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## Novel Interventions for HIV Self-Management in African American Women: A Systematic Review of mHealth Interventions

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## Abstract

The purpose of this systematic review was to assess the quality of interventions using mHealth technology being developed for and trialed with HIV-infected African American (AA) women. We aimed to assess rigor and to ascertain if these interventions have been expanded to include the broad domain of self-management. After an extensive search using the PRISMA approach and reviewing 450 records (411 published studies and 39 on-going trials at clinicaltrials.gov), we found little completed research that tested mHealth HIV self-management interventions for AA women. At clinicaltrials.gov, we found several mHealth HIV intervention studies designed for women in general, forecasting a promising future. However, most studies were exploratory in nature and focused on a single narrow outcome, such as medication adherence. Given that cultural adaptation is the key to successfully implementing any effective self-management intervention, culturally relevant, gender specific mHealth interventions focusing on HIV-infected AA women are warranted for the future.

*Keywords:* African American women, HIV, mHealth, novel interventions, self-management, systematic review

## **Novel Interventions for HIV Self-management in African American Women: A Systematic Review of mHealth Interventions**

HIV, once a death sentence, is now considered a chronic condition due to the therapeutic effects of antiretroviral therapy (ART) and standardized treatment of HIV. Adherence to standardized HIV care and treatment regimens is essential to achieve optimal health outcomes. Nonetheless, public health officials estimate only one fourth of Americans who are living with HIV are successfully managing virus-related sequelae (Hall et al., 2013), which is disheartening given that self-management of other chronic conditions has been associated with better health outcomes (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Groessl et al., 2011; Lorig, Ritter, Laurent, & Plant, 2006; Ory et al., 2013).

### **Background and Significance**

To date, the focus of most evidence-based HIV behavioral interventions for people living with HIV (PLWH) has been rather narrow; targeting risk reduction for HIV and sexually transmitted disease (STD) reinfection or medication adherence (Centers for Disease Control and Prevention [CDC], 2013a; Pellowski & Kalichman, 2012). These interventions fail to address the multiple dimensions of self-management, including adherence to routine medical visits, healthy dietary intake, exercise regimes, self-monitoring of health status, and/or stress reduction. Little has been done to help PLWH effectively manage chronic HIV infection beyond emphasizing medication adherence. This is especially true for African American (AA) women, who, when compared with members of other races and ethnic groups, account for a higher proportion of HIV infections at all stages of disease across the spectrum from new infections to deaths (CDC, 2013b).

Of the estimated 47,500 new HIV cases documented in 2010, one in four occurred in

women (CDC, 2013b). AA women continue to be disproportionately affected by HIV. African Americans constitute an estimated 14% of the U.S. population; however, they account for 44% of those living with HIV and 45% of the newly infected each year (CDC, 2013b). Among AA women, the incidence rate is nearly 20 times higher than that of Caucasian women, and 5 times that of Hispanic women (CDC, 2013a). AA women's vulnerabilities to HIV are linked to biological, behavioral, and psychosocial factors (Davis & Tucker-Brown, 2013), and 87% of AA women who contract HIV reportedly do so via heterosexual contact (CDC, 2013b). Thus, considerable numbers of HIV-infected AA women need evidence-based strategies for managing this condition.

Evidence-based self-management interventions have the potential to help HIV-infected AA women successfully monitor the condition and minimize negative sequelae (Elzarrad, Eckstein, & Glasgow, 2013). Notably, AA women living with HIV have health care and self-management needs that are similar to others who are living with chronic diseases. However, because this group constitutes a unique ethnic and cultural group it is best that any self-management behavioral intervention be tailored to their gender and cultural preferences. Tailoring may increase the likelihood that the intervention is acceptable to these women, thereby enhancing its effectiveness.

Evidence-based self-management interventions have been associated with increased self-efficacy for self-care skills, enhanced knowledge about chronic disease management, and improved patient-provider communication in various populations across a wide range of conditions resulting in better health outcomes (Goepfing, Armstrong, Schwartz, Ensley, & Brady, 2007; Lorig et al., 2006; Tomioka, Braun, Compton, & Tanoue, 2012). However, most of these interventions required face-to-face interaction and a substantial intensity of resources to

deliver the evidence-based, standardized, culturally relevant, and gender specific health education (Tobias, Downes, Eddens, & Ruiz, 2012; Webel, 2010) that may be most effective for HIV-infected AA women. The time and resources needed to participate in face-to-face programs may limit access and present a barrier to participation (Jaglal et al., 2013; Jerant, von Friederichs-Fitzwater, & Moore, 2005). These barriers might be particularly relevant for HIV-infected AA women who are often medically and socially disenfranchised (Miles, Isler, Banks, Sengupta, & Corbie-Smith, 2011; Webel & Higgins, 2012). Globally, mobile health (mHealth) technologies are being used to overcome logistical, cultural, and economic barriers for medically and socially disenfranchised groups.

mHealth is the use of portable electronic devices with software applications that provide health services, manage patient information, and facilitate knowledge acquisition and skill development for patient health promotion, condition management, and disease prevention (Källander et al., 2013). Use of mobile technologies is rapidly becoming a social norm, with large numbers of consumers currently possessing one or more devices including mobile phones and/or tablet computers. Therefore, the utility of these devices as platforms for delivering disease self-management programs and health promotion is currently being explored (Buhi et al., 2013). mHealth has been shown to be a useful platform for facilitating patient self-management when the condition requires adherence to prescribing regimens and self-monitoring (Logan, 2013). Hence, this form of intervention delivery may have utility for AA women who are striving to engage in HIV self-management. In recent years, there has been a proliferation of behavioral health research that has explored the effectiveness of mHealth technologies for self-management of a variety of health conditions including diabetes (Arora, Peters, Agy, & Menchine, 2012; Buis et al., 2013), cardiovascular disease (Logan, 2013), and depression (Pinto, Hickman, Clochesy,

& Buchner, 2013), as well as for health promotion activities such as exercise and smoking cessation (Gritz et al., 2013). Therefore, mHealth technologies may be useful education adjuncts for supporting self-management of all chronic diseases (de Jongh, Gurol-Urganci, Vodopivec-Jamsek, Car, & Atun, 2012; Parmanto et al., 2013), including HIV.

Hence, mobile health platforms for the delivery of self-management interventions that automate the health education encounter, promote high quality self-management instruction, and can be delivered directly to HIV-infected AA women hold potential for overcoming some of the barriers that they face regarding the self-management of their condition (Tufts, Wessell, & Kearney, 2010). Nonetheless, AA women are a unique ethnic and cultural group. Therefore, it is important that any mHealth intervention is tailored to be culturally relevant and gender specific. Any mHealth intervention that has shown promise for self-management of HIV, which has been developed for other populations and/or which has been used in international settings, must be specifically tailored for use with AA women.

### **Purpose and Aims**

Our aim was to evaluate the state of the science for mHealth self-management interventions that had been developed for and trialed with HIV-infected AA women. The purpose of study was to examine extant literature, to (a) assess rigor of behavioral health intervention research that has employed mHealth self-management technologies specifically for HIV-infected AA women; (b) determine what work was in development by examining registered randomized controlled trials (RCTs) at [clinicaltrials.gov](http://clinicaltrials.gov); and (c) ascertain if current interventions continued to be narrowly focused on medication adherence or had been broadened to include the full scope of HIV self-management domains such as routine visits to HIV providers, healthy diets, exercise regimes, self-monitoring of health status, and stress reduction practices. We also

proposed to make recommendations for future mHealth intervention development.

Our work builds on previous systematic reviews that reported on the state of the science of HIV self-management intervention development including (a) a review of mHealth HIV treatment and prevention interventions for PLWH in general that reported on all literature that referred to mHealth and to HIV or AIDS (i.e., position papers, literature reviews, interventional work; Catalani, Philbrick, Fraser, Mechael, & Israelski, 2013); (b) a review of efficacy evaluations of mobile and electronic devices that were used for the delivery of HIV health promotion and secondary prevention interventions (Pellowksi & Kachlichman, 2012); (c) a Cochrane review of mobile text messages for promoting adherence to antiretroviral medication (Horvath, Azman, Kennedy, & Rutherford, 2012); and (d) a general review of HIV self-management education programs (Millard, Elliot, & Girdler, 2013). We also extended our review to the gray literature and included an assessment of studies in progress as reported by the U.S. National Institutes of Health at [clinicaltrials.gov](http://clinicaltrials.gov).

## **Methods**

PRISMA (Liberati et al., 2009) is a well-established framework for guiding the process and reporting the results of systematic reviews of health care interventions. We used the PRISMA guidelines to frame the scope of our data retrieval. We assessed studies for (a) study design, (b) setting, (c) sampling strategies, (d) sample size, (e) participant characteristics, (f) type of mHealth intervention, (g) purpose of intervention, and (h) results.

## **Inclusion Criteria**

We included reports of RCTs that were (a) published in peer reviewed journals between January 1, 1985 and October 31, 2013; (b) published in English; (c) conducted in the United States; (d) with 50% or more of the sample population being identified as HIV-infected AA

women; and (e) used mobile technologies such as cellular phones, electronic computer tablets, and/or personal digital assistants, to deliver behavioral interventions for the purposes of self-managing HIV (e.g., medication adherence, routine visits to HIV care providers, healthy diets, exercise regimes, self-monitoring of health status, and stress reduction). We also included studies, registered at [clinicaltrials.gov](http://clinicaltrials.gov), which met the aforementioned inclusion criteria.

### **Search Process**

We searched PsycINFO (OvidSP), PubMed (OvidSP), and CINAHL (EbscoHOST) with limits of January 1, 1985 to October 31, 2013. We searched using key terms *self-management AND (mhealth OR mHealth) OR handheld computers OR mobile device OR cellular phone [MH] OR mobile phone AND (HIV OR AIDS)* or used similar terms that were appropriate for specific databases. We reviewed article titles, abstracts, and author keywords for our inclusion criteria. We then retrieved and reviewed full text versions of any article for which there was any question about the appropriateness for inclusion in or exclusion from review. We also searched the gray literature (i.e., [clinicaltrials.gov](http://clinicaltrials.gov)), where we also reviewed studies in progress.

We examined all articles from our initial yield that referred to mHealth interventions for self-management of HIV or AIDS and health promotion for persons living with HIV (see Figure 1; van Velthoven, Brusamento, Majeed, & Car, 2013). Once we identified and examined articles that referred to HIV or AIDS, we began to apply our additional limits: (a) those studies conducted in the United States, (b) with adult participants, (c) with AA participants, and finally, (d) with female participants. Studies reporting that 50% or more of the study participants were female and AA and that were designed to explore or enhance HIV self-management were deemed to meet inclusion criteria. We also identified and excluded duplicate articles across the published databases (see Figure1). We engaged a group of independent reviewers to confirm

which articles were duplicates.

Two independent reviewers evaluated study characteristics for inclusion criteria. A third reviewer resolved any disagreement. Independent reviewers then coded articles, retrieving data about study design, sample characteristics, purpose of the intervention, type of interventions and controls, and results. These data were entered into a database. A third reviewer then confirmed the accuracy of the database. We followed the same process to review on-going trials registered at [clinicaltrials.gov](http://clinicaltrials.gov). When reporting on-going trials, we included any study that met all other inclusion criteria and additionally reported that study participants would be either all female or both genders. This decision was made because, although gender was reported as inclusion or exclusion criteria for ongoing studies, often the percentage or number of women actually enrolled was not reported.

## Results

Figure 1 details the steps of our search for RCTs conducted with HIV-infected AA women in the United States. Our search terms resulted in an initial yield of 882 published articles and 977 on-going trials registered at [clinicaltrials.gov](http://clinicaltrials.gov). All records were then examined and duplications ( $n = 71$ ) were removed. The remaining titles, keywords, and/or abstracts of all records ( $n = 1,338$ ), including all yielded at [clinicaltrials.gov](http://clinicaltrials.gov), were examined to determine if they met our inclusion criteria. That assessment yielded 450 records (411 published studies and 39 on-going trials), which were then reassessed in detail to determine if the study was conducted with HIV-infected AA women and focused on self-management of HIV, using an mHealth platform for intervention delivery. Of the published studies assessed, none met our inclusion criteria. Fourteen of the on-going trials met our inclusion criteria (See Figure 1 and Table 1).

The majority of yielded studies were designed to be conducted with men, in settings

outside of the United States, and/or not designed for female participants. Excluded published studies had samples that were all male or majority male (Gritz et al., 2013; Hightow-Weidman et al., 2012; Kalichman et al., 2011; Sullivan et al., 2014; Winstead-Derlega et al., 2012), were not conducted in the United States (van der Kop et al., 2013; van Heerden, Norris, Tollman, Richter, & Rotheram-Borus, 2013), had participants who were not all PLWH (Jones, Hoover, & Lacroix, 2013; van Velthoven et al., 2013), were not RCTs (Pinto et al., 2013; van Velthoven et al., 2013; Winstead-Derlega et al., 2012), or did not employ mHealth technologies (Ramanathan, Swendeman, Comulada, Estrin, & Rotheram-Borus, 2013; Webel, 2010; Webel & Higgins, 2012).

Fourteen of the 39 HIV self-management on-going trials identified from [clinicaltrials.gov](http://clinicaltrials.gov) met our inclusion criteria (See Table 1). However, 25 of these on-going trials were excluded because they were not RCTs, were conducted outside the United States, and/or were telehealth focused rather than mHealth interventions.

As our systematic review revealed, no mHealth HIV self-management studies conducted in the United States were specifically designed and culturally tailored for use with HIV-infected AA women. Of the published articles focusing on African Americans, the participants are largely men (Gritz et al., 2013; Zou et al., 2013). Among studies where the majority of participants were women, the women were not AA (Maduka & Tobin-West, 2013). The studies conducted with AA women were either not RCTs (Chander et al., 2012) or did not enroll PLWHs (Whiteley et al., 2011) and were focused on reducing HIV risks (Jones et al., 2013) rather than living with HIV.

## Discussion

The aim of this systematic review was to examine the extant literature and on-going

clinical trials RCTs that tested mHealth self-management interventions with HIV-infected AA women, specifically to ascertain the rigor of such interventions, to assess if these interventions were culturally tailored and designed for use with HIV-infected AA women, and to understand the scope of interventions being developed and deployed for this population. It has been well established that interventions that support and teach self-management skills to HIV-infected AA women are important because HIV is one of the leading causes of death for AA women ages 25-34 (CDC, 2013b). Over the last 20 years, the field has been inundated with studies focused on men with HIV. Conversely, interventions designed for HIV-infected AA women have been quite limited. The proliferation of current and upcoming research focused on mHealth strategies is promising. These interventions have the potential to assist vulnerable populations such as AA women to more effectively manage HIV. To that end, we conducted a systematic review of the databases using [clinicaltrials.gov](http://clinicaltrials.gov), PsychINFO, PubMed, and CINAHL.

After carefully assessing each study for eligibility for inclusion, we found no published studies that met our inclusion criterion. Most of the studies that employed mHealth for self-management were conducted outside of the United States (Chang et al., 2013; van Heerden et al., 2013). This may be due to substantial amounts of grant funding for and attention to HIV self-management in other countries by organizations such as the Gates Foundation (n.d.) and the President's Emergency Plan for AIDS Relief (U.S. State Department, 2014). We also found several studies that employed telehealth approaches rather than mHealth (Källander et al., 2013) including providing person-to-person cognitive behavioral counseling via telephones (Kalichman et al., 2011) rather than using mobile technologies as a platform to deliver automated interventions.

Although we did not find any published studies that tested mHealth self-management

interventions for AA women living with HIV, the reviewed studies often reported statistically significant improvements in adherence for study participants as compared to control groups (see van Velthoven et al., 2013 for a review). In addition, studies published from 2010-2013 tended to focus more on the use of mobile phone interventions (Pop-Eleches et al., 2011; van Velthoven et al., 2013); this trend coincided with mobile phones becoming more accessible, increased government funding for discounts on cell phones, and free cell phones through programs such as *Lifeline*. As an example, since 2005 the *Lifeline* program has provided free basic cellphones for persons living under the poverty line ([www.fcc.gov/lifeline](http://www.fcc.gov/lifeline)). Other technology included beepers, personal digital assistants, and electronic tablets (Brock & Smith, 2007; Dunbar et al., 2003).

To address the second aim of this systematic review, we searched the on-going trials registered at [clinicaltrials.gov](http://clinicaltrials.gov). Our search terms yielded 977 initial records from this database. Our assessment for eligibility for inclusion yielded only 14 eligible RCTs. These studies, however few, have important implications for the science of self-management interventions for HIV-infected AA women (Glasner-Edwards, CT01884233; Holstad, NCT01786148; Kuo, NCT01721226; Kurth NCT00443378; Moskowitz NCT01997008); expanding beyond adherence to broader domains of self-management. Nonetheless, the preponderance of studies in progress continued to focus narrowly on medication adherence (Brown NCT01887210; Garofalo NCT01354210; Ingersoll NCT01343654; Kahn NCT01252212; Kalichman NCT01359280; Kumar NCT01229722; Moore NCT01317277; Petry NCT01760759), or focus on one specific behavior such as binge drinking (Chander, NCT01125371). If we expect more optimal health outcomes for PLWH, we must extend the scope of our interventions to include other self-management domains, including prevention, self-monitoring of health status, and stress reduction.

It should be noted that our examination was limited by the scope of the data at clinicaltrials.gov. Although investigators reported if they planned to enroll women for study participation, we could not specifically determine if interventions were tailored for use with AA women and what proportion of the sample would be AA women. Despite this limitation, important information was gleaned from this review. Specifically, many of the studies in progress have planned to recruit women for study participation. Hence, we may soon have new knowledge about the efficacy of mHealth self-management for AA women. Nonetheless, the results of our review underscored that more interventions must be specifically and culturally tailored for and tested with AA women.

In regard to rigor, mHealth HIV self-management science is in the early stages of development with most of the published work being exploratory rather than experimental (Chander et al., 2012; Person, Blain, Jiang, Rasmussen, & Stout, 2011; Ramanathan et al., 2013). In fact, many of the published studies did not meet our criteria for inclusion because they were cross-sectional and/or qualitative in nature. Also, most of the studies reported small samples that limited generalizability. For example, 8 of 14 on-going trials planned for participant enrollments of fewer than 100 participants (See Table 1). The focus on designing and testing interventions with samples of men in low resources settings also hampered the overall generalizability of most mHealth HIV self-management research that we identified via our data collection.

Easily accessible and cost-effective evidence-based interventions for use in HIV care and treatment are lacking. AA women face an untold burden from HIV. Thus, they must actively and effectively manage the condition in order to achieve optimal health outcomes and delay negative sequelae related to HIV. HIV self-management interventions, culturally tailored for and gender specific to AA women, are more likely to yield effective results for this group.

## Conclusion

We found very little completed research that tested mHealth HIV self-management interventions for AA women. Yet the mHealth strategy is potentially fruitful for the target population because we found several studies that included women or were designed for women in general (Ingersoll et al., 2014; Kalichman et al., 2011). Although not many studies were designed specifically for AA women who need to manage HIV, mHealth interventions are being designed as HIV prevention measures specifically for women (Jones et al., 2013). In the near future, it will also be important to extend this work to include risk prevention for AA women living with HIV.

We found reports of several studies that were conducted with small samples using exploratory methods, designed for and tested with HIV-infected men, and trialed in international settings. If we want to impact the health of the United States by reducing the negative sequelae of HIV, we cannot continue to exclude vulnerable populations such as AA women. Providing support for and education related to self-management of HIV is essential to facilitate engagement and retention in care. It is vital that this scientific gap be addressed. Hence, resources should be directed toward consciously and specifically designing and testing mHealth-delivered HIV self-management interventions for HIV-infected AA women. All in all, the science must move along to include RCTs of mHealth HIV self-management interventions for larger, more diverse samples of PLWH conducted in U.S. populations.

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### Key Considerations

- African American (AA) women continue to bear the burden of HIV disease. Hence, it is essential that policy-makers set aside public research dollars for projects that target this population.
- In light of the paucity of mHealth HIV self-management interventions available for AA women who are living with HIV, the clinical setting may be a fruitful venue for engaging these women in the design of culturally-tailored and gender-specific research projects that have been informed by them.
- The use of mobile technologies as platforms for facilitating HIV self-management knowledge acquisition and skill development for health promotion, condition management, and disease prevention may be one more effective strategy in the armament to increase linkages to care and promote enhanced retention in care for AA women.

## mHealth HIV Self-management

Table 1

*Novel Interventions for HIV Self-Management Randomized Controlled Trials Registered at Clinicaltrials.gov (n =14)*

<b>Principal Investigator</b>	<b>Clinical Trials Registration Number</b>	<b>Study Title</b>	<b>Design</b>	<b>Type and Purpose of Technology</b>	<b>AA Women Included in Sample*</b>	<b>Estimated Participant Enrollment</b>
Kumar	NCT01229722	ARemind: A personalized system to remind for adherence	RCT 2-Arm Parallel Assignment	Cell phone-based system that assists with medication adherence	Yes	70
Holstad	NCT01786148	Music for Health Project (MFH)	RCT 2-Arm Experimental Active Comparator	Mobile phone application employing a radio talk show format to support medication adherence and self-management by songs	Yes	230
Petry	NCT01760759	Antiretroviral therapy adherence and secondary prevention of Human Immunodeficiency Virus	RCT 3-Arm intervention Parallel Assignment	Cell phone-based adherence reminders	Yes	65
Moskowitz	NCT01997008	Optimizing resilience and coping in HIV via internet delivery (ORCHID)	RCT 2-Arm Parallel Assignment	Internet-based positive emotional affect skills training Control receives text messages	Yes	50
Moore	NCT01317277	Personalized text messages to improve ART adherence in HIV-infected methamphetamine users (iTAB)	RCT 2-Arm Active Comparator	Mobile phone text messaging to improve adherence to ART	Yes	70
Brown	NCT01887210	A pilot gaming adherence program for youth living with HIV	RCT 2-Arm Parallel Assignment	Mobile phone gaming application to improve treatment adherence	Yes	60

## mHealth HIV Self-management

Table 1. *Cont.*

<b>Principal Investigator</b>	<b>Clinical Trials Registration Number</b>	<b>Study Title</b>	<b>Design</b>	<b>Type and Purpose of Technology</b>	<b>AA Women Included in Sample*</b>	<b>Estimated Participant Enrollment</b>
Chander	NCT01125371	Computerized brief alcohol intervention (BI) for binge drinking HIV at-risk and infected women	RCT Active Comparator Placebo Comparator	Cell-phone booster calls using interactive voice response technology (IVR) to counsel on: (a) alcohol use and (b) associated HIV/STI risk behaviors	Yes	450
Kalichman	NCT01359280	Nurse delivered cell phone adherence intervention (Pick it UP)	RCT 4-Arm 2 Experimental 2 Placebo Comparator	Text messages for reminder system for medication adherence and sustaining adherence improvements	Yes	600
Glasner-Edwards	NCT01884233	Cell phone technology targeting ART adherence and drug use (TXT-CBT)	RCT 2-Arm Active Comparator	Text-messages to (a) promote relapse prevention skills, (b) reduce risk behaviors, and (c) improve treatment adherence	Yes	50
Kuo	NCT01721226	CARE correction: Technology for jail HIV/HCV testing, linkage, and care (TLC)	RCT 2-Arm Experimental Sham Comparator	Computer-based tool to (a) improve linkage to community HIV care, (b) adhere to medications after release, and (c) achieve or maintain HIV viral suppression following community re-entry	Yes	320
Kurth	NCT00443378	Computer assisted Rx education for HIV-positives: CARE+	RCT 2-Arm Parallel Assignment	Tablet computer used for interactive counseling tool health promotion plan incorporating ART adherence and transmission risk reduction	Yes	300

## mHealth HIV Self-management

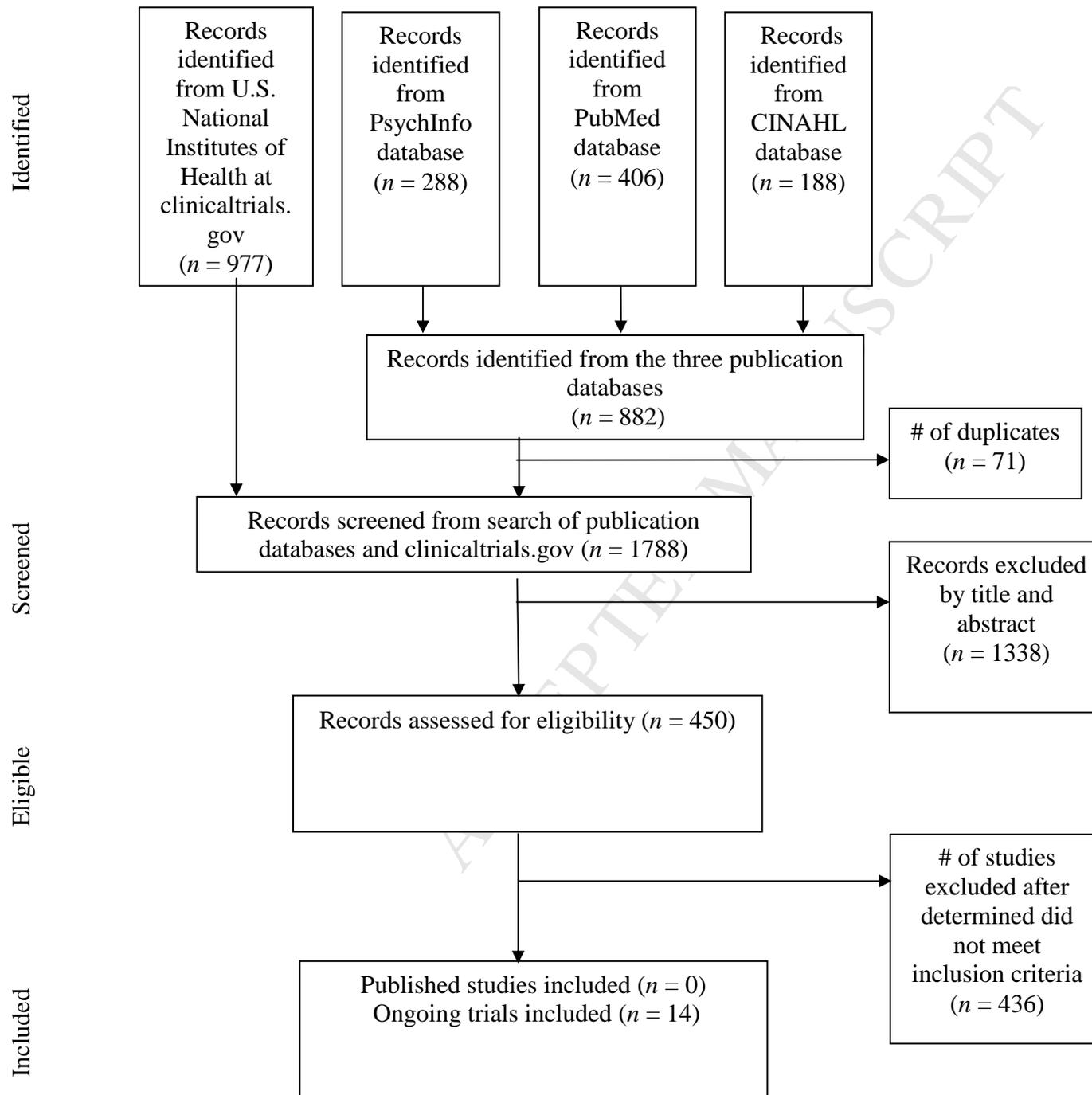
Table 1. *Cont.*

<b>Principal Investigator</b>	<b>Clinical Trials Registration Number</b>	<b>Study Title</b>	<b>Design</b>	<b>Type and Purpose of Technology</b>	<b>AA Women Included in Sample*</b>	<b>Estimated Participant Enrollment</b>
Kahn	NCT01252212	Adherence Improvement Measure (AIM) system; challenge topic: 10-MH-101	RCT 2-Arm Active Comparator	Cell phone short message service reminders for medication adherence	Yes	99
Garofalo	NCT01354210	Text messaging intervention to improve ART adherence among HIV-positive youth	RCT 2-Arm Crossover Assignment	Cell phone short message service to improve medication adherence	Yes	152
Ingersoll	NCT01343654	RCT of a text messaging adherence assessment & intervention tool for rural HIV+ drug users	RCT 2-Arm Parallel Assignment	Personalized text messaging system based on Ecological Momentary Assessment; to assess and improve ART adherence and drug use in real time	Yes	70

*Note.* AA = African American; ART = antiretroviral therapy; STI = sexually transmitted infection; HCV = hepatitis C virus; RCT = randomized controlled trial; Rx = prescription.

\*Specifics related to gender and race were not reported at clinicaltrials.gov. Thus, we were unable to determine if 50% or more of the sample were AA women.

## mHealth HIV Self-management



*Figure 1.* Flow diagram for search process and conducting the review.

Adapted from: Liberati et al. (2009).

*Note.* CINHAL = Cumulative Index to Nursing and Allied Health Literature

ACCEPTED MANUSCRIPT