (6,7). As a result, many individuals remain undiagnosed until advanced disease stages, limiting the effectiveness of preventive interventions (8).

In recent years, digital health technologies have emerged as scalable and accessible tools to support disease detection. Digital health encompasses a broad range of technologies, including mobile health (mHealth) applications, electronic health records, wearable devices, telemedicine platforms, and algorithm-driven decision support systems (9,10). These innovations facilitate remote risk assessment and early identification of individuals at high risk for T2DM, particularly in populations facing barriers to healthcare access (11,12). Importantly, digital health tools are intended to support screening and risk identification rather than replace formal diagnostic confirmation.

Growing evidence suggests that digital health interventions can enhance early detection of T2DM by improving screening coverage, supporting personalized risk stratification, and increasing patient engagement in preventive care (13,14,15). Digital tools such as mobile applications, electronic risk calculators, and remote monitoring systems have demonstrated potential in identifying individuals with undiagnosed hyperglycemia, especially in underserved populations including low-income communities, ethnic minorities, and rural residents (16,17,18). However, despite this growing body of research, existing evidence remains fragmented, with substantial heterogeneity in study designs, digital platforms, target populations, and outcome measures.

Moreover, many digital health initiatives have primarily focused on diabetes management rather than early detection, leaving critical gaps in understanding the effectiveness of these technologies for identifying undiagnosed T2DM. Challenges related to digital literacy, technology access, data privacy, and long-term sustainability further complicate the implementation of digital screening strategies in real-world settings (19,20,21). Given these gaps, a comprehensive synthesis of existing evidence is needed to clarify how digital health approaches are being utilized to detect undiagnosed T2DM, particularly among underserved populations. Therefore, this scoping review aims to systematically map and analyze the available literature on digital health interventions used for the detection of undiagnosed type 2 diabetes mellitus. By identifying the types of technologies employed, target populations, screening strategies, and reported outcomes, this review seeks to inform future research, guide policy development, and support the design of equitable and effective digital health solutions for early diabetes detection.

Methods

Study design

This study employed a scoping review methodology to systematically map existing evidence on digital health approaches used for the detection of undiagnosed type 2 diabetes mellitus (T2DM). The review followed the methodological framework originally proposed by (22) and further refined by (23) to enhance methodological rigor and transparency. Reporting of this review was guided by the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)* checklist (24). A review protocol was developed a priori and is available upon request.

Literature search strategy

A comprehensive literature search was conducted to identify relevant studies examining digital health approaches for the detection of undiagnosed T2DM. An initial exploratory search was undertaken to identify key concepts and terminology, followed by the development of a structured search strategy using a combination of controlled vocabulary (e.g., MeSH terms) and free-text keywords.

The final search strategy was applied across the following electronic databases: PubMed/MEDLINE, Scopus, Web of Science,

and CINAHL. Search terms included combinations of *"type 2 diabetes," "prediabetes," "digital health," "mobile health," "telemedicine," "screening," "early detection,"* and related synonyms. Boolean operators (AND/OR) and truncation were used to enhance sensitivity. In addition, reference lists of included articles and relevant reviews were manually screened to identify further eligible studies. When full texts were not accessible, attempts were made to contact corresponding authors.

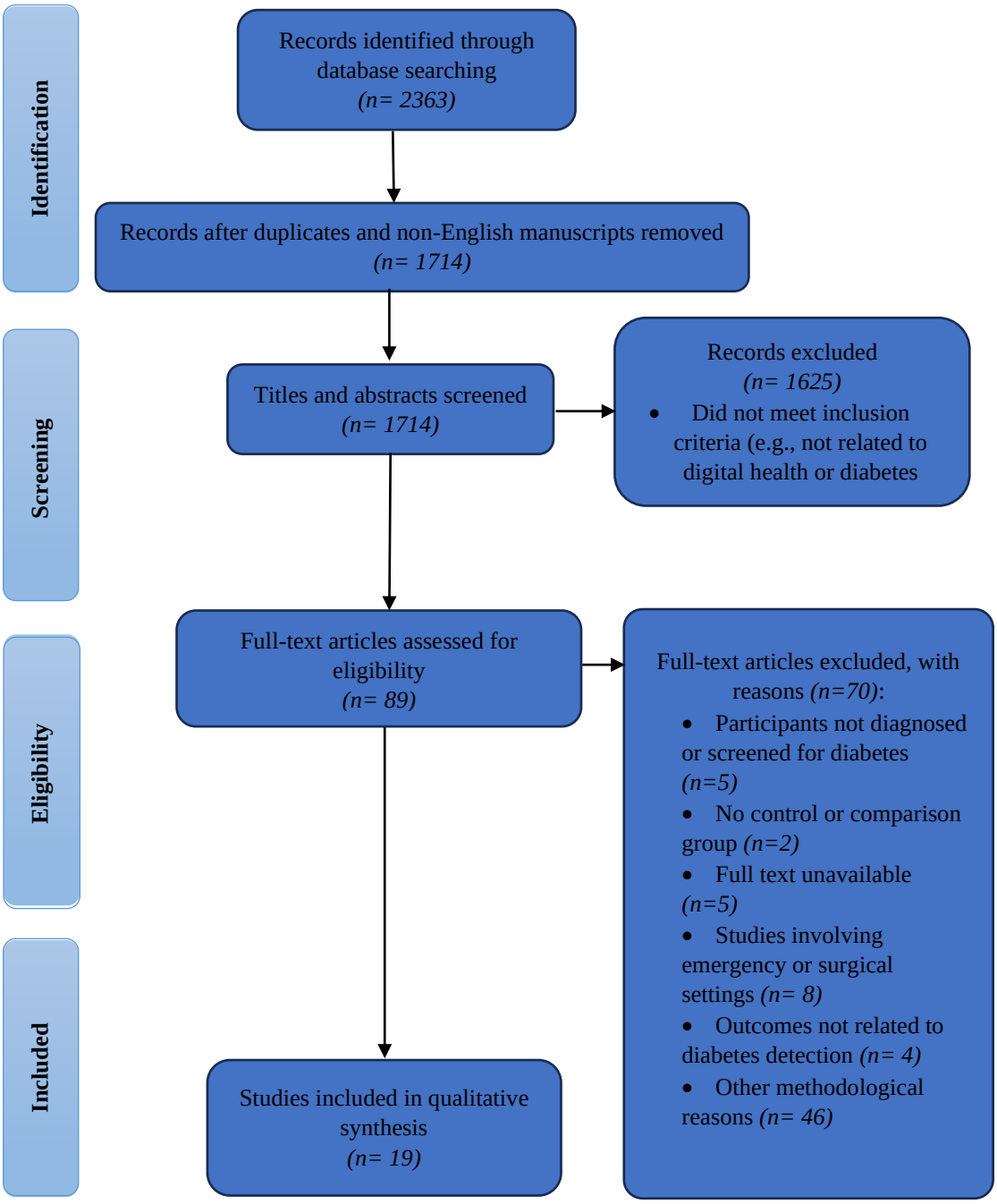

Figure 1. PRISMA flow diagram of study selection process

Eligibility criteria

Eligibility criteria were defined using the Population–Concept–Context (PCC) framework recommended for scoping reviews (Peters et al., 2020).

- Population: Adults (≥18 years) from underserved or vulnerable populations, including individuals from low- and middle-income settings, ethnic minorities, rural communities, or populations with limited access to healthcare.
- Concept: Digital health interventions aimed at the *detection or identification* of undiagnosed type 2 diabetes mellitus, including mobile health applications, telehealth platforms, electronic health records, wearable technologies, and digital screening tools.
- Context: Community-based, primary care, or population-level settings in which digital tools were used for early detection rather than disease management.
- Types of evidence: Quantitative, qualitative, and mixed-methods studies were included. Reviews, editorials, conference abstracts, and non–peer-reviewed articles were excluded.
- Language and timeframe: Only articles published in English from 2015 onward were included to reflect contemporary digital health developments.

Study selection

All retrieved records were imported into reference management software, and duplicate entries were removed prior to screening. Two reviewers independently sc reened the titles and abstracts to assess eligibility based on the predefined inclusion and exclusion criteria. Full-text articles of potentially relevant studies were subsequently retrieved and evaluated for final inclusion. Any discrepancies between reviewers were resolved through discussion, and when consensus could not be reached, a third reviewer was consulted. The overall study selection process, including identification, screening, eligibility assessment, and final inclusion of studies, is summarized in the PRISMA flow diagram (Figure 1).

Data extraction

A standardized data extraction form was developed and pilot-tested prior to full extraction. Extracted variables included: author and year of publication, country, study design, population characteristics, type of digital health intervention, screening or detection method, outcomes related to diabetes identification, and reported barriers or facilitators. Data extraction was independently performed by two reviewers, with discrepancies resolved through consensus. Data from included studies were systematically charted using a predefined synthesis grid capturing study characteristics, target populations, digital health modalities, screening strategies, outcomes, barriers, facilitators, and identified research gaps. The complete synthesis grid is provided in Supplementary Table S1.

Data synthesis

Given the heterogeneity of study designs, interventions, and outcomes, a narrative synthesis approach was employed. Extracted data were organized thematically to identify patterns related to types of digital technologies, detection strategies, population characteristics, and implementation challenges. Findings were summarized descriptively and presented in tabular and narrative formats to support comparison across studies and identify gaps in the existing literature. Although formal quality appraisal is not mandatory in scoping reviews, variations in study design and methodological rigor across included studies were acknowledged and considered during data synthesis and interpretation.

Ethical considerations

As this study involved secondary analysis of previously published literature, ethical approval was not required.

Results

Overview of included evidence

A total of 19 studies were included in the synthesis, representing research published

between 2016 and 2024. The studies were conducted across a broad range of geographic contexts, including the United States, Europe (England and Spain), Asia (India and Singapore), Latin America (Mexico and Argentina), and the Middle East (Lebanon). Most studies were undertaken in primary care or community-based settings, with a strong focus on populations experiencing structural barriers to healthcare access, such as low-income groups, ethnic minorities, rural residents, refugees, and uninsured or publicly insured individuals (16,17).

Study designs were heterogeneous and included randomized controlled trials, quasi-experimental studies, cohort studies, pilot feasibility studies, and mixed-methods evaluations. While several studies assessed clinical outcomes, the majority focused on screening uptake, identification of dysglycemia, and feasibility of digital detection strategies.

Digital health modalities used for diabetes detection

Five main categories of digital health approaches were identified across the included studies.

1. Electronic health record (EHR)–based screening and decision support systems, used to flag individuals eligible for diabetes screening based on risk profiles or missing laboratory data
2. Mobile health (mHealth) applications, providing digital risk assessment, lifestyle data collection, and screening facilitation
3. Short message service (SMS)–based interventions, delivering screening reminders and health prompts
4. Wearable technologies and continuous glucose monitoring (CGM) integrated with mobile platforms
5. Telehealth and remote screening models, enabling off-site identification and referral

EHR-based approaches were the most frequently reported modality, particularly in U.S.-based studies serving safety-net populations (13,16). Several studies implemented multicomponent interventions that combined digital screening with health coaching or community-based follow-up. The distribution of digital health modalities across the included studies is illustrated in Figure 2, highlighting the predominance of mHealth applications and EHR-based screening approaches.

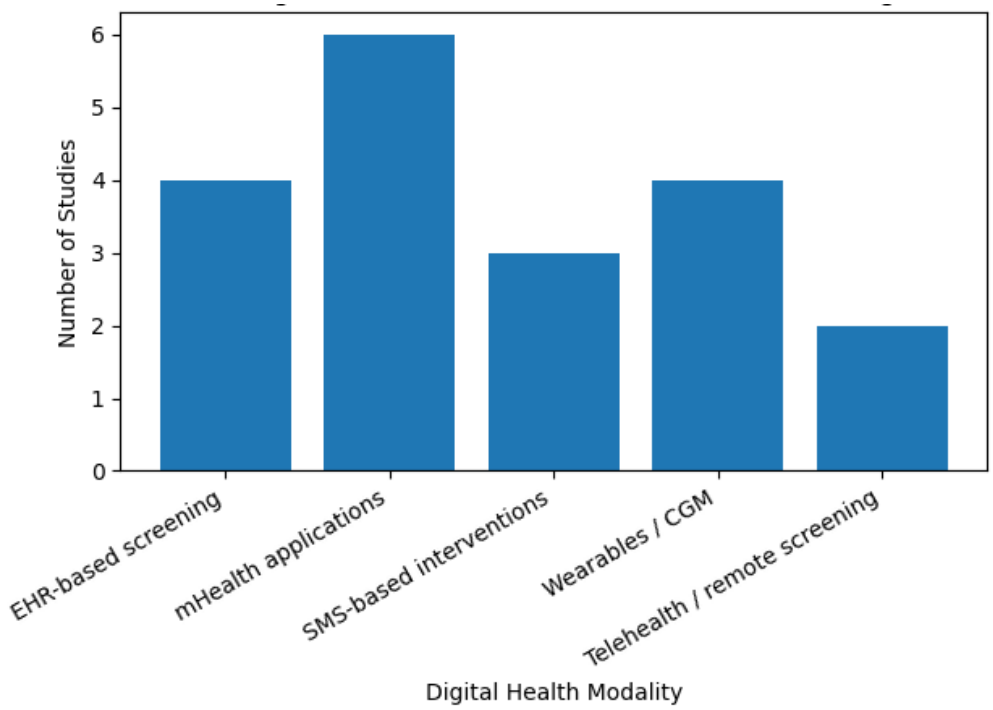

Figure 2. Distribution of digital health modalities used for detection of undiagnosed type 2 diabetes mellitus across included studies (n=19).

Screening and identification strategies

Digital tools supported diabetes detection through multiple screening strategies. Most studies incorporated biochemical testing, including HbA1c, fasting plasma glucose, oral glucose tolerance tests, or capillary blood glucose measurements, as confirmatory outcomes. However, the initial identification of at-risk individuals was commonly driven by digital risk stratification rather than universal testing.

Risk-based identification approaches included EHR-derived algorithms, registry-based screening, and digital diabetes risk scores, which enabled targeted outreach to individuals who had not previously been screened (15,17). Community-based studies frequently used mobile decision support tools operated by trained health workers, facilitating screening in non-clinical environments.

Several studies also employed remote identification and referral mechanisms, allowing participants to complete initial risk assessments or consent processes digitally prior to confirmatory testing. Figure 3 illustrates the digital health enabled detection pathway, highlighting the sequential process from risk stratification to confirmatory testing and linkage to care.

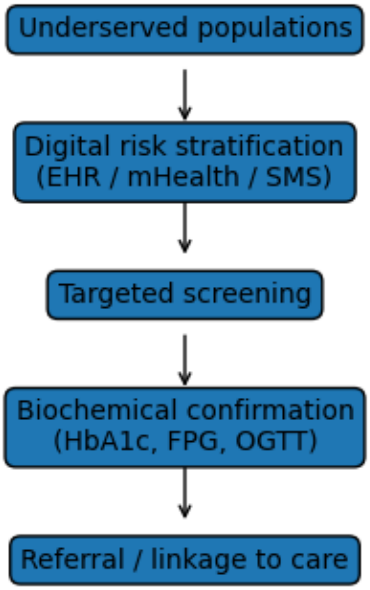

Figure 3. Digital health–enabled pathway for detection of undiagnosed dysglycemia in underserved populations

Detection outcomes and yield of undiagnosed dysglycemia

Across the included studies, digital health interventions consistently demonstrated the ability to increase screening coverage and identify previously undiagnosed dysglycemia, including both prediabetes and type 2 diabetes mellitus. Studies targeting high-risk populations reported a substantial proportion of participants with newly detected abnormal glycemic values, underscoring the hidden burden of undiagnosed disease in underserved settings (13,16).

Several studies reported improvements in intermediate metabolic indicators, such as reductions in HbA1c, fasting glucose levels, body weight, and waist circumference among individuals identified through digital screening pathways (15). Although formal diabetes diagnosis was not always the primary endpoint, several studies reported intermediate outcomes such as risk stratification, screening uptake, or referral rates rather than confirmed T2DM diagnoses. The identification of elevated risk frequently resulted in referral for confirmatory testing or preventive interventions.

Feasibility, engagement, and acceptability

High levels of feasibility and acceptability were reported across diverse

digital modalities. Studies involving SMS-based programs and basic mHealth applications consistently demonstrated strong participant engagement, particularly in populations with limited prior exposure to digital health tools (19).

More technologically intensive interventions, such as wearable devices and CGM-based screening, showed variable uptake, with engagement influenced by device cost, digital literacy, and ease of use. Nevertheless, when successfully implemented, these approaches enabled more granular identification of glycemic abnormalities.

Reported barriers and facilitators

Common barriers reported across studies included limited digital literacy, inconsistent access to internet-enabled devices, language barriers, and usability challenges. Socioeconomic constraints, such as work schedules and competing priorities, further affected participation in screening programs (21).

Facilitators included widespread mobile phone ownership, culturally and linguistically tailored content, simplified digital interfaces, integration with existing healthcare systems, and support from community health workers or primary care teams (17).

Discussion

This scoping review synthesizes current evidence on digital health approaches for detecting undiagnosed type 2 diabetes mellitus in underserved populations. It highlights the evolving role of digital technologies as active case-finding tools rather than solely instruments for disease management. This focus is highly relevant given that nearly one in two adults living with diabetes globally remains undiagnosed, with the burden disproportionately affecting populations facing structural barriers to healthcare access (1,2,25).

Across diverse settings, digital health interventions demonstrated a consistent capacity to expand screening reach and uncover previously undiagnosed dysglycemia, addressing fundamental limitations of conventional facility-based detection models that rely on opportunistic screening during clinical encounters (5). These findings align with prior evidence indicating that underserved populations are significantly less likely to receive guideline-recommended diabetes screening due to fragmented care, financial constraints, and limited access to laboratory services (7,26).

A salient finding of this review is that digital health technologies are most impactful when deployed proactively and embedded within healthcare systems. Electronic health record–based decision support tools and registry-driven risk stratification enabled systematic identification of individuals who had not undergone routine diabetes screening, effectively shifting detection upstream and facilitating population-level surveillance of metabolic risk (13,16,27). This proactive approach directly addresses longstanding calls by the World Health Organization to leverage digital systems for early detection of noncommunicable diseases in resource-constrained settings (9).

Importantly, the synthesis demonstrates that contextual appropriateness outweighs technological sophistication in detection-focused interventions. Simpler digital modalities, including SMS-based interventions and basic mobile health applications, consistently showed high feasibility and acceptability, whereas more complex technologies such as wearable devices and continuous glucose monitoring exhibited variable uptake, often constrained by cost, digital literacy, and device accessibility (15,19). This finding reinforces evidence from digital health equity research indicating that low-burden technologies are more likely to achieve scale and sustainability in underserved populations (21,28). The transferability of digital screening strategies may depend heavily on health system capacity, infrastructure readiness, and workforce availability, particularly in low-resource settings.

The review further indicates that digital detection strategies are most effective when integrated within existing care pathways. Interventions that incorporated community

health workers, primary care teams, or structured referral mechanisms were more likely to translate risk identification into confirmatory testing and linkage to care (11,17). This aligns with implementation science literature emphasizing that digital tools alone are insufficient to improve outcomes unless embedded within supportive health system infrastructures (11,29).

Notably, many included studies framed outcomes around identification of prediabetes or elevated metabolic risk rather than formal T2DM diagnosis. While this limits direct assessment of diagnostic yield, it reflects a growing paradigm shift toward early interception along the diabetes risk continuum, which is increasingly recognized as essential for reducing long-term disease burden (4,30,31). Digital health technologies are particularly well suited to this preventive approach, as they enable repeated risk assessment, longitudinal monitoring, and dynamic stratification beyond single-point diagnostic encounters.

The included studies exhibited substantial heterogeneity in design, populations, and methodological rigor; consistent with the purpose of a scoping review, the findings should be interpreted as a mapping of available evidence rather than a measure of intervention effectiveness. Despite these promising findings, the evidence base remains constrained by limited long-term follow-up, insufficient evaluation of cost-effectiveness, and underrepresentation of populations with very low digital access, limited literacy, or advanced age. These gaps raise critical equity concerns, as poorly designed digital screening initiatives may inadvertently exacerbate disparities if structural and social determinants of digital access are not addressed (21, 32). Future research should therefore prioritize evaluating cost-effectiveness, long-term outcomes, and linkage-to-care pathways, alongside implementation-focused evaluations, hybrid digital–human delivery models, and equity-sensitive outcome measures that extend beyond screening uptake to include sustained care engagement and prevention of disease progression.

Overall, this review strengthens the evidence that digital health technologies can play a transformative role in detecting undiagnosed T2DM in underserved populations when interventions are proactive, contextually appropriate, and integrated within health systems. By shifting detection from episodic diagnosis to continuous risk identification and timely care linkage, digital approaches may contribute meaningfully to global strategies aimed at reducing the burden of undiagnosed diabetes and advancing health equity (1,9,).

Conclusion

This scoping review demonstrates that digital health technologies can play an important role in improving the detection of undiagnosed type 2 diabetes mellitus in underserved populations. Proactive and low-burden digital approaches particularly EHR-based screening systems, mobile health applications, and SMS interventions were effective in expanding screening coverage and identifying previously unrecognized dysglycemia. These interventions were most impactful when integrated within existing healthcare and community care pathways. Future research should prioritize scalable, equity-centered implementation models that support timely linkage to care and sustained prevention of disease progression.

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Conflict of Interest Statement

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Supplementary Table S1. Summary and evidence synthesis grid of digital health interventions for detection of undiagnosed type 2 diabetes mellitus

Study (Year)	Country/ Region	Underserved Population Targeted	Digital Health Approach	Screening/ Detection Method	Key Outcomes	Reported Barriers	Reported Enablers	Research Gap Identified
Fontil et al., (2016)	United States	Low-income prediabetes patients at a large safety net clinic, characterized by public insurance, nonwhite, and language preferences (40% prefer to speak a language other than English, 15% are monolingual Spanish speakers)	The digital health approach in this study is the Omada Health Program, an internet and mobile phone-based educational program modeled after the DPP lifestyle intervention. It includes small group support, personalized health coaching, a weekly curriculum, digital tracking tools, and a private online social network. The program is designed to be scalable and improve usability for low-income populations through collaboration between researchers and a digital health company.	- Electronic health record (EHR) query for language, age, HbA1c test result, and BMI. - Eligibility criteria: - Fluent in English or Spanish - Age 18-75 - HbA1c test result of 5.7-6.4% or fasting glucose test of 110-125 mg/dL - BMI ≥ 24 kg/m 2 (or ≥22 kg/m 2 if Asian American) - Using the Internet at least weekly - Able to give informed consent	- High receptivity to the program among focus group participants. - Successful adaptation of content to a 5th-grade reading level based on patient feedback. - 54% of eligible patients expressed interest in enrolling. - High engagement: 80% logged in at least once a week. - High satisfaction with the program and intentions to maintain healthy behaviors. - Challenges with computer literacy and accessibility. - Opportunities for collaboration to improve usability.	- Difficulties using uniform resource locators (URLs) - Challenges navigating online sign-up forms - Issues with using email for confirmation codes and links - Technical difficulties due to poor computer or online literacy - Inconsistent computer or Internet access	The reported enablers include the receptiveness of participants , curriculum modifications for readability and cultural relevance , high engagement and satisfaction levels , collaboration between researchers and a digital health company , integration within a safety net clinical practice , and real-time technical assistance solutions.	- The need for digital health interventions to utilize content and curricula based on validated evidence for behavioral change. - The scarcity of feasibility studies of digital health interventions in real-world clinical settings that care for underserved populations. - Challenges related to computer and online literacy and accessibility in low-income populations.
Kim et al., (2018)	United States	Low-income population, specifically those with Medicaid insurance or eligibility, and those without insurance, recruited from healthcare facilities serving low-income populations.	The digital health approach includes a 52 -week program with weekly educational curriculum, human health coaching, connected tracking tools, and peer support from a virtual group, aimed at engaging underserved populations in lifestyle changes to reduce the risk of type 2 diabetes.	Blood test indicating prediabetes, HbA1c test	- Engagement in a digital diabetes prevention program - Achievement of lifestyle changes to reduce risk of type 2 diabetes - Health assessments (anthropometrics, HbA1c) - Qualitative data on implementation barriers, successes, and best practices	Not mentioned (the abstract does not specify the reported barriers)	- Internet or smartphone access - Comfort reading and writing in English or Spanish - Weekly educational curriculum - Human health coaching - Connected tracking tools - Peer support from a virtual group	The research gap identified is the need to adapt and test digital diabetes prevention programs for underserved, low-income populations, particularly those with Medicaid or those who are uninsured, to ensure engagement and effectiveness in reducing the risk of type 2 diabetes.
Philis-Tsimikas et al., (2022)	United States	Hispanic/Latino adults with low income and poorly managed type 2 diabetes	Dulce Digital -Me (DD-Me), an adaptive mHealth intervention that combines educational text messaging with personalized	Automated EHR-derived patient identification reports; telephone screening for additional eligibility	- Primary outcomes: HbA1c , LDL-C, SBP - Secondary outcomes: Patient adherence, patient-provider communication	- Poor healthcare access - Cultural barriers - Practical barriers (work, transportatio, caregiving) - Limited access to traditional DSME/S	- Widespread adoption of mobile phones among underserved Hispanic populations - Willingness to use mobile phones for	The research gap identified is the lack of effective healthcare access and cultural barriers for Hispanic populations

Study (Year)	Country/ Region	Underserved Population Targeted	Digital Health Approach	Screening/ Detection Method	Key Outcomes	Reported Barriers	Reported Enablers	Research Gap Identified
			goal-setting and feedback, delivered via automated text messaging or telephonic delivery by a health coach.	criteria (e.g., minimal literacy, no plans to relocate); clinical criteria (HbA1c ≥ 8.0%, SBP ≥ 140, LDL-C ≥ 100 mg/dL)	- Additional outcomes: Feasibility, acceptability, sustainability, dissemination potential	- Need for personalized and adaptive interventions	health management - Personalized and adaptive nature of the Dulce Digital-Me intervention - Use of the RE-AIM model to evaluate feasibility, acceptability, sustainability, and dissemination potential - Flexibility of the Dulce Digital-Me model for adaptation to other chronic conditions and delivery by different personnel	with diabetes, leading to poor clinical management and outcomes. Additionally, there is a need for larger and longer randomized controlled trials to confirm the value and acceptability of mHealth interventions in this at-risk population.
Kim et al., (2019)	United States	Low-income adults aged 18-75 years enrolled in Medicaid or other safety-net insurance plans with evidence of prediabetes.	- Digital DPP: A web-based and mobile-based program with 52 weeks of participation. - Components: Educational curriculum, health coaching, peer support. - Delivery: Virtual groups, online lessons, private messaging, chat boards. - Adaptation: Curriculum rewritten at 4th-5th grade reading levels, cultural tailoring, Spanish translation, bilingual/bicultural health coaches. - Benefits: Overcomes barriers like time constraints, transportation issues; improves access and engagement for low-income populations.	Electronic Health Records (EHRs) and referrals from primary care physicians	- Mean weight loss: 4.4% at 12 months - Percentage of participants with more than 5% weight loss: 41% at 6 months , 37% at 12 months - Sustainability of weight loss over 12 months - No significant difference in HbA1c levels between intervention and control groups - Decrease in HbA1c levels for participants with more than 5% weight loss at 6 months - Significant difference in BMI change compared to control group at 6 months	- Limited flexibility in work schedules - Lack of reliable transportation - Difficulty accessing affordable childcare - Distance from DPP locations, particularly in rural areas - Time constraints - Logistical factors impeding attendance in location-based meetings	- Growing use and acceptance of accessible technologies in low-income communities - Availability and affordability of mobile technology - Low barrier to digital technology for motivated individuals - Effectiveness of digital DPPs in achieving and sustaining weight loss - Removal of barriers such as time constraints, transportation, and childcare issues	The research gap identified is the need for effective, accessible, and engaging digital health approaches to prevent type 2 diabetes in underserved populations, particularly low-income individuals and those from underrepresented racial and ethnic groups, due to the limitations of traditional in-person diabetes prevention programs.
(Yingling et al., 2019)	United States, Utah	Hispanic adults, specifically low-income Hispanic adults in Utah	The digital health approach involves the use of wearable sensors and mobile apps, specifically a real-time continuous glucose monitor (RT-CGM), a	Real-time continuous glucose monitor (RT-CGM) for direct measurement of blood glucose levels	- Sensor-based tools for T2DM self-monitoring are feasible and acceptable among low-income Hispanic adults. - A multimodal system (RT-CGM, activity tracker, digital	- Fear of using devices (e.g., insertion site fear, device movement fear) - Trust issues (e.g., discrepancies between self-monitored and	Reported enablers include the use of RT-CGM for insights into lifestyle-health relationships, support from health professionals, tailored training and culturally	The research gap identified is the lack of studies on the use of digital health tools for type 2 diabetes management among Hispanic adult populations,

