# NATIONAL HEALTH IT COLLABORATIVE

## For the Underserved

*"A Public/Private Partnership for a Healthier America"*

# Promoting Consumer Engagement and Empowerment through the Adoption and Use of Health Information Technology in Communities of Color

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## About NHIT Collaborative

Established in 2008, the National Health IT Collaborative for the Underserved (NHIT Collaborative) contributes to the elimination of health disparities and the attainment of optimal health through the effective use of health information technology (HIT) by and for the underserved, with an emphasis on communities of color. NHIT Collaborative works in partnership with organizations and individuals to assure that providers and consumers in these communities benefit equitably from HIT advances and resources. NHIT Collaborative supports the full engagement of multicultural populations with respect to HIT planning, adoption and use; education and outreach; workforce development/training; policy development/implementation; finance/sustainability; and research and evaluation.

## Acknowledgements

# Abstract

This document presents the results of a literature review and environmental scan of the adoption rates, use, and outreach strategies for health information technology (HIT) tools. Our focus is on those tools with potential to enhance personal health care management in communities of color (COC). Specifically, the document reviews the use of personal health records (PHRs), patient portals, and other mobile health care applications (MHCAs) that assist consumers to manage their health and health care electronically. The literature suggests that, while COC benefit from the use of HIT tools, the adoption of this technology remains low when compared to the white patient populace. To maximize the effectiveness of these electronic tools, education and outreach initiatives must incorporate the use of mobile devices and culturally inclusive strategies.

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# Introduction

Over the course of just a few years, the health care industry in the United States has gone through significant reform to improve the quality, efficiency, equity, and cost of health care services. One of the central tenets in truly reforming health care is ensuring that the patient, or the consumer, is engaged.[a] This point is not lost on the industry, as countless efforts have been deployed, in both the public and private sectors, to engage the consumer.

The "face" of the average health care consumer is also rapidly changing in the United States. It is estimated that by 2045 over half of the United States population will be a person of color;[1] and, of COC, Latinos are the fastest growing minority population in the United States. [2] Despite the demographic shift, consumers in these communities continue to experience worse access to health care and worse health outcomes when compared to members in the white consumer community.[b]

Of the many health care reform initiatives, health information technology (HIT)[c] has become a fundamental element to improve the access, efficiency, equity, and quality of health care in multiple settings. Of the HIT tools available, the personal health record (PHR) and patient portal have been specifically referenced, in accordance with Meaningful Use Stage Two[d] attestation, as platforms that directly improve consumer engagement through personal health care management.

A recent survey by the California Healthcare Foundation indicates that PHRs are successful platforms for the improvement of consumer engagement. [3] Specifically, the survey found that consumers who used PHRs took action to improve their health care status, asked more questions of their providers, felt more connected to their providers, and knew more about their health status. Notably, the positive effects of the PHR were most valued by individuals with multiple chronic conditions, less education, and a lower reported income. A separate survey, conducted by the Virginia Commonwealth University, also found that PHR use had

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[a] Often, the terms patient and consumer are used interchangeably. For the purpose of the document, both phrases will be used in reference to both the consumer and the patient. The use of the word consumer is purposeful and used to convey the ability of choice for the individual.

[b] **Access to health care remains worse in communities of color, even when factors like income and access to insurance are controlled. *IOM Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare.***

[c] Health information technology is a blanket term used to describe electronic tools used to collect, store, retrieve, and transfer information electronically for the purpose of health care.

[d] Two of the core criteria measures in Meaningful Use Stage Two include direct references to consumer engagement. Traditionally, both public and private initiatives have focused on the use of the PHR and patient portal to satisfy these requirements. As such, particular attention is paid to these platforms within the document. However, other technologies, such as MHCA are referenced as important technologies that may also satisfy the requirement.

a positive effect on consumer engagement.[4] Specifically, the survey stated that consumers who used an interactive PHR were twice as likely to be up-to-date on preventative screenings.

Despite successes of this technology platform, the California Healthcare Foundation Survey indicated overall low adoption rates of PHRs by consumers. While one in 14 consumers reported use of a PHR to manage care needs, only seven percent of adults report constant use of the tool.[5] Also, while PHRs can benefit all consumers, an overwhelming majority of the users were under the age 45, educated, higher income white males.[6]

PHRs are not the only technology platforms that have shown success in consumer engagement. Patient portals and mobile health care applications (MHCAs) are also successful tools in increasing consumer engagement by allowing patients to message directly with providers, view test results, and order medication refills. In a recent survey, 15 percent of consumers with online access reported using a patient portal in the last 12 months, and an additional 28 percent were interested in trying the platform.[7] Through the use of portals, providers are able to better engage patients and families in care needs. Likewise, additional studies suggest that through the use of the portal, care is more efficient and of a higher quality, particularly for consumers with chronic illness.[8] However, similar to findings for PHR use, consumers who were more likely to register for patient portals fit a defined patient demographic – white, female, and between the ages of 30 and 65.[9]

MHCAs enable the viewing, receiving, and sending of information to and from cellular phone technologies. Through the use of MHCAs, patients are able to conduct a wide range of functions, such as monitoring their health care needs, setting appointment reminders, ordering medication refills, and receiving helpful messages through a short message service (SMS).[10] A study conducted by the Pew Research Center suggests that the use of MHCAs is more ubiquitous with a reported 19 percent of all Smartphone[e] owners having downloaded an app[f] specifically designed to track or manage their health.[11] Uniquely, the survey reported that Latinos and African Americans, consumers between the ages of 18 and 49, and those who have attained at least some college education were more likely to use mobile devices (specifically a Smartphone) to research health information online.

Overall, while literature shows that consumers become more engaged and are more aware of their health when it is available online, the use of PHRs and patient portals is lower

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[e] For the purpose of this document, Smartphones will refer to mobile phones that offer such standard cellular technologies as voice and text communication as well as advanced computing and communication capabilities, including Internet access, software applications, and geo-positioning systems.
[f] The term app is common shorthand for software application.

among COC. Conversely, recent trends show greater adoption and use of mobile devices for health care purposes by members of COC. As providers move into Meaningful Use Stage Two and beyond, the adoption and use of patient-centered technology will become integral to the success of reform efforts. As such, priority must be placed on engaging *all* consumers in the use of HIT platforