

**Table 1: Published studies of Mobile Health Interventions to Enhance Self-Management of HIV and Non-Communicable Disease in SSA.**

SN	Citation	Type of intervention	Intervention outcome	Study Design	Theoretical Framework	Participants and age group	Country	Intervention strategy	Main Findings
<b>Category 1: HIV Prevention, ART Adherence and Retention of Care</b>									
1	Aunon et al., 2020	Nurse-delivered ART adherence text messaging	ART adherence	Non-randomized pilot study with 12 weeks post intervention follow-up	Information–Motivation–Behavioral Skills (IMB) theoretical framework	23 adult female sex workers	Kenya	23 purposively sampled female sex workers living with HIV participated in 5 FGDs to iteratively develop, format and structure of the nurse-delivered, text-based ART adherence intervention.	Information-oriented text messages addressed concerns and misconceptions about ART adherence and HIV prevention. Messages also reinforced women’s desires to engage in HIV prevention activities.
2	Georgette et al. 2016	Text messaging in HIV care	High adherence to ART	Nonrandomized cohort study	Not mentioned	A sample of 100 participants (59 females and 41 males)	South Africa	The SMS-based ART adherence support program developed and involves a weekly SMS program in reminding HIV patient’s adherence to treatment and appointments.	77% felt the program helped them remember clinic appointments and HIV disclosure outside the home. This clinical SMS adherence program was found to have high patient-perceived usefulness.

3	Ivanova et al. 2019	An ehealth digital peer support platform – ELIMIKA	Improving ART Adherence among HIV Positive Youth	Uncontrolled pre-post-test design	Not mentioned	81 participants (males 36, Females 45) completed the pre- and post-questionnaires.	Kenya	pre- and post-online knowledge and behavior questionnaires, and a mid-term usability survey.	Overall, the participants were satisfied with the main features of the web platform and stated that they would use it again (95%). However, there was not a significant change in knowledge and behavior, but adherence intentions after 3 months intervention period improved.
4	John et al., 2016	weekly voice calls, short text messages/multi-media messages (SMS/MMS) and WhatsApp messages	To enhancing self-care using text messaging for youth living with HIV	One-group pre-test/post-test experimental design	Trans-theoretical Model (TTM)	19 adolescents and young adults (12 males and 7 females)	Nigeria	weekly voice calls, short text messages/multi-media messages (SMS/MMS) and WhatsApp messages (according to participants' preference), over a 3-month period. The pre and posttest questionnaires completed	Scores on self-care capacity, psychological adjustment and engagement increased significantly at post-test. HIV-related visits to health facilities did not improve significantly even at 6 months. However, participants still preferred to

									consult healthcare providers for counselling through mobile phone.
5	Lester et al. 2010	Text messaging	self-reported ART adherence	Randomized controlled trial	Not mentioned	273 participants (177 females and 96 males)	Kenya	. Patients were randomized (1:1) by simple randomization with a random number generating program to a mobile phone short message service (SMS) intervention or standard care. Patients in the intervention group received weekly SMS messages from a clinic nurse and were required to respond within 48 hours.	Patients who received SMS support had significantly improved ART adherence and rates of viral suppression compared with the control individuals. Mobile phones might be effective tools to improve patient outcome in resource-limited settings
6	Oluoch et al. 2014	Electronic Medical Record (EMR) System	Appropriate placement of HIV patients on antiretroviral therapy using Electronic medical record systems	a retrospective, pre-post study	Not mentioned	A total of 3300 patients were enrolled at 17 rural health facilities. A total o	Kenya	A retrospective, pre-post EMR study among patients enrolled in HIV care and eligible for ART at	EMR was independently associated with a 22% increase in the odds of initiating ART among eligible

						in Western Kenya.		17 rural Kenyan clinics	patients compared to paper-based system
7	Pop-Eleches et al. 2011	Text messaging	Adherence to antiretroviral treatment in a resource-limited setting	Randomized controlled trial	Not mentioned	431 women patients who had initiated ART within 3 months were enrolled and randomly assigned to a control group or one of the four intervention groups	Kenya	Participants in the intervention groups received SMS reminders that were either short or long and sent at a daily or weekly frequency. Adherence was measured using the medication event monitoring system.	53% of participants receiving weekly SMS reminders achieved adherence of at least 90% during the 48 weeks of the study, compared with 40% of participants in the control group (P=0.03). Participants in groups receiving weekly reminders were also significantly less likely to experience treatment interruptions exceeding 48 h during the 48-week follow-up period than participants in the control group
8	Ronen et al. 2018	Text messaging	Improve ART adherence	Randomized controlled trial	Behavior Change	10 (FGDs) with 87 HIV-	Kenya	10 focus group discussions (FGDs)	These findings show there may

					Communication theory	infected peripartum women		with 87 HIV-infected peripartum women to determine desirability and preferred terminology of HIV-related content	be interest in overt HIV-related information by SMS when risk of status disclosure is low, and support use of messaging strategies that allows participant choice in HIV-related content while protecting against undesired disclosure.
9	Winskell et al., 2018	Smartphone Game-Based Intervention	HIV prevention among the youth by knowledge, motivation, and behavioral skills to delay sexual initiation and use a condom at first sex	Randomized controlled trial	applied Entertainment-Education communication & Social Cognitive Theory	30 (14 females and 16 males) adolescents were recruited in the intervention arm.	Kenya	Participants were randomly assigned to the control or intervention arms of the study. One parent for each of the intervention arm participants was also recruited (n=30). The intervention arm participants were provided with smartphones on which Tumaini was loaded so that	The intervention arm showed significant gains in sexual health-related knowledge and self-efficacy, behavioral intention for risk-avoidance strategies and sexual risk communication. The pilot study demonstrated that the smartphone games have the potential to

								they could play the game at home.	dramatically increase the reach of culturally adapted behavioral interventions while ensuring fidelity to intervention design
10	Sarna et al., 2019	The counselor delivered phone calls to provide one-to-one need-based support.	s Retention of Mothers With HIV Infection in Care and Infant HIV Testing	Randomized controlled trial	Self-Regulation Theory	404 pregnant women with HIV who were between 14 and 36 weeks of gestation and randomly assigned them to the intervention (n=207) or control arm (n=197)	Kenya	The intervention comprised a fixed protocol of counselor delivered phone calls to provide one-to-one need-based support. The number of calls made varied depending on when participants presented for antenatal care services; the maximum number was 42. The control group received routine care	The one-on-one tailored counseling delivered via cell phone was effective in retaining mothers with HIV infection in care and promoting uptake of infant HIV testing and antenatal and postnatal care services. Phone counseling offers a practical approach to reach and retain pregnant women with HIV infection and postpartum mothers in care, but greater

									emphasis on collection of medications and adherence is required.
11	Smillie et al. 2014	text messaging intervention	early retention in HIV care for people living with HIV.	Qualitative review of Randomized controlled trial	Theory of Reasoned Action and the Technology Acceptance Model.	people living with HIV (n = 15) and healthcare providers (HCP) (n = 5) Female were 11 and 4 males.	Kenya	An informative qualitative study with people living with HIV (n = 15) and healthcare providers (HCP) (n = 5) was conducted to exploring the experiences of people living with HIV who have attempted to engage in HIV care, the use of cell phones in everyday life, and perceptions of communicating via text message with HCP.	All participants had access to a mobile phone, and most were comfortable communicating through text messages, or were willing to learn. Both people living with HIV and HCP felt that increased communication via the text messaging intervention has the potential to enable early identification of problems, leading to timely problem solving that may improve retention and engagement in care during the first year after diagnosis.

12	Van de Kop et al., 2018	Text messaging	Patient retention during the first year of HIV care in Kenya	an open-label, randomized parallel-group study	Not mentioned	700 were recruited (419 females and 241 males). 349 people were allocated to the intervention group and 351 to the control group	Kenya	Eligible participants were aged 18 years or older, HIV-positive were randomly assigned (1:1), with random block sizes of 2, 4, and 6, to the intervention or control group. Participants in the intervention group received a weekly text message from the automated WeTel service for 1 year and were asked to respond within 48 h. Participants in the control group did not receive text messages.	This weekly text-messaging service did not improve retention of people in early HIV care. The intervention might have a modest role in improving self-perceived health-related quality of life in individuals in HIV care in similar settings.
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Category 2: Hypertension control, medication adherence and complication prevention									
1	Barsky et al., 2019	SMS text messaging	Impact on blood pressure control and change of knowledge from the SMS text messages	Randomized control Study	Not mentioned	243 participants in Canada and 130 participants from Tanzania	Tanzania and Canada	Blood pressure readings were taken by a community health worker and transmitted to a mobile phone via Bluetooth, then by wireless to a programmed central server. From the server, the readings were sent to the participant's own phone as well. Participants also received biweekly tailored SMS text messages on their phones.	In remote communities, the study helped local health care providers deliver a blood pressure management program that enabled patients and community workers to feel connected in timely manner.
2	Bobrow et al., 2016	Text messaging	The change in systolic blood pressure at 12 months from baseline	Single-blind, three-arm randomized trial	Not mentioned	1372 (379 males & 993 Females) participants were randomized to receive information-only SMS text-messages (n=457), interactive	South Africa	patients treated for high blood pressure were randomly allocated in a 1:1:1 ratio to information-only or interactive SMS text-messaging, or usual care.	SMS text-message in a general outpatient population of adults with high blood pressure, we found a small, reduction in systolic blood pressure control compared to usual

						SMS text-messages (n=458), or usual care (n=457)			care at 12months follow-up
3	Haricharan et al., 2017	Text messaging in hypertension care for the deaf	Improved hypertension knowledge for deaf South Africans	uncontrolled pre-post-test design	Not mentioned	43 participants: 25 males and 18 females).	South Africa	The SMS-campaign with information on hypertension and tips on healthy living was sent to the target participants. A baseline questionnaire was completed before intervention and an exit one after the SMS intervention.	SMSs were effective in improving Deaf people's knowledge of hypertension and healthy living. However, SMS-campaigns should be cognizant of Deaf people's unique needs and communication preference and explore how to accommodate these.
4	Kingue et al., 2013	A specialized telemedicine center and remote patient care centers.	Improving the outcomes of care for hypertension in rural setting	A prospective cohort interventional study	Not mentioned	10 centers (165 patients) in the intervention groups (105 females and 60 males)	Cameroon	Participants in the intervention group had higher baseline systolic (SBP) and diastolic (DBP) blood pressure, and included fewer individuals with diabetes than those in the usual care group	An intervention package comprising tele-support to general practitioners and nurses is effective in improving the management and outcome of care for hypertension in rural underserved

									populations. This can potentially help in addressing the shortage of trained health workforce for chronic disease management in some settings
5	Leon et al., 2015	Text messaging	Adherence to medication, for hypertensive patients	Randomized controlled trial	Behavior Change Communication theory.	22 participants: 16 were females and 6 males	South Africa	The intervention was a structured 12-month program of blood pressure medication adherence support delivered by SMS-text message	Adherence support for treatment of raised blood pressure, delivered via SMS-text message on the patient's own phone, was found to be acceptable, relevant, and helpful, even for those who already had their own reminder systems in place.
6	Nichols et al. 2019	Mobile smartphone app	medication adherence and blood pressure self-management system	two-arm cluster, randomized controlled design	Self-Determination Theory and Technology Acceptance Model	24 participants: Stroke survivors (n = 16) and their caregivers (n = 8)	Ghana	Participants randomized to the interventional arm of the study, both stroke survivors and caregivers, were invited to participate in one of three focus	Post-intervention adherence declined following study intervention, indicating a need for increased exposure through the app to

								group sessions upon completion of the 3-month post-intervention follow-up phase of the trial	facilitate long-term behavioral change, although participants conveyed a heightened awareness of the importance of BP monitoring and lifestyle changes needed.
7	Owolabi et al. 2019	personalized phone text-messaging, and educational video	Improve Systolic Blood Pressure Control	Randomized controlled trial	Not mentioned	400 patients (254 males and 154 females) were randomized to intervention and control group.	Nigeria	were randomized to intervention and control group. The participants were randomized assigned in intervention and control group. The control group also received text messages, and both groups received modest financial incentives. The primary outcome was mean change in systolic BP (SBP) at 12 months.	At 12 months, there was no significant difference in SBP reduction from baseline in the Intervention versus control group
8	Sarfo et al. 2019	Smartphone for monitoring and reporting BP measurements	improvement in BP control among stroke survivors in a	two-arm pilot cluster randomized controlled trial	Self-determination theory & technology	60 stroke survivor's intervention arm (n=30),	Ghana	Participants in the intervention arm (n =30) received a Blue-toothed BP	The pilot study demonstrates feasibility and signal of

		and medication intake for 3 months compared with standard of care	resource-limited setting via an mHealth intervention		application theories	Control arm (n=30)		device and smartphone with an App for monitoring BP measurements and medication intake under nurse guidance for three months after which intervention was withdrawn. Control arm (n = 30) received usual care.	improvement in BP control among stroke survivors in a resource-limited setting via an mHealth intervention. Larger scale studies are warranted.
<b>Category 3: Diabetes prevention, medication adherence and complications prevention</b>									
1	Kurji et al., 2019	Assess diabetic patient satisfaction with teleophthalmology screening compared to face-to face screening	Improving diabetic retinopathy screening through teleophthalmology	Prospective cohort study	Not mentioned	A total of 26 participants: (15 male and 11 females)	Kenya	diabetic patients from a one-stop multidisciplinary diabetic clinic in Nairobi, Kenya were included if they had undergone both a teleophthalmology (stereoscopic digital retinal photographs graded by an ophthalmologist remotely) and a traditional clinical screening exam	Patients preferred the teleophthalmology option for future screenings compared to face to face screening. This is a cost-effective intervention in improving diabetic retinopathy screening through teleophthalmology

								(face to face examination).	
2	Nanji et al. 2020	web-based teleophthalmology assessment	effectiveness of tele-retina examination compared to in person in prevention of diabetic retinopathy	Blinded randomized controlled trials	Not mentioned	306 diabetic patients	Kenya	Participants underwent both a clinical slit lamp examination and a tele-retina (TR) assessment by an experienced ophthalmologist. Both assessments were compared for any DR and AMD using the early treatment diabetic retinopathy study and age-related eye disease study grading scales, respectively.	The study demonstrated a fair correlation between tele-retina screening and traditional slit-lamp examination in the diagnosis of diabetic retinopathy (DR) and age-related macular degeneration (AMD)
3	Owolabi et al. 2019	Test messaging intervention	Adequate blood sugar control	Randomized controlled trial	Integrated Behavior Change framework	A total of 216 patients (182 females and 34 males) with diabetes with uncontrolled glycemic status randomly assigned into the intervention (n=108) and	South Africa	Participants in the intervention arm received daily educational text messages on diabetes for six months. Data was collected at baseline and six months post-intervention. Blood glucose, blood pressure	Both arms of the study showed improvement in their blood glucose levels, but the intervention did not have any significant effect. Also, the intervention did not have any significant effect on weight, body

						the control group (n=108)		and anthropometric measurements followed standard procedure	mass index, systolic and diastolic blood pressure. Almost all participants (90.74%) were pleased with the intervention and felt it was helpful.
4	Owolabi et al. 2020	Text messaging	Medication adherence among patients with diabetes in a rural setting	2-arm, multicenter, parallel, randomized controlled trial	Not mentioned	A total of 216 patients (182 females and 34 males) with diabetes with uncontrolled glycemic status randomly assigned into the intervention (n=108) and the control group (n=108)	South Africa	Participants in the intervention arm received daily educational text messages on diabetes and reminders for 6 months, while the control arm continued with standard care only.	The text messaging intervention did not bring about any significant improvement in medication, dietary and physical activity adherence levels. There is a need to design effective strategies for improving adherence to recommended lifestyle changes in this setting.
5	Rotheram et al. 2012	Text messaging	self-management of Diabetes in resource limited setting.	Uncontrolled interventional study	Not mentioned	22 women with diabetes in Cape Town, South Africa	South Africa	Women with diabetes (n=22) in Cape Town, South Africa participated in a 12-week program focused on providing and	Between baseline and three months, women increased their sleep and reported a higher level of positive action and social

								applying knowledge of health routines to manage diabetes. Women were linked with a buddy via a mobile phone for support and questioned daily about a health behavior via text message.	support coping, yet blood glucose increased by 3.3 points. From 3 to 6 months, spiritual hope decreased, and diastolic blood pressure increased. One year later, the 22 women continue to attend meetings.
6	Webb et al., 2017	text messaging intervention	Glycemic and lipid control, as well as diabetic complications.	A cluster randomized control trial	Not mentioned	599 (410 females and 189 males) diabetic patients from twelve primary health care clinics in South Africa	South Africa	The study was carried out in three phases: Phase 1 was a historical baseline data, Phase 2 intervention and Phase 3: postintervention changes follow-up	A comprehensive program that integrates clinical evaluations, active screening and an individualized patient management plan did not lead to significant improvement in the HbA1c levels. However, screening for glycemic and lipid control, as well as diabetic complications, improved dramatically with a dedicated team

7	Leon et al., 2021	text messaging intervention	Improved treatment adherence for diabetic patients	Randomized controlled trial (pilot study)	Behavior Change Theory	20 participants (16 were females and 6 males)	South Africa and Malawi	In pilot study, brief (less than 5 min) weekly telephone interviews were conducted with 10 patients in each site over a 3-week period to check the technical delivery of the intervention and how messages were understood.	The participants were comfortable with the idea of receiving health promotion-related messaging on their phone but wanted a way to easily distinguish health messaging from spam messages. In particular they asked that the message sender be identified as coming from the health services to avoid it being deleted as spam. They wanted the option of receiving messages in their first language.
<b>Category 4: General patient management and referral through teleconsultation</b>									
1	Fry et al., 2020	An asynchronous teleconsultations service	Improve patient management and referral.	Qualitative interventional study evaluation	Appreciative Inquiry, considered as a method and a theory of change	118 participants (81 Nurses, 26 Clinical Officers and 11 Medical officers.	Kenya	An asynchronous teleconsultations service was implemented in Turkana County, Kenya, connecting NPCs with a volunteer network of remote	The findings reveal the wider impact that modern teleconsultation services enabled by mobile technologies and algorithms can

									physicians and specialists	have on Low- and middle-income countries and health systems.
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