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			wrist-worn physical activity tracker, and a tablet-based digital food diary, to self-monitor blood glucose levels, physical activity, and food intake among Hispanic adults with type 2 diabetes mellitus (T2DM).		food diary) is feasible, acceptable, and educational. - Barriers to acceptability and preferences for wearable sensor integration were identified. - Interventions should be tailored to individual needs, accessible, and actionable for patients, clinicians, and family members.	RT-CGM readings) - Calibration challenges (e.g., difficulty with daily calibration, lack of experience with SMBG) - Comfort concerns (e.g., irritation from wristbands and adhesives) - Cost barriers (e.g., affordability issues for future use) - Technology limitations (e.g., lack of Spanish language support, limited food options in logging apps)	relevant content, data sharing capabilities, social support, data integration on a single platform, and the use of familiar devices like smartphones.	particularly those with limited English proficiency, and the need for culturally and linguistically tailored tools for this demographic.
Zaheda ni et al., (2023)	United States	The underserved population targeted includes those living in remote areas and those with limited access to traditional healthcare services, with a focus on customization for varied ethnicities and socioeconomic levels, as well as different age groups such as the elderly and youth.	- Remote program using continuous glucose monitoring (CGM) and wearables for lifestyle recommendatio ns - Smartphone app integrating wearable data for daily insights on glucose patterns, activity, and food intake. - Personalized recommendatio ns based on user preferences, goals, and glycemic patterns. - Season of Me program for improving glucose time in range and weight loss in T2D risk individuals. - Machine learning models like CGP for predicting glycemic impact and providing tailored advice. - Food recommendatio n engine suggesting healthier alternatives	Continuous glucose monitoring (CGM) integrated with wearable data and a smartphone app for personalized recommendati ons	- Significant improvements in hyperglycemia, glucose variability, and hypoglycemia, particularly in non-diabetic individuals at baseline. - Body weight reduction across all groups , with significant decreases in caloric intake and improvements in dietary habits. - Increased physical activity, especially in healthy and prediabetic subgroups. - Notable improvements in Time in Range (TIR) for individuals with suboptimal baseline control. - Reductions in hyperglycemic events and glycemic variability across subgroups. - Significant weight loss: average of 2.5 lbs in nondiabetic and prediabetic individuals and 4.4 lbs in those with T2D over 28 days.	- Resource intensity and requirement for healthcare professional contact - Socioeconomic barriers and lack of physician referrals - Lack of control group in the study - Short duration of the intervention - Absence of ethnicity data for culturally sensitive recommendations	- Use of modern technologies to enhance lifestyle interventions - Widespread use of smartphones for data integration - Continuous glucose monitoring (CGM) and wearable devices for tracking health metrics - Integration of wearable data with mobile apps for personalized feedback - AI-enabled personalization for scalable interventions - Ability to offer interventions without human coaching	- The use of modern technologies to improve lifestyle interventions for T2D prevention is underutilized. - Current interventions are resource-intensive and have low participation rates due to accessibility barriers. - There is a lack of formal evaluation of CGM as a tool for lifestyle modification in T2D prevention. - Current lifestyle management approaches are not personalized to individual responses to nutrients and activity. - There is a need for culturally sensitive interventions, including ethnicity data collection. - TIR thresholds for individuals without diabetes need to be established.

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			based on individualized glycemic responses.					
Ang et al., (2021)	Singapore	Military personnel from the Singapore Armed Forces	The digital health approach in this study involves a personalized mHealth-anchored intervention program that includes in-person consultations, continuous glucose monitoring (CGM), mobile app for dietary intake and physical activity tracking, and context-sensitive digital health coaching. It leverages wearable sensors for real-time tracking and monitoring, and integrates medical support and lifestyle care delivery through a mobile app.	HbA1c levels: ≥6.5% for type 2 diabetes, 5.7% to 6.4% for prediabetes	- Significant reduction in HbA1c levels from 7.6% to 7.0% (P=.004) - Significant reduction in body weight from 76.8 kg to 73.9 kg (P<.001) - Significant reduction in BMI from 27.8 kg/m2 to 26.7 kg/m2 (P<.001) - High patient satisfaction and acceptability - Clinically significant weight loss of 3.5% from baseline	- Conflict between work schedules and center's hours of operation - Distance to center - Forgetfulness - Lack of familiarity with the center and services - Apathy toward diabetes education - Increased stress leading to unhealthy food consumption during lockdown - Difficulty accessing healthcare due to lockdowns - Issues with medication refills due to lockdown - Communication difficulties due to security restrictions in military camps	- Use of mHealth technologies for accessible communication and self-management education - Personalization through adaptable feedback and tailored messaging - Real-time tracking and monitoring using wearable sensors and mobile apps - Remote monitoring and actionable insights for patient empowerment	The research gap identified is the need for effective, scalable, and personalized programs to manage and improve type 2 diabetes outcomes, particularly in addressing the limitations of traditional lifestyle and behavior modification interventions. The gap is addressed by leveraging mobile health (mHealth) interventions to provide accessible and personalized care.
Muralidharan et al., (2017)	India	Adults at high risk for type 2 diabetes in low- and middle-income countries, specifically in India, using a mobile phone app (mDiab) for intervention.	The digital health approach in this study is the use of a mobile health (mHealth) app called mDiab, which delivers a reality television-based lifestyle intervention program to Android smartphone users at high risk for type 2 diabetes . The app includes video lessons, goal setting, tracking of diet, physical activity, and weight, and weekly coach calls from trained nutritionists.	- Indian Diabetes Risk Score (IDRS) - Body Mass Index (BMI) - Capillary Blood Glucose (CBG) – 75-g Oral Glucose Tolerance Test	- Primary outcome: Weight loss - Secondary outcomes: Improvement in cardiometabolic risk factors (waist circumference, blood pressure, glucose, insulin, and lipids), physical activity, quality of life, and dietary habits - Cost-effectiveness analysis: Incremental cost per case of diabetes prevented and incremental cost per QALY	Not mentioned (the paper does not explicitly detail reported barriers)	- Mobile phone app for tracking weight, physical activity, and diet - Weekly video lessons on type 2 diabetes prevention - Standardized reminders and motivational messages - Weekly coach calls from trained nutritionists - In-app messaging tool for communication with health coaches	The research gap identified is the need for novel methods to address the increasing incidence of type 2 diabetes in low- and middle-income countries , particularly the lack of studies on the efficacy of mobile health technology for diabetes prevention in these settings.
Galmes-Panades et al., (2022)	Spain	Socially vulnerable populations, particularly those with lower socio-economic status (V	- The digital health approach involves a multifaceted intervention to	- HbA1c levels from 6% to 6.4% in the last three months	- Primary outcome: Glycated haemoglobin (HbA1c) at 6	- Patient level: External determinants related to healthcare	- Use of mobile health (mHealth) interventions to support lifestyle changes	There is a knowledge gap about the impact of digital interventions to

