

Review

Effectiveness of Mobile Phone and Web-Based Interventions for Diabetes and Obesity Among African American and Hispanic Adults in the United States: Systematic Review

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Abstract

Background: Mobile health (mHealth) and web-based technological advances allow for new approaches to deliver behavioral interventions for chronic diseases such as obesity and diabetes. African American and Hispanic adults experience a disproportionate burden of major chronic diseases.

Objective: This paper reviews the evidence for mHealth and web-based interventions for diabetes and obesity in African American and Hispanic adults.

Methods: Literature searches of PubMed/Medline, The Cochrane Library, EMBASE, CINAHL Plus, Global Health, Scopus, and Library & Information Science Source were conducted for relevant English-language articles. Articles identified through searches were reviewed by 2 investigators and, if they met the inclusion criteria, were extracted and assessed for risk of bias. Findings were summarized in tabular and narrative format. The overall strength of the evidence was assessed as high, moderate, low, or insufficient on the basis of risk of bias, consistency of findings, directness, precision, and other limitations.

Results: Searches yielded 2358 electronic publications, 196 reports were found to be eligible for inclusion, and 7 studies met the eligibility criteria. All 7 included studies were randomized control trials. Five studies evaluated the effectiveness of an mHealth intervention for weight loss, including one that evaluated the effectiveness for diabetes and two studies focused on diabetes. Of all the studies that focused on weight loss, 3 reported significant differences in weight loss in participants in the intervention group compared with those in the usual care group. Although all studies on diabetes control showed greater improvement in glycemic control for the intervention group compared to that in the control group, only one study showed a significant difference between the 2 groups.

Conclusions: This analysis indicates that there are few published studies that assessed mHealth interventions among minority populations and focused on weight or diabetes. Although the overall strength of evidence was low for diabetes control, it was moderate for weight loss, and our findings suggest that mHealth and web-based interventions may provide a promising approach for interventions among African American and Hispanic adults who have obesity or diabetes.

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KEYWORDS

mHealth; mobile health; technology; diabetes; obesity; African American; Hispanic

Introduction

Mobile health (mHealth) and web-based technological advances allow for new approaches to delivering behavioral interventions for chronic diseases such as obesity and diabetes [1,2]. These are tailored interventions that supplement or augment in-person contact or office visits through activities such as text messaging, the use of downloadable apps with real time feedback, and other mobile technologies [3,4]. mHealth and web-based interventions are easily accessible because a large proportion of Americans have access to a mobile phone and the internet [5,6].

African American and Hispanic adults experience a disproportionate burden of major chronic diseases, have a high prevalence of diabetes and obesity, and end up with worse health outcomes compared to their White counterparts [7]. For instance, African American adults are at a higher risk of obesity than any other racial or ethnic groups, and they are more likely to have uncontrolled diabetes, develop diabetic retinopathy and end stage renal disease, and have a higher diabetes-related mortality rate than non-Hispanic White adults [8-10]. The management of these health conditions can be challenging for patients since a high level of health literacy and numeracy is required for the self-administration of insulin doses, medications, and the maintenance of a healthy diet. This is compounded with limited access to care or very brief clinic visits with limited time for engagement to fully discuss and understand the disease process or treatment plan [11].

mHealth and web-based technology can mitigate some of these access issues and treatment challenges by providing pertinent information for patients with regard to their condition and offering elements such as monitoring of blood glucose levels and insulin dose adjustment, carbohydrate and calorie counting, and physical activities, which can be incorporated into their routine to improve outcomes [11]. Several studies on mHealth and web-based technology have shown promise in the management of diabetes and obesity [12-14]. A number of systematic reviews have suggested significant benefits of mobile or web-based interventions that target physical activity, diet, and diabetes [15-17]. However, these reviews did not specifically focus on underrepresented racial and ethnic minorities such as African American or Hispanic individuals [18-20]. One systematic review that examined participation of African American adults in mHealth interventions focused on recruitment and retention strategies [21]. Another systematic review that examined the effect of health information technology-based diabetes self-management education interventions on medically underserved patients with diabetes included a broader range of technology including computer software with no internet and telemedicine [22].

Furthermore, minority populations such as African American adults are known to be underrepresented in mHealth research despite existing health disparities [21]. mHealth and web-based technology interventions have the potential to reach patients who may have significant barriers to accessing health care the traditional way. A large proportion of underserved minority populations have ownership of a smartphone and access the internet on their mobile device on a daily basis [23]. African

American and Hispanic adults, compared to non-Hispanic White adults, have been shown to use mobile phones and text messages for a wider range of functions such as purchasing products, using social network sites, and web-based banking [24], which suggests that they may be more receptive to mHealth interventions, thus bridging the health care access divide.

While a growing body of literature supports the ease and effectiveness of mHealth and web-based interventions for diabetes and obesity, to our knowledge, no systematic review has evaluated the effectiveness of such interventions for improving health outcomes of African American and Hispanic patients. The objective of this study is to provide a review of the evidence for mHealth and web-based interventions for diabetes and obesity in African American and Hispanic patients.

Methods

Search Strategy and Data Sources

Our literature search was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [25]. We searched for published literature in electronic literature databases PubMed/Medline, The Cochrane Library, EMBASE, CINAHL Plus, Web of Science, Global Health, Scopus, and Library & Information Science Source for unpublished studies, using ClinicalTrials.gov.

A research librarian performed searches for English-language articles on human adults in scientific journals (aged ≥ 18 years), which combined terms for (1) minority population terms, (2) mHealth intervention terms, and (3) chronic condition terms for type 2 diabetes mellitus and obesity. The last search was conducted on September 23, 2020. Searches were limited by study design to controlled trials. [Multimedia Appendix 1](#) provides full details regarding the search terms. Studies were included if they met the eligibility criteria ([Table 1](#)). Selected studies were either randomized controlled trials or nonrandomized controlled trials, and study participants had to be either African American or Hispanic individuals in the United States. Studies were also included if at least 30% of participants were African American adults, Hispanic adults, or a mixture of both minority groups. The intervention was any mobile or web-based health intervention including cellular phone calls, text messaging (SMS or MMS), and web-based applications or downloadable mobile apps that targeted management for diabetes and obesity.

Studies with any of the aforementioned interventions in combination with other types of activities such as keeping a journal of meals or extra group or one-on-one coaching were also included. Studies that focused on patients with diabetes or overweight with other health conditions as a group such as stroke, pregnancy, or depression were excluded from this study. There was no limit on the publication time, duration of the intervention, or participants' age. For this review, primary outcomes of interest were objective measures related to obesity and diabetes, including BMI, weight change, waist circumference, or hemoglobin A_{1c}, which is a standard measure of glycemic control in patients with diabetes.

Table 1. Eligibility criteria.

Category	Include	Exclude
Population	Studies focused on African American or Hispanic adults and studies in which African American or Hispanic adults comprise $\geq 30\%$ of the study population. All age groups.	Studies in which $<30\%$ of the population comprises African American or Hispanic adults and special populations such as pregnant women.
Intervention	Controlled trials with any mobile phone and web-based intervention including text messages (SMS or MMS), downloadable apps, use of other hand-held devices, or the internet. Duration of the intervention, frequency of contact, time of the day, expected response or action from participants with each contact such as note or log recording or reply to text message.	N/A ^a
Comparators	Usual care including face-to-face coaching, handouts, and no intervention	Comparative effectiveness studies or studies in which both the intervention and control groups had any form of mobile phone or web-based intervention. Studies in which treatment and control groups differed by other interventions besides the intervention delivered by mobile phones or the web (for instance, the intervention group also attends a group class and control group receives phone calls)
Outcome(s)	Hemoglobin A _{1c} , BMI, weight, and waist circumference.	N/A
Timing	No limit	N/A
Setting	Studies performed in the United States	Studies performed in other countries
Study Designs	Randomized and nonrandomized controlled trials (includes pilot studies)	Cohort studies, case-control studies, case series, and meta-analyses

^aN/A: not applicable.

Study Selection and Data Extraction

Two reviewers (CE and MH) extracted the data, and each reviewer independently extracting data from all studies. Extracted elements included the following: publication date, authors, study aims and objectives, study design, number of participants in the intervention and control arms, components and duration of the intervention, and results of the study. Outcome measures were extracted at all timepoints for studies that included multiple assessments. Reviewers checked each other's extractions for accuracy and completeness. Discrepancies were discussed until arrival at an agreement and when necessary, a third reviewer was involved.

Risk of Bias Assessment, Data Synthesis, and Analysis

Each included study was assessed for risk of bias, using the Cochrane tool for risk of bias in randomized trials [26]. The following domains were assessed for risk of bias: selection bias (including the method of randomization and allocation concealment), detection bias, attrition bias, and reporting bias. Studies were rated as low risk, high risk, or unclear risk. Unclear

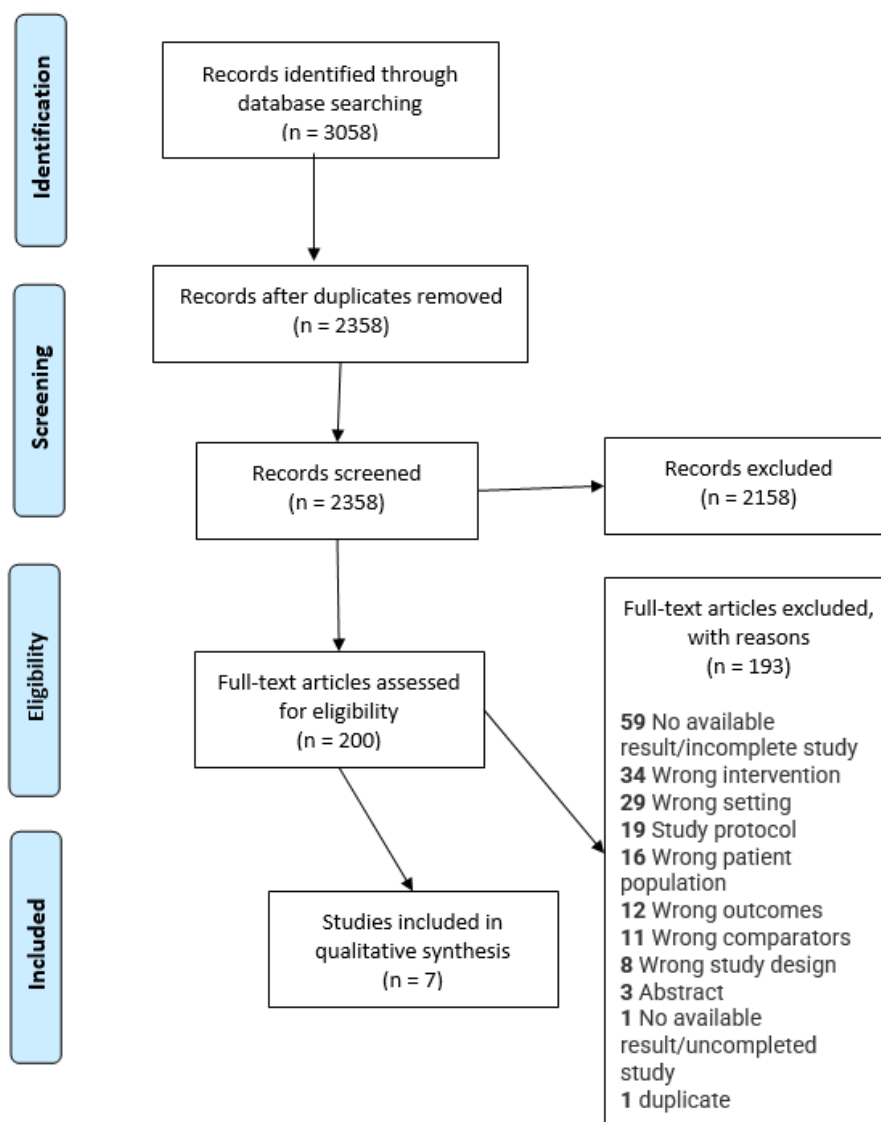
risk of bias was assigned to a study if there was uncertainty or lack of information.

We summarized our findings for each question in tabular and narrative format. We did not conduct a meta-analysis owing to the limited number of studies that met the inclusion criteria. The overall strength of the evidence (SOE) was assessed as high, moderate, low, or insufficient on the basis of the overall risk of bias of included studies, the consistency of findings across studies, directness, precision, and other limitations [27].

Results

Search Strategy and Data Sources

The combined search strategies yielded 2358 electronic citations, which were screened to assess for eligibility (Figure 1). In total, 200 studies were found to be potentially eligible, and their full texts were obtained for further assessment. Of these, 7 studies met the eligibility criteria. The top 4 reasons for rejecting other studies were primarily unavailability of results or incompleteness of studies, incorrect patient population, incorrect intervention, and incorrect setting.

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart for study selection.

Study Selection and Data Extraction

The primary aim of 5 studies was to evaluate the effectiveness of an mHealth intervention for weight loss or diabetes, while 2 studies included an evaluation of the feasibility and acceptability of the mHealth intervention as their primary aim. All included studies were randomized control trials [1,2,12,28-31]. Included studies focused on diabetes control (2 trials) [12,28], obesity and weight loss (4 trials) [2,29-31], or both diabetes and obesity (1 trial) [1].

The total number of participants in all studies was 942, with sample sizes ranging from 18 to 371. Three studies had all African American or Hispanic participants, and the other 3 studies had greater than 30% of participants who identified as

African American or Hispanic minorities. Study durations ranged from 3 months to 12 months. Mean participant ages across studies ranged from 24 to 53 years. BMI of the participants ranged from 31.5 to 38.0. Mean hemoglobin A_{1c} values for the diabetes studies ranged from 9.02% to 10.2%.

All studies had mobile phones and SMS text messaging as the main mHealth device and medium of communication (Table 2). SMS text messages were sent to participants anywhere from 2-3 times a day to 3-4 times a week. Mobile technology was applied in several ways including medication reminders, prompts for blood glucose check, provision of motivational messages, education on healthy eating patterns, eating cues, and links to other resources and social support.

Table 2. Details of intervention and control activities for the included studies.

Study	Study aim	Intervention	Control
Agboola, 2016 [12]	To evaluate the effectiveness on sending daily physical activity–focused text messages in patients with diabetes compared with no text message on physical activity. Furthermore, an evaluation of the effectiveness of the intervention on hemoglobin A _{1c} level, weight change, physical activity, engagement, usability, and satisfaction with the intervention	Participants received a minimum of two automated text messages per day in addition to pedometers—one message in the morning and the other in the evening for 6 months. Messages provided coaching that was dependent on pedometer-captured step counts and physical activity goals target set during the initial visit. Messages received in the morning gave feedback based on activities of the previous day, and messages on other times of the day focused on different coaching themes. Some messages were interactive and focused on elements such as food intake, health status, physical activity, and satisfaction with the program	Pedometers
Arora, 2014 [28]	To evaluate an mHealth intervention for resource-poor emergency department patients with diabetes	Patients received 2 SMS text messages delivered at 9 AM and 5 PM to their mobile phones daily for 6 months. Messages of four categories were sent: one educational/motivational message per day, 3 medication reminders per week, 2 healthy living challenges per week, and 2 trivia messages per week and sent out in question form with the answer sent out an hour later	Usual care (details not provided)
Fortmann, 2017 [1]	To investigate the glycemic effectiveness of a culturally tailored SMS-based diabetes self-management education and support intervention (Dulce Digital)	Participants received information on how to receive and send SMS text messages. Those without a mobile phone were given one. Content of text messages were derived from culturally appropriate Diabetes Self-Management Education and Support curriculum. Participants received 2-3 messages a day initially, which was tapered over 6 months. They received ongoing motivational messages, medication reminders, and prompts for blood glucose measurement	Usual care, which includes visits with a primary care physician, certified diabetes educator, and group diabetes self-management education, dependent on patient or provider initiative
Herring, 2014 [29]	To examine the feasibility, acceptability, and initial efficacy of a technology-based weight loss intervention for urban low-income mothers	Six behavioral health strategies were implemented, one at a time for 2-4 weeks. Participants set realistic goals for each strategy and received 15 minutes biweekly calls from a health counselor. They also receive 3-4 text messages weekly, which probed into their adherence with set goals. Participants also received membership to a Facebook group, which provided access to social support and videos/websites for additional resources.	Regular postpartum care, which is typically one visit with their primary care provider or with a provider through the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). This visit is usually between 6 and 8 weeks post partum and involves counseling on lactation, birth control, and depression screening. Participants in the study also received counseling on nutrition and vouchers for food and beverages through WIC.
Lin, 2015 [2]	To investigate a behavioral theory-based mobile health intervention to enhance weight loss in patients with obesity	Automated SMS text message program tailored to participants' selection of 3 relevant goals out of 8 options. Messages were customized to participants' wake, lunch, and sleep times	Initial assessment including 20-minute individual sessions with a dietician, health status review with a study physician, and receiving educational material on diet and activity. They also received a digital pedometer
Phelan, 2017 [30]	To evaluate the effect of an internet-based weight loss program in addition to the WIC program on weight loss for low-income postpartum women	Internet-based weight loss program with setting of caloric and physical activity goals. Provision of weekly lessons, web diary, weight and physical activity tracker, and instructional and inspirational videos. Participants received 4 SMS text messages per week with notification of new website content and provision of motivation, support, and feedback. This was in addition to all elements of the WIC program	Participants received all aspects of the standard WIC program and a newsletter every 2 months with information on exercise, nutrition, and wellness

Study	Study aim	Intervention	Control
Steinberg, 2013 [31]	To evaluate the feasibility of daily text messages for self-monitoring behavioral goals for weight loss among African American women with obesity	Shape plan-tracking of tailored behavior change goals through SMS text messaging. Daily feedback through SMS text messages and weekly feedback by email. At 3 months, participants received skills training information including healthy eating patterns and eating cues to reduce face-to-face contact. At 6 months, a 1-hour face-to-face session that focused on problem-solving, progress assessment, and behavior change	Participants received a health education lesson at the start of the study and at 6 months. They also received a set of videos covering topics on healthy eating and exercise at 3 months, in addition to a pedometer and a prescription to walk 10,000 steps a day

mHealth technology was also used to check on adherence to or progress on set physical activity and dietary goals.

In addition to SMS text messages, 3 studies that focused on obesity had additional activities as part of the intervention. One study included all elements of the Women, Infants, and Children (WIC) program [30], another included 15 minutes biweekly calls from health counselors [29], while the other had a face-to-face 1-hour session at the end of the study, which focused on problem-solving, progress assessment, and behavior change [31].

Obesity trials reported mean weight loss and weight change from baseline, percentage weight loss, and change in BMI. One study reported the proportion of participants who achieved a $\geq 5\%$ weight loss and a $\geq 10\%$ weight loss from baseline. The diabetes trial reported hemoglobin A_{1c}, weight, and BMI of participants at 3 months and 6 months.

Risk of Bias Assessment and Data Synthesis and Analysis

With regard to the risk of bias of studies included, a randomization sequence generation process was reported by all studies. Bias for allocation concealment and selective outcome

reporting were determined to be low for all studies. Only two studies provided information on blinding of personnel and outcome assessors [2,30]. One trial was determined to have a high risk of bias for incomplete data (up to 63.7% missing at 3 months and 41.1% at 6 months after the start of the intervention) [2,29] and another study was unable to assess differences in provider contact time between intervention and control groups [29].

Overall, 3 studies reported significant differences in weight loss between participants in the intervention group and those in the usual care group [2,29,30] (Table 3). Improvement in weight was noted at 3 months, 14 weeks, 6 months, and 12 months. Two studies found no significant difference in weight loss between groups [1,31].

For the studies that focused on diabetes, all reported an improvement in glycemic control in participants in intervention groups compared to those in control groups [1,12,28], but only one recorded a significant improvement at 6 months [1].

Overall, some evidence supports the efficacy of mHealth and web-based interventions for weight loss among obese African American and Hispanic adults (moderate SOE; Table 4).

Table 3. Outcomes of the included studies.

Study participants and sample sizes	Outcome	Baseline data	Result	P value
Agboola, 2016 [12]				
126 English- or Spanish-speaking adults with type 2 diabetes and a hemoglobin A _{1c} value of >7.0%	Hemoglobin A _{1c} value at 6 months (SD)	<ul style="list-style-type: none"> Control: mean hemoglobin A_{1c} 8.38% (SD 1.37%) Intervention: mean hemoglobin A_{1c} 9.02% (SD 1.63%) 	<ul style="list-style-type: none"> Control: mean hemoglobin A_{1c} 8.17% (SD 1.6%) Intervention: mean hemoglobin A_{1c} 8.59% (SD 1.6%) 	.14
Arora, 2014 [28]				
128 adults with poorly controlled diabetes	Median change in hemoglobin A _{1c} at 6 months (95% CI)	<ul style="list-style-type: none"> Control: mean hemoglobin A_{1c} 10.0% (SD 1.7%) Intervention: mean hemoglobin A_{1c} 10.2% (SD 1.7%) 	<ul style="list-style-type: none"> Control: median change in hemoglobin A_{1c} -0.60 (95% CI -6.8 to 2.11) Intervention: median change in hemoglobin A_{1c} -1.05 (95% CI -5.9 to 2.8) 	.23
Fortmann, 2017 [1]				
126 Hispanic adults with poor glycemic control	<ul style="list-style-type: none"> Mean hemoglobin A_{1c} at 3 months and 6 months (SD) Mean weight (lbs) and BMI at 3 months and 6 months (SD) Mean BMI (kg/m²) at 3 months and 6 months (SD) 	<ul style="list-style-type: none"> Control: mean hemoglobin A_{1c} 9.6% (SD 1.4%) Intervention: mean hemoglobin A_{1c} 9.5% (SD 1.2%) Control: mean weight 176.4 (SD 41.6) lbs Intervention: mean weight 173.1 (SD 34.6) lbs Control: mean BMI 32.2 (SD 6.6) Intervention: mean BMI 31.5 (SD 6.0) 	<ul style="list-style-type: none"> 3 months <ul style="list-style-type: none"> Control: mean hemoglobin A_{1c} 9.3% (SD 1.9%) Intervention: mean hemoglobin A_{1c} 8.5% (SD 1.2%) 6 months <ul style="list-style-type: none"> Control: mean hemoglobin A_{1c} 9.4% (SD 2.0%) Intervention: mean hemoglobin A_{1c} 8.5% (SD 1.2%) 3 months <ul style="list-style-type: none"> Control: mean weight 174.2 (SD 39.7) lbs Intervention: mean weight 176.2 (SD 33.0) lbs 6 months <ul style="list-style-type: none"> Control: mean weight 175.2 (SD 41.6) lbs Intervention: mean weight 174.1 (SD 27.8) lbs 3 months <ul style="list-style-type: none"> Control: mean BMI 32 (SD 6.1) Intervention: mean BMI 31.7 (SD 5.2) 6 months <ul style="list-style-type: none"> Control: mean BMI 32.1 (SD 6.6) Intervention: mean BMI 31.9 (SD 5.4) 	.03
Herring 2014 [29]				
18 adult women with singleton infants delivered within the last 2 weeks to 12 months	Mean weight loss (kg) at 14 weeks (SD)	<ul style="list-style-type: none"> No baseline weight data 	<ul style="list-style-type: none"> Control: mean weight loss 0.5 (SD 2.3) kg Intervention: mean weight loss 2.9 (SD 3.6) kg 	.04
Lin, 2015 [2]				

Study participants and sample sizes	Outcome	Baseline data	Result	P value
124 African Americans adults	Mean weight loss (kg) from baseline (95% CI)	<ul style="list-style-type: none"> Control: mean weight loss 101.2 kg (95% CI 95.7 kg to 106.7 kg) Intervention: mean weight loss 101.8 kg (95% CI 96.4 kg to 107.2 kg) 	<ul style="list-style-type: none"> 3 months <ul style="list-style-type: none"> Control: mean weight loss -0.2 kg (95% CI -1.0 kg to 0.7 kg) Intervention: mean weight loss -2.6 kg (95% CI -3.8 kg to -1.5 kg) 6 months <ul style="list-style-type: none"> Control: mean weight loss -0.2 kg (95% CI -1.4 kg to 1.0 kg) Intervention: mean weight loss -3.7 kg (95% CI -5.3 kg to -2.1 kg) 	<.001 (3 months); .001 (6 months)
Phela, 2017 [30]				
371 Hispanic adult women monitored 6 weeks to 12 months post partum	Mean weight change (kg) at 6 and 12 months (95% CI)	<ul style="list-style-type: none"> Control: mean weight change 82.4 kg (95% CI 77.9 kg to 87.1 kg) Intervention: mean weight change 82.5 kg (95% CI 77.5 kg to 87.5 kg) 	<ul style="list-style-type: none"> 6 months <ul style="list-style-type: none"> Control: mean weight change -1.0 kg (95% CI -1.8 kg to -0.2 kg) Intervention: mean weight change -3.1 kg (95% CI -4.0 kg to -2.3 kg) 12 months <ul style="list-style-type: none"> Control: mean weight change -0.9 kg (95% CI -1.7 kg to -0.1 kg) Intervention: mean weight change -3.2 kg (95% CI -4.1 kg to -2.4 kg) 	<.001
Steinberg, 2013 [31]				
50 African American women with obesity	<ul style="list-style-type: none"> Mean weight change (kg) at 6 months (SD) Mean change in BMI (kg/m²) (SD) 	<ul style="list-style-type: none"> Control: mean weight change 96.0 (SD 23.1) kg Intervention: mean weight change 102.0 (SD 16.6) kg Control: mean BMI change 34.6 (SD 5.8) Intervention: mean BMI change 36.9 (SD 6.2) 	<ul style="list-style-type: none"> Control: mean weight change 1.14 (SD 2.53) kg Intervention: mean weight change -1.27 (SD 6.51) kg Control: mean BMI change 0.42 (SD 0.90) Intervention: mean BMI change -0.47 (SD 2.42) 	.09

Table 4. Overall strength of the evidence.

Outcome	Studies (observations), n	Summary of findings	Consistency, directness, and precision	Limitations (including reporting bias)	Overall strength of evidence	Applicability
Weight	5 [1,2,29-31] (689)	Increased weight loss noted in all intervention groups but significant in only 3 studies. One high-quality study [30] (n=371) reported a significant difference in weight change between participants in the intervention and those in the control group	Consistent, indirect, and precise	Two studies had a high risk of bias for nonblinding of study personnel, participants, and outcome assessors. One study had a high risk of bias for incomplete data	Moderate	African American and Hispanic adults with obesity or morbid obesity, who are young and middle-aged adults, and have access to a mobile phone
Hemoglobin A _{1c}	3 [1,12,28] (380)	Improvement in hemoglobin A _{1c} in the intervention groups but only significant in one study	Consistent, indirect, and imprecise	Studies had a high risk of bias from the nonblinding of study personnel and participants. One study also had a high risk of bias from the nonblinding of outcome assessors and the other study had an unclear risk of bias for the same	Low	African American or Hispanic adults with poorly controlled diabetes and access to a mobile phone

Discussion

Principal Findings

We identified 7 trials that reported the benefit of mHealth interventions directed toward obesity and diabetes among African American and Hispanic adults. We found an association between receiving the mHealth intervention and weight loss compared to those in control groups, which suggests that mHealth and web-based interventions are effective for minority patients who are overweight. Of the three studies that addressed diabetes, only one reported an improvement in hemoglobin A_{1c} among those who received mHealth interventions compared to their control group counterparts, suggesting that the evidence may be unclear for the role of mHealth interventions in diabetes control among patients in ethnic minorities. This systematic review shows that mHealth and web-based interventions for 6 months to a year can be effective for weight loss in African American and Hispanic adults.

Our findings in support of mHealth interventions for weight loss among patients in ethnic minorities are similar to those of other studies [32-34]. A systematic review by Ryan et al [32] reported that mHealth intervention for weight loss is beneficial, while the systematic review and meta-analysis by Sorgente et al [33] was more specific in suggesting that web-based interventions are more effective than usual care or minimal intervention, but the evidence is conflicting with regard to the benefit of web-based interventions compared to non-web-based interventions. In our systematic review, of the 3 studies that reported significant weight loss in the intervention group, one of them had a control group that received usual care, while control group participants in the other 2 studies had comparable non-mHealth interventions. Beilegoli et al [34] suggest that

web-based interventions only lead to a short-term weight loss but provide no evidence for weight loss over a long period of time. The longest study duration in our review was 12 months. Studies beyond 12 months, which met our inclusion criteria, were not found, and it is unclear if participants will remain in an intervention of this kind for longer than a period of a year. Changes in diet and activity patterns during holiday periods, the challenge or burden of adherence to self-monitoring over a long period of time, and the need for coaching in addition to self-monitoring have been suggested as reasons for the difficulty in maintaining the long-term effects of mHealth interventions for obesity and weight loss [35,36].

We also observed an improvement in hemoglobin A_{1c} with mHealth interventions compared to those with usual care. Our findings are similar to those of other studies that have shown improved glycemic control with mHealth interventions in the general population [12,14,36], except that only one study in this review showed a significant difference at 6 months. Another systematic review showed an improvement in 42% of studies in the review [37]. One major finding noted in the diabetes studies in this review was that the study with significant results incorporated culturally appropriate messages as part of their intervention [1]. Even with the improvements noted, it is unclear if outcomes would be significantly better if mHealth and web-based interventions have improved usability. African American and Hispanic adults have been found to be less adherent to interventions with technology [38,39]. Better outcomes have been noted in studies where the intervention was developed to be more appealing to the target minority population [40]. The lack of cultural consistency and application has been noted as a major challenge with mHealth and web-based interventions, which can influence results and

outcomes [37,41]. Furthermore, some studies have shown that diabetes mHealth programs do not always meet health literacy guidelines, and they are not as user-friendly [42]. The design of some mHealth apps makes it challenging for some groups of people. For instance, Hispanic patients with diabetes who use apps are more likely to use certain functionalities such as medication and blood glucose diaries and less likely to use diaries developed for insulin and hemoglobin A_{1c} [43].

Another important finding from this study is the limited number of studies with African American and Hispanic adults in mHealth interventions for obesity and diabetes. The underrepresentation of participants from minority groups in research studies has been well-documented [44-46] and is reflective in this review. Several reasons have been cited for this, including barriers related to misconceptions or lack of information, mistrust, concerns about outcomes, stigmatization, insurance coverage, and immigration status in the United States [46-48]. More studies focused on mHealth interventions for African American and Hispanic adults with diabetes and obesity will augment the current evidence on the role of mHealth interventions for chronic disease management. This may also contribute to reducing the disparities gap that currently exist in the health care system.

Limitations

The limited number of studies with primarily African American and Hispanic participants is a limitation of this study, which has also been observed in several other studies [21]. Another limitation is our study inclusion criteria. This review focused on African American and Hispanic participants and only included studies with ≥30% of the participants of interest. The

team considered a set of less rigid inclusion criteria but decided against it since greater the proportion of African American or Hispanic participants, greater the ability to make conclusions specifically about the effectiveness of mHealth interventions on these racial groups in these studies. While all included studies involved mobile phones and SMS text messages, they differed in the content of the intervention, sample sizes, and study duration. The absence of studies with data beyond 12 months is also a limitation. Obesity and diabetes are chronic conditions that require long-term management and lifestyle modification. Furthermore, although some studies that met our inclusion criteria showed significant changes, it is unclear whether these translate to clinical significance.

Conclusions

Although the overall strength of the evidence was moderate for weight loss and low for diabetes, our findings suggest that mHealth and web-based interventions may provide a promising approach. mHealth technology can be used to meet different health needs such as the delivery of motivational messages, health education, prompts or reminders, and personal coaching [49]. Further studies are required to fully understand the role of mHealth interventions in chronic disease management in minority patients. These findings are significant because minority patients bear a heavy burden of diabetes and obesity in the United States. mHealth and web-based interventions have the potential to assist medical providers as they provide care to patients with chronic disease and improve health disparities. Further research to better understand how mHealth and web-based interventions can help overcome challenges or barriers to chronic disease management and will be very useful.

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Conflicts of Interest

None declared.

Multimedia Appendix 1

Search terms.

[\[PDF File \(Adobe PDF File\). 611 KB-Multimedia Appendix 1\]](#)

References

1. Fortmann AL, Gallo L, Garcia M, Taleb M, Euyoque JA, Clark T, et al. Dulce Digital: An mHealth SMS-Based Intervention Improves Glycemic Control in Hispanics With Type 2 Diabetes. *Diabetes Care* 2017 Oct;40(10):1349-1355 [FREE Full text] [doi: [10.2337/dc17-0230](https://doi.org/10.2337/dc17-0230)] [Medline: [28600309](https://pubmed.ncbi.nlm.nih.gov/28600309/)]
2. Lin M, Mahmooth Z, Dedhia N, Frutchey R, Mercado CE, Epstein DH, et al. Tailored, interactive text messages for enhancing weight loss among African American adults: the TRIMM randomized controlled trial. *Am J Med* 2015 Aug;128(8):896-904. [doi: [10.1016/j.amjmed.2015.03.013](https://doi.org/10.1016/j.amjmed.2015.03.013)] [Medline: [25840035](https://pubmed.ncbi.nlm.nih.gov/25840035/)]
3. Ybarra M, Bağcı Bosi AT, Korchmaros J, Emri S. A text messaging-based smoking cessation program for adult smokers: randomized controlled trial. *J Med Internet Res* 2012 Dec 27;14(6):e172 [FREE Full text] [doi: [10.2196/jmir.2231](https://doi.org/10.2196/jmir.2231)] [Medline: [23271159](https://pubmed.ncbi.nlm.nih.gov/23271159/)]
4. Whittaker R, McRobbie H, Bullen C, Rodgers A, Gu Y. Mobile phone-based interventions for smoking cessation. *Cochrane Database Syst Rev* 2016 Apr 10;4:CD006611 [FREE Full text] [doi: [10.1002/14651858.CD006611.pub4](https://doi.org/10.1002/14651858.CD006611.pub4)] [Medline: [27060875](https://pubmed.ncbi.nlm.nih.gov/27060875/)]