Study (Year)	Country/ Region	Underserved Population Targeted	Digital Health Approach	Screening/ Detection Method	Key Outcomes	Reported Barriers	Reported Enablers	Research Gap Identified
		to VI) in Spain, who are disproportionately affected by T2DM and have difficulties accessing healthcare services.	prevent T2DM by supporting lifestyle changes in individuals at risk. - The intervention includes two main components: 1. Mobile health technology to send tailored text messages promoting lifestyle changes. 2. Online education for primary healthcare professionals about T2DM prevention and management of prediabetes. - The intervention aims to raise awareness, increase knowledge, improve counselling techniques, and enhance communication skills related to T2DM prevention. - Text messages focus on nutrition and physical activity, providing personalized recommendations. - Online education for healthcare professionals includes written materials and video examples to support behavioral changes in patients with prediabetes. - The intervention is designed to be low-cost and easily implementable, making it a sustainable strategy for health systems.	- Two consecutive values of fasting plasma glucose between 110-125 mg/dL - Blood tests to confirm eligibility	months follow-up - Secondary outcomes: - Clinical and physiological outcomes: Fasting blood glucose, triglycerides, total cholesterol, LDL, HDL, lipoprotein A, AST, ALT, GGT, complete hemogram, creatinine, serum albumin, insulin, urinary sediment, albumin-creatinine ratio, body weight, waist circumference, blood pressure, cardiovascular disease risk - Diabetes incidence: Proportion of patients with a new diagnosis of T2DM - Motivational and behavioral outcomes: Brief motivation questionnaire, adherence to Mediterranean diet, physical activity, sedentary behavior, smoking habit, alcohol consumption - Trial feasibility outcomes: Numbers of eligible patients, recruitment rate, follow-up rate	professionals or the environment. - Healthcare professional level: Lack of confidence in prevention programs, poor communication skills, lack of time, lack of specialized staff, lack of training, limited organizational support. - Potential unfeasibility of online interventions due to the COVID-19 pandemic.	- Automated, tailored brief text messages to target beliefs and behaviors - Provision of education to primary healthcare professionals about T2DM prevention and management of prediabetes - Feasibility and acceptability of the interventions for patients and healthcare professionals - Potential to reach socially vulnerable populations	support healthy lifestyles in patients with prediabetes, particularly in Spain, where such interventions have not been trialled. The study aims to address this gap by developing and evaluating a digital health intervention to prevent type 2 diabetes.

Study (Year)	Country/ Region	Underserved Population Targeted	Digital Health Approach	Screening/ Detection Method	Key Outcomes	Reported Barriers	Reported Enablers	Research Gap Identified
Seely et al., (2020)	United States	Hispanic women with recent gestational diabetes mellitus (GDM)	The digital health approach in this study is the development and use of a mobile app, ¡Hola Bebé, Adiós Diabetes!, which is a culturally tailored, bilingual (Spanish/English) lifestyle program designed to reduce risk factors for type 2 diabetes in Hispanic women with prior gestational diabetes mellitus (GDM). The app includes educational modules, personal action plans, motivational messages, weight tracking, and rewards to increase self-efficacy for healthy eating and physical activity.	The screening/detection method involved identifying Hispanic women with a history of gestational diabetes mellitus (GDM) within the past 5 years from a community health center (CHC) database by a nurse and a medical assistant.	- Statistically significant improvement in self-efficacy for physical activity (P=.003) - Statistically significant improvement in self-efficacy for healthy eating (P=.007) - Weight decreased but not significantly - High level of user engagement: 91% viewed audiovisual modules and created action plans; 95% earned badges	- Sociocultural barriers to healthy eating: cost of healthy food , lack of knowledge about nutritional values, family food preferences. - Structural barriers to healthy eating: food deserts. - Barriers to physical activity: lack of time, lack of childcare , tiredness , limited self-discipline , discouragement from family and friends, lack of safe places to exercise. - Systemic barriers: lack of contact with primary care post-delivery, challenges in implementing face-to-face interventions due to cost and accessibility.	- Educational audiovisual modules on healthy eating and physical activity - Personal action plans - Motivational text messages - Weight tracking - Tiered badges to reward achievements - App designed to meet 8th-grade literacy level - Availability in Spanish and English with audio voiceover - Widespread use among Hispanic women - Flexibility in use (can be accessed at any time and place) - Culturally and linguistically tailored for Hispanic women	The research gap identified is the lack of mobile health (mHealth) programs tailored to reduce risk factors for type 2 diabetes in Hispanic women with prior gestational diabetes mellitus (GDM), despite their high risk and existing barriers to healthcare access and healthy lifestyle behaviors.
(Albu et al., 2017)	United States	Low- and middle-income populations in New York City, served by federally qualified community health centers and private practices.	The digital health approach in this study involves the use of electronic health records (EHRs) with decision support systems to identify patients eligible for dysglycemia screening based on American Diabetes Association guidelines, combined with standardized training for healthcare providers and staff.	- Electronic Health Record (EHR)-based decision support system - Standardized provider and staff training on ADA guidelines -Appropriate screening tests: fasting glucose test, oral glucose tolerance test, hemoglobin A 1c (HbA 1c) test	- Doubling of screening for eligible patients (mean increase + 11.0% [95% CI 9.0, 13.0]) - Increase in testing among ineligible patients (+5.0% [95% CI 3.0, 8.0]) - No change in cholesterol testing - High prevalence of dysglycemia among tested patients (59%) - Significant increase in patients targeted for treatment to prevent or delay type 2 diabetes	- Underestimation of actual screening numbers due to only considering first qualifying visits. - Reliance on EHR data with uncertain accuracy. - Inability to capture certain risk factors (family history, gestational diabetes, physical activity, acanthosis) due to their absence in EHR data.	- Formal provider and office staff training - Electronic health record (EHR)-based decision support system - EHR templates - Formal staff training - EHR modifications	The research gap identified is the inconsistent and underutilized screening for dysglycemia in routine clinical practice, particularly in underserved populations, despite available guidelines and the high prevalence of undiagnosed type 2 diabetes and prediabetes.
Saleh et al., (2018)	Lebanon	Individuals with noncommunicable diseases (NCDs) in rural areas and Palestinian refugee camps in Lebanon	The digital health approach in this study involves a dual-component mHealth intervention: (1) community-	Community-based screening for HTN and diabetes by trained community health workers	- Significant increase in blood pressure control (P=.03) - Significant decrease in mean systolic blood pressure (P=.02)	- Economic, sociocultural, and geographic factors limiting access to preventive healthcare services. - Lack of knowledge and	- Use of mobile health (mHealth) interventions, specifically short message service (SMS) messages, for medical information,	The research gap identified is the need for a comprehensive change in the approach to managing noncommunica

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			based component with community screening for hypertension and diabetes, and weekly educational SMSs to patients; (2) PHC center-based component with online training modules and forums for healthcare providers. This approach aims to improve accessibility to health services and health indicators for individuals with NCDs in rural and refugee settings.	among individuals aged 40 years or older.	- Significant decrease in mean glycated hemoglobin (HbA1c; P<.01) - Significant decrease in the proportion of HbA1c poor control (P=.02) - 28% increase in the odds of blood pressure control (P=.05) - 38% decrease in the odds of HbA1c poor control (P=.04) - Mean decrease in HbA1c of 0.87% (P<.01) - Lower HbA1c scores in rural areas compared to refugee camps (P<.01) - Differential improvements in diabetes and hypertension quality indicators between rural areas and refugee camps	awareness about NCD prevention among underserved populations. - Financial barriers, geographic inaccessibility, safety issues, and cultural and language barriers for refugees. - Strain on healthcare resources due to refugee influxes affecting access to services like eye and foot exams. - Maturity and configuration of existing healthcare programs impacting mHealth intervention effectiveness. - Limitations in data collection and intervention design, such as missing demographic data and issues with SMS message delivery.	reminders, and compliance encouragement. - Community screening by trained community health workers for early detection. - Training of healthcare providers using eHealth tools for improved provider-patient communication and compliance. - Integration of existing NCD programs with mHealth interventions. - Presence of advanced diabetes control programs and UNRWA's NCD program.	ble diseases (NCDs) in underserved communities, particularly in rural areas and refugee camps in Lebanon, and the uninvestigated potential role of mHealth in enhancing access to NCD care in these settings.
Morelli et al., (2023)	Argentina	- Age: >= 18 years - Education: 72.8% with less than 12 years of formal education - Health Coverage: 53.5% lacked health coverage - Location: Poor urban areas in Corrientes, Argentina - Comorbidities: Hypertension (60.8%), overweight/obesity (88.2%)	Mobile app with diabetes registry - Clinical decision support tool for providers - Text messaging intervention for patients - Personalized SMS messages based on patient risk profiles - Web-based platform for data collection and education	The paper does not explicitly mention a specific screening or detection method for undiagnosed type 2 diabetes. However, it describes the use of a mobile app with a diabetes registry and text messaging as part of the multicomponent intervention for managing type 2 diabetes.	- Significant increase in laboratory check-ups (HbA1c: 20.3% to 64.4%) - Significant increase in foot exams (62.1% to 87.2%) - Decrease in uncontrolled blood pressure (47.2% to 30.8%) - No change in poor metabolic control - Improvements in process indicators related to laboratory exams - Integration of digital health and provider training improved process indicators and blood pressure control	- Lack of time, infrastructure, and technology skills among healthcare professionals - Poor internet connectivity - Absence of institutional strategy to support online tools for capacity building - Limited access to lab services and specialist care - Study design limitations due to lack of randomization	- Integration of digital health interventions in public primary care - Use of a diabetes registry system to improve care processes - Text messaging for patient education and engagement - Digital health component well accepted by participants - Improved process indicators related to laboratory exams and blood pressure control - Optimization of service delivery platforms during the COVID-19 pandemic	The research gap identified is the need for innovative and effective interventions to improve diabetes care in resource-limited settings, particularly in Latin America, where current evidence-based interventions are not widely implemented or adopted. Additionally, there is a gap in intensifying treatment and coordinating follow-up for diabetes management.
Sevilla-Gonzalez et al., (2022)	Mexico	Middle-income population in Mexico, specifically individuals at risk of developing Type 2	- Digital Health Approach: Vida Sana, a web platform designed to record lifestyle	- Oral glucose tolerance test (OGTT) - Fasting glucose levels - Glycated	- Feasibility of Vida Sana: 42% - Usability of Vida Sana: 48.7 (SD 14.24)	- Difficulty in accessing the platform due to difficulty of use (36%)	- Ease of use without needing detailed training - Scheduling appropriate times for data recording	The research gap identified is the lack of knowledge on the effectiveness of

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		Diabetes (T2D) with prediabetes criteria.	habits and medication use within a lifestyle change program. - Modules: Contact information, tobacco consumption, alcohol consumption, emotional state, hours of sleep, dietary habits, physical activity, and medication. - Effectiveness: Lowered glucose levels, body fat percentage, and waist circumference in individuals at risk of developing type 2 diabetes.	hemoglobin A1c (HbA1c) levels - Dual-energy X-ray absorptiometry for body composition assessment	- Effectiveness in lowering glucose in fasting: –3.1 mg/dL vs –0.11 mg/dL; P=.038 - Effectiveness in lowering glucose at 2 hours: –16.9 mg/dL vs 2.5 mg/dL; P=.045 - Effectiveness in reducing body fat percentage: –1.3 vs –1.02; P=.02 - Effectiveness in reducing waist circumference: –3.2 cm vs –1.7 cm; P=.02 - Improving accessibility and ease of navigation could enhance acceptance of digital health solutions.	- Lack of time to record their habits (34%) - Lack of interest to record their habits (18%) - Lack of resources (11%)	- Use of reminders - Designing friendly interfaces - Visual tracking of records - Training to increase familiarity and understanding of the platform's benefits	mobile health (mHealth) technologies for type 2 diabetes prevention in low- and middle-income populations, particularly in addressing barriers such as technology gaps, infrastructure, and education level.
Murray et al., (2019)	England	The underserved population targeted includes adults with non-diabetic hyperglycaemia (NDH) and adults who are overweight or obese, with a focus on varying socioeconomic status (SES) as an indicator of health inequalities.	The digital health approach in this study involves the evaluation of a digital diabetes prevention programme (DDPP) pilot, which includes five different digital interventions focusing on dietary intake, weight loss, and physical activity. The approach aims to reduce HbA1c and weight in at-risk populations and includes both quantitative and qualitative data collection to assess effectiveness and implementation. It also considers socioeconomic status and patient activation, indicating a focus on equity and accessibility.	- Screening for non-diabetic hyperglycaemia (NDH): HbA1c measurement of 42-47 mmol/mol or fasting plasma glucose measurement of 5.5-6.9 mmol/L. - Identification of overweight or obese individuals: Body mass index (BMI) >25 kg/m2 or >30 kg/m2. - Referral process: General practitioners (GPs) or alternative providers contracted for cardiovascular risk assessment as part of the NHS Health Check Programme.	- Primary Outcomes: Reduction in HbA1c and weight (for people with NDH) and reduction in weight (for people who are overweight or obese) at 12 months. - Secondary Outcomes: Use of the intervention, satisfaction, physical activity, patient activation, resources needed for successful implementation , intervention uptake, behavioral and clinical outcomes, and costs related to implementation.	- Acceptability issues due to intensive schedules and perceived stigma in face-to-face programs. - Low engagement and adherence in digital health interventions. - Concerns around the 'digital divide.' - Challenges in successful implementation of digital health interventions.	- Description of implementation strategies applied in the eight demonstrator sites. - Determination of costs associated with implementing and delivering a DDPP from an NHS perspective. - Exploration of commissioner, healthcare professional, and provider views about key factors influencing implementation, uptake, and impact of the DDPI.	The research gap identified is the lack of evidence supporting the advantages of digital diabetes prevention programs over traditional face-to-face programs, particularly in terms of overcoming challenges such as low uptake and high attrition rates, and the need for understanding how digital interventions can be effectively integrated into routine healthcare to address health inequalities and resource requirements.
Ajay et al., (2016)	India	Individuals utilizing Community Health Centers in Himachal	The digital health approach in this study	A nurse-facilitated, mobile	- Detection of hypertension and diabetes mellitus:	- High burden of undetected and undertreated	- Mobile phone-based clinical	The high burden of undetected and

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		Pradesh, India, particularly those in resource poor settings with hypertension and diabetes mellitus.	involves a mobile phone–based clinical decision support system used by nurse care coordinators to screen patients, enter their parameters, and generate prescriptions vetted by physicians. This approach is designed to be scalable and feasible in resource-poor settings, improving blood pressure and blood glucose control.	phone–based clinical decision support system was used for screening and detection. The system involved a nurse care coordinator screening and examining patients, entering parameters into the system to generate prescriptions vetted by a physician.	6,016 participants with hypertension (52% newly detected), 1,516 participants with diabetes mellitus (30% newly detected). - Improvements in blood pressure and blood glucose control: reductions in systolic blood pressure (-14.6 mm Hg), diastolic blood pressure (-7.6 mm Hg), and fasting plasma glucose (-50.0 mg/dL) over 18 months. - Potential for scale-up in resource-poor settings.	hypertension and diabetes mellitus - Lack of access to effective care delivery systems - Resource limitations in primary healthcare facilities	decision support system - Task-sharing with nurse care coordinators - Nurse-facilitated intervention	undertreated hypertension and diabetes mellitus is a major health challenge worldwide, indicating a need for innovative solutions to improve detection and management, particularly in resource-poor settings.
Yotsu et al., (2023)	Côte d'Ivoire	Patients with skin diseases in rural Côte d'Ivoire, particularly those affected by skin-related neglected tropical diseases (skin NTDs) in resource-limited settings.	The digital health approach in this paper is the use of a mobile health app called eSkinHealth for detecting and managing skin diseases, particularly skin-related neglected tropical diseases (NTDs), in resource-limited settings. It serves as a portable electronic patient chart and is used for teledermatolog. However, it does not address the detection of undiagnosed Type 2 Diabetes Mellitus.	eSkinHealth mobile app for teledermatology and electronic patient charting	- The eSkinHealth app showed improved usability over time, with SUS scores increasing from 72.3 to 86.3. - The app was effective in detecting skin NTDs, with 79 cases reported in the intervention arm compared to 17 in the control arm. - More skin diseases were diagnosed within the app compared to the control arm. - The app improved the detection and management of skin diseases in Côte d'Ivoire.	- Limited access to healthcare due to remote geographical locations - Lack of experts in skin diseases	- High System Usability Scale (SUS) scores indicating user-friendliness and effectiveness - Satisfaction among participants, including dermatologists and program managers - Empowerment of community health care workers - Increased detection of skin NTDs compared to the control arm	The research gap identified is the high burden of skin diseases, particularly skin-related neglected tropical diseases (skin NTDs), in sub-Saharan Africa due to limited access to healthcare and a lack of experts, leading to these diseases being often overlooked.
Ross et al., (2022)	England	The study targets adults with non-diabetic hyperglycemia (NDH) from diverse geographical regions across England , including those from socioeconomically disadvantaged backgrounds and various ethnicities , indicating an effort to reach underserved populations.	The digital health approach in the paper involves a digital stream of the diabetes prevention program (DDPP) that includes five digital health interventions (DHIs). These DHIs offer behavioral change support through	- Glycated hemoglobin (HbA1c) readings of 42-47 mmol/mol - Fasting blood glucose readings of 5.5-6.9 mmol/L - Identification from general practice (GP) lists - NHS Health Checks	- Mean weight change at 12 months: -3.1 kg (95% CI: -3.4 to -2.8, p<0.001) - Mean HbA1c change at 12 months: -1.6 mmol/mol (95% CI: -1.8 to -1.4, p<0.001) - Mean weight change at 6 months: -3.5 kg (95% CI: -3.7 to -3.3, p<0.001) - Mean HbA1c change at 6	- Concerns around the digital divide and impact on health inequalities - Repeated failures of implementation - Lack of understanding of the most effective digital components or active ingredients - External confounders due to the uncontrolled	- Peer support - Access to a website - Telephone service - Wearables	The research gap identified is the lack of large-scale real-world evaluations and evidence on the effectiveness of digital health interventions in diabetes prevention, particularly in real-world populations.

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			wearable technologies, apps for health coaching, online peer support groups, and electronic goal setting and monitoring. The interventions are delivered via smartphone apps and websites with varying levels of human support.	for individuals aged 40-74	months: -1.8 mmol/mol (95% CI: -2.0 to -1.7, p<0.001)	nature of the analysis - Missing data affecting data interpretation - Potential novelty effect influencing adoption and use		
Ritchie et al., (2024)	United States	- Diverse and predominantly low-income population - English- and Spanish-speaking adults - Racial and ethnic minority groups (Latinx, Non-Latinx Black) - Individuals with Medicaid or uninsured - Adults with obesity	The digital health approach in this study involves the use of remote protocols, including phone and video conferencing, e-consenting, electronic surveys, and the use of technology for data collection such as texting or emailing scale readings. This approach is designed to reduce logistical and time challenges, making it more accessible for underserved populations to participate in diabetes research.	- Eligibility criteria: BMI ≥25 kg/m² (≥23 kg/m² for Asian race), prediabetes (A1C 5.7%-6.4%), past gestational diabetes, or elevated score on a risk questionnaire. - Identification methods: Provider and self-referrals, risk registry based on medical record data . - Screening method: Medical record screening by study staff.	- Three-fold greater odds of enrolling in remote versus in-person protocols (AOR 2.90; P < 0.001 [95% CI 2.29–3.67]). - Higher enrollment among Latinx, Black, Spanish-speaking, and low-income individuals. - Remote protocol well-accepted by diverse and low-income populations. - Higher enrollment rates with remote protocol compared to in-person protocol. - Need for targeted recruitment efforts for males and older adults.	- Digital divide: unequal access to technology and internet - Limited financial means - English proficiency issues - Limited availability of technology and internet access - Use of insurance as a proxy for income - Lack of comprehensive measures for social determinants of health (SDOH) - Impact of the COVID-19 pandemic on motivation and participation	- Remote study protocol being well-accepted by diverse and low-income populations - Increased enrollment rates with remote protocol compared to in-person protocol - Remote setting being more comfortable and less stigmatizing - Reduction in logistic and time challenges - Removal of barriers to participation for underrepresented groups	The research gap identified is the limited inclusion of underrepresented groups in diabetes trials , with current strategies often falling short . The paper suggests that remote protocols could improve enrollment but notes limitations in measuring social determinants of health and the need for broader generalizability