5. Shaw R, Bosworth H. Short message service (SMS) text messaging as an intervention medium for weight loss: A literature review. *Health Informatics J* 2012 Dec;18(4):235-250 [[FREE Full text](#)] [doi: [10.1177/1460458212442422](https://doi.org/10.1177/1460458212442422)] [Medline: [23257055](https://pubmed.ncbi.nlm.nih.gov/23257055/)]
6. Stephens J, Allen J. Mobile phone interventions to increase physical activity and reduce weight: a systematic review. *J Cardiovasc Nurs* 2013;28(4):320-329 [[FREE Full text](#)] [doi: [10.1097/JCN.0b013e318250a3e7](https://doi.org/10.1097/JCN.0b013e318250a3e7)] [Medline: [22635061](https://pubmed.ncbi.nlm.nih.gov/22635061/)]
7. Weinstock RS, Teresi J, Goland R, Izquierdo R, Palmas W, Eimicke JP, IDEATel Consortium. Glycemic control and health disparities in older ethnically diverse underserved adults with diabetes: five-year results from the Informatics for Diabetes Education and Telemedicine (IDEATel) study. *Diabetes Care* 2011 Feb;34(2):274-279 [[FREE Full text](#)] [doi: [10.2337/dc10-1346](https://doi.org/10.2337/dc10-1346)] [Medline: [21270184](https://pubmed.ncbi.nlm.nih.gov/21270184/)]
8. Petersen R, Pan L, Blanck HM. Racial and Ethnic Disparities in Adult Obesity in the United States: CDC's Tracking to Inform State and Local Action. *Prev Chronic Dis* 2019 Apr 11;16:E46 [[FREE Full text](#)] [doi: [10.5888/pcd16.180579](https://doi.org/10.5888/pcd16.180579)] [Medline: [30974071](https://pubmed.ncbi.nlm.nih.gov/30974071/)]
9. Golden SH, Brown A, Cauley J, Chin MH, Gary-Webb TL, Kim C, et al. Health disparities in endocrine disorders: biological, clinical, and nonclinical factors--an Endocrine Society scientific statement. *J Clin Endocrinol Metab* 2012 Sep;97(9):E1579-E1639 [[FREE Full text](#)] [doi: [10.1210/jc.2012-2043](https://doi.org/10.1210/jc.2012-2043)] [Medline: [22730516](https://pubmed.ncbi.nlm.nih.gov/22730516/)]
10. Lanting LC, Joung I, Mackenbach J, Lamberts SWJ, Bootsma AH. Ethnic differences in mortality, end-stage complications, and quality of care among diabetic patients: a review. *Diabetes Care* 2005 Sep;28(9):2280-2288. [doi: [10.2337/diacare.28.9.2280](https://doi.org/10.2337/diacare.28.9.2280)] [Medline: [16123507](https://pubmed.ncbi.nlm.nih.gov/16123507/)]
11. Shan R, Sarkar S, Martin SS. Digital health technology and mobile devices for the management of diabetes mellitus: state of the art. *Diabetologia* 2019 Jun;62(6):877-887. [doi: [10.1007/s00125-019-4864-7](https://doi.org/10.1007/s00125-019-4864-7)] [Medline: [30963188](https://pubmed.ncbi.nlm.nih.gov/30963188/)]
12. Agboola S, Jethwani K, Lopez L, Searl M, O'Keefe S, Kvedar J. Text to Move: A Randomized Controlled Trial of a Text-Messaging Program to Improve Physical Activity Behaviors in Patients With Type 2 Diabetes Mellitus. *J Med Internet Res* 2016 Nov 18;18(11):e307 [[FREE Full text](#)] [doi: [10.2196/jmir.6439](https://doi.org/10.2196/jmir.6439)] [Medline: [27864165](https://pubmed.ncbi.nlm.nih.gov/27864165/)]
13. Bennett GG, Steinberg D, Askew S, Levine E, Foley P, Batch BC, et al. Effectiveness of an App and Provider Counseling for Obesity Treatment in Primary Care. *Am J Prev Med* 2018 Dec;55(6):777-786 [[FREE Full text](#)] [doi: [10.1016/j.amepre.2018.07.005](https://doi.org/10.1016/j.amepre.2018.07.005)] [Medline: [30361140](https://pubmed.ncbi.nlm.nih.gov/30361140/)]
14. Stephens JD, Yager AM, Allen J. Smartphone Technology and Text Messaging for Weight Loss in Young Adults: A Randomized Controlled Trial. *J Cardiovasc Nurs* 2017;32(1):39-46 [[FREE Full text](#)] [doi: [10.1097/JCN.0000000000000307](https://doi.org/10.1097/JCN.0000000000000307)] [Medline: [26646593](https://pubmed.ncbi.nlm.nih.gov/26646593/)]
15. Palmer M, Sutherland J, Barnard S, Wynne A, Rezel E, Doel A, et al. The effectiveness of smoking cessation, physical activity/diet and alcohol reduction interventions delivered by mobile phones for the prevention of non-communicable diseases: A systematic review of randomised controlled trials. *PLoS One* 2018;13(1):e0189801 [[FREE Full text](#)] [doi: [10.1371/journal.pone.0189801](https://doi.org/10.1371/journal.pone.0189801)] [Medline: [29304148](https://pubmed.ncbi.nlm.nih.gov/29304148/)]
16. Afshin A, Babalola D, Mclean M, Yu Z, Ma W, Chen C, et al. Information Technology and Lifestyle: A Systematic Evaluation of Internet and Mobile Interventions for Improving Diet, Physical Activity, Obesity, Tobacco, and Alcohol Use. *J Am Heart Assoc* 2016 Aug 31;5(9):e003058 [[FREE Full text](#)] [doi: [10.1161/JAHA.115.003058](https://doi.org/10.1161/JAHA.115.003058)] [Medline: [27581172](https://pubmed.ncbi.nlm.nih.gov/27581172/)]
17. Schoeppe S, Alley S, Van Lippevelde W, Bray NA, Williams SL, Duncan MJ, et al. Efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour: a systematic review. *Int J Behav Nutr Phys Act* 2016 Dec 07;13(1):127 [[FREE Full text](#)] [doi: [10.1186/s12966-016-0454-y](https://doi.org/10.1186/s12966-016-0454-y)] [Medline: [27927218](https://pubmed.ncbi.nlm.nih.gov/27927218/)]
18. Isaacs T, Hunt D, Ward D, Rooshenas L, Edwards L. The Inclusion of Ethnic Minority Patients and the Role of Language in Telehealth Trials for Type 2 Diabetes: A Systematic Review. *J Med Internet Res* 2016 Sep 26;18(9):e256 [[FREE Full text](#)] [doi: [10.2196/jmir.6374](https://doi.org/10.2196/jmir.6374)] [Medline: [27670360](https://pubmed.ncbi.nlm.nih.gov/27670360/)]
19. Jackson CL, Bolen S, Brancati FL, Batts-Turner ML, Gary TL. A systematic review of interactive computer-assisted technology in diabetes care. *Interactive information technology in diabetes care. J Gen Intern Med* 2006 Feb;21(2):105-110 [[FREE Full text](#)] [doi: [10.1111/j.1525-1497.2005.00310.x](https://doi.org/10.1111/j.1525-1497.2005.00310.x)] [Medline: [16390512](https://pubmed.ncbi.nlm.nih.gov/16390512/)]
20. Ford JG, Howerton MW, Lai GY, Gary TL, Bolen S, Gibbons MC, et al. Barriers to recruiting underrepresented populations to cancer clinical trials: a systematic review. *Cancer* 2008 Jan 15;112(2):228-242 [[FREE Full text](#)] [doi: [10.1002/cncr.23157](https://doi.org/10.1002/cncr.23157)] [Medline: [18008363](https://pubmed.ncbi.nlm.nih.gov/18008363/)]
21. James DC, Harville C, Sears C, Efunbumi O, Bondoc I. Participation of African Americans in e-Health and m-Health Studies: A Systematic Review. *Telemed J E Health* 2017 May;23(5):351-364. [doi: [10.1089/tmj.2016.0067](https://doi.org/10.1089/tmj.2016.0067)] [Medline: [27792475](https://pubmed.ncbi.nlm.nih.gov/27792475/)]
22. Heitkemper EM, Mamykina L, Travers J, Smaldone A. Do health information technology self-management interventions improve glycemic control in medically underserved adults with diabetes? A systematic review and meta-analysis. *J Am Med Inform Assoc* 2017 Sep 01;24(5):1024-1035 [[FREE Full text](#)] [doi: [10.1093/jamia/ocx025](https://doi.org/10.1093/jamia/ocx025)] [Medline: [28379397](https://pubmed.ncbi.nlm.nih.gov/28379397/)]
23. Stockman M, Modzelewski K, Steenkamp D. Mobile Health and Technology Usage by Patients in the Diabetes, Nutrition, and Weight Management Clinic at an Urban Academic Medical Center. *Diabetes Technol Ther* 2019 Jul;21(7):400-405. [doi: [10.1089/dia.2018.0369](https://doi.org/10.1089/dia.2018.0369)] [Medline: [31045447](https://pubmed.ncbi.nlm.nih.gov/31045447/)]
24. Zickuhr K, Smith A. Digital differences. Pew Research Center. 2012 Apr 13. URL: <https://www.pewresearch.org/internet/2012/04/13/digital-differences/> [accessed 2020-06-24]

25. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015 Jan 01;4:1 [[FREE Full text](#)] [doi: [10.1186/2046-4053-4-1](https://doi.org/10.1186/2046-4053-4-1)] [Medline: [25554246](#)]
26. Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, Cochrane Bias Methods Group, Cochrane Statistical Methods Group. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011 Oct 18;343:d5928 [[FREE Full text](#)] [doi: [10.1136/bmj.d5928](https://doi.org/10.1136/bmj.d5928)] [Medline: [22008217](#)]
27. Berkman ND, Lohr KN, Ansari M, McDonagh M, Balk E, Whitlock E, et al. Grading the Strength of a Body of Evidence When Assessing Health Care Interventions for the Effective Health Care Program of the Agency for Healthcare Research and Quality: An Update. In: *Methods Guide for Effectiveness and Comparative Effectiveness Reviews*. Rockville, MD: Agency for Healthcare Research and Quality; 2008.
28. Arora S, Peters AL, Burner E, Lam CN, Menchine M. Trial to examine text message-based mHealth in emergency department patients with diabetes (TEXT-MED): a randomized controlled trial. *Ann Emerg Med* 2014 Jun;63(6):745-54.e6. [doi: [10.1016/j.annemergmed.2013.10.012](https://doi.org/10.1016/j.annemergmed.2013.10.012)] [Medline: [24225332](#)]
29. Herring SJ, Cruice JF, Bennett GG, Davey A, Foster GD. Using technology to promote postpartum weight loss in urban, low-income mothers: a pilot randomized controlled trial. *J Nutr Educ Behav* 2014;46(6):610-615 [[FREE Full text](#)] [doi: [10.1016/j.jneb.2014.06.002](https://doi.org/10.1016/j.jneb.2014.06.002)] [Medline: [25069621](#)]
30. Phelan S, Hagobian T, Brannen A, Hatley KE, Schaffner A, Muñoz-Christian K, et al. Effect of an Internet-Based Program on Weight Loss for Low-Income Postpartum Women: A Randomized Clinical Trial. *JAMA* 2017 Jun 20;317(23):2381-2391 [[FREE Full text](#)] [doi: [10.1001/jama.2017.7119](https://doi.org/10.1001/jama.2017.7119)] [Medline: [28632867](#)]
31. Steinberg DM, Levine EL, Askew S, Foley P, Bennett GG. Daily text messaging for weight control among racial and ethnic minority women: randomized controlled pilot study. *J Med Internet Res* 2013 Nov 18;15(11):e244 [[FREE Full text](#)] [doi: [10.2196/jmir.2844](https://doi.org/10.2196/jmir.2844)] [Medline: [24246427](#)]
32. Ryan K, Dockray S, Linehan C. A systematic review of tailored eHealth interventions for weight loss. *Digit Health* 2019;5:2055207619826685 [[FREE Full text](#)] [doi: [10.1177/2055207619826685](https://doi.org/10.1177/2055207619826685)] [Medline: [30783535](#)]
33. Sorgente A, Pietrabissa G, Manzoni GM, Re F, Simpson S, Perona S, et al. Web-Based Interventions for Weight Loss or Weight Loss Maintenance in Overweight and Obese People: A Systematic Review of Systematic Reviews. *J Med Internet Res* 2017 Jun 26;19(6):e229 [[FREE Full text](#)] [doi: [10.2196/jmir.6972](https://doi.org/10.2196/jmir.6972)] [Medline: [28652225](#)]
34. Beleigoli AM, Andrade AQ, Cançado AG, Paulo MN, Diniz MDFH, Ribeiro AL. Web-Based Digital Health Interventions for Weight Loss and Lifestyle Habit Changes in Overweight and Obese Adults: Systematic Review and Meta-Analysis. *J Med Internet Res* 2019 Jan 08;21(1):e298 [[FREE Full text](#)] [doi: [10.2196/jmir.9609](https://doi.org/10.2196/jmir.9609)] [Medline: [30622090](#)]
35. Burke LE, Styn MA, Sereika SM, Conroy MB, Ye L, Glanz K, et al. Using mHealth technology to enhance self-monitoring for weight loss: a randomized trial. *Am J Prev Med* 2012 Jul;43(1):20-26 [[FREE Full text](#)] [doi: [10.1016/j.amepre.2012.03.016](https://doi.org/10.1016/j.amepre.2012.03.016)] [Medline: [22704741](#)]
36. Pretlow RA, Stock CM, Allison S, Roeger L. Treatment of child/adolescent obesity using the addiction model: a smartphone app pilot study. *Child Obes* 2015 Jun;11(3):248-259 [[FREE Full text](#)] [doi: [10.1089/chi.2014.0124](https://doi.org/10.1089/chi.2014.0124)] [Medline: [25760813](#)]
37. Hamine S, Gerth-Guyette E, Faulx D, Green BB, Ginsburg AS. Impact of mHealth chronic disease management on treatment adherence and patient outcomes: a systematic review. *J Med Internet Res* 2015 Feb 24;17(2):e52 [[FREE Full text](#)] [doi: [10.2196/jmir.3951](https://doi.org/10.2196/jmir.3951)] [Medline: [25803266](#)]
38. Trief PM, Izquierdo R, Eimicke JP, Teresi JA, Goland R, Palmas W, et al. Adherence to diabetes self care for white, African-American and Hispanic American telemedicine participants: 5 year results from the IDEATel project. *Ethn Health* 2013;18(1):83-96. [doi: [10.1080/13557858.2012.700915](https://doi.org/10.1080/13557858.2012.700915)] [Medline: [22762449](#)]
39. Wolin KY, Steinberg DM, Lane IB, Askew S, Greaney ML, Colditz GA, et al. Engagement with eHealth Self-Monitoring in a Primary Care-Based Weight Management Intervention. *PLoS One* 2015;10(10):e0140455 [[FREE Full text](#)] [doi: [10.1371/journal.pone.0140455](https://doi.org/10.1371/journal.pone.0140455)] [Medline: [26469065](#)]
40. Turnbull S, Cabral C, Hay A, Lucas PJ. Health Equity in the Effectiveness of Web-Based Health Interventions for the Self-Care of People With Chronic Health Conditions: Systematic Review. *J Med Internet Res* 2020 Jun 05;22(6):e17849 [[FREE Full text](#)] [doi: [10.2196/17849](https://doi.org/10.2196/17849)] [Medline: [32459632](#)]
41. Wu X, Guo X, Zhang Z. The Efficacy of Mobile Phone Apps for Lifestyle Modification in Diabetes: Systematic Review and Meta-Analysis. *JMIR Mhealth Uhealth* 2019 Jan 15;7(1):e12297 [[FREE Full text](#)] [doi: [10.2196/12297](https://doi.org/10.2196/12297)] [Medline: [30664494](#)]
42. Fu H, McMahon SK, Gross CR, Adam TJ, Wyman JF. Usability and clinical efficacy of diabetes mobile applications for adults with type 2 diabetes: A systematic review. *Diabetes Res Clin Pract* 2017 Sep;131:70-81. [doi: [10.1016/j.diabres.2017.06.016](https://doi.org/10.1016/j.diabres.2017.06.016)] [Medline: [28692830](#)]
43. Williams JP, Schroeder D. Popular Glucose Tracking Apps and Use of mHealth by Latinos With Diabetes: Review. *JMIR Mhealth Uhealth* 2015 Aug 25;3(3):e84 [[FREE Full text](#)] [doi: [10.2196/mhealth.3986](https://doi.org/10.2196/mhealth.3986)] [Medline: [26307533](#)]
44. Miranda J, Nakamura R, Bernal G. Including ethnic minorities in mental health intervention research: a practical approach to a long-standing problem. *Cult Med Psychiatry* 2003 Dec;27(4):467-486. [doi: [10.1023/b:medi.0000005484.26741.79](https://doi.org/10.1023/b:medi.0000005484.26741.79)] [Medline: [14727681](#)]

45. Hussain-Gambles M, Atkin K, Leese B. Why ethnic minority groups are under-represented in clinical trials: a review of the literature. *Health Soc Care Community* 2004 Sep;12(5):382-328. [doi: [10.1111/j.1365-2524.2004.00507.x](https://doi.org/10.1111/j.1365-2524.2004.00507.x)] [Medline: [15373816](https://pubmed.ncbi.nlm.nih.gov/15373816/)]
46. George S, Duran N, Norris K. A systematic review of barriers and facilitators to minority research participation among African Americans, Latinos, Asian Americans, and Pacific Islanders. *Am J Public Health* 2014 Feb;104(2):e16-e31. [doi: [10.2105/AJPH.2013.301706](https://doi.org/10.2105/AJPH.2013.301706)] [Medline: [24328648](https://pubmed.ncbi.nlm.nih.gov/24328648/)]
47. BeLue R, Taylor-Richardson K, Lin J, Rivera A, Grandison D. African Americans and participation in clinical trials: differences in beliefs and attitudes by gender. *Contemp Clin Trials* 2006 Dec;27(6):498-505. [doi: [10.1016/j.cct.2006.08.001](https://doi.org/10.1016/j.cct.2006.08.001)] [Medline: [16962382](https://pubmed.ncbi.nlm.nih.gov/16962382/)]
48. Katz RV, Green BL, Kressin NR, Kegeles SS, Wang MQ, James SA, et al. The legacy of the Tuskegee Syphilis Study: assessing its impact on willingness to participate in biomedical studies. *J Health Care Poor Underserved* 2008 Nov;19(4):1168-1180 [FREE Full text] [doi: [10.1353/hpu.0.0067](https://doi.org/10.1353/hpu.0.0067)] [Medline: [19029744](https://pubmed.ncbi.nlm.nih.gov/19029744/)]
49. Lyles C, Schillinger D, Sarkar U. Connecting the Dots: Health Information Technology Expansion and Health Disparities. *PLoS Med* 2015 Jul;12(7):e1001852 [FREE Full text] [doi: [10.1371/journal.pmed.1001852](https://doi.org/10.1371/journal.pmed.1001852)] [Medline: [26172977](https://pubmed.ncbi.nlm.nih.gov/26172977/)]

Abbreviations

mHealth: mobile health

SOE: strength of the evidence

WIC: Women, Infants, and Children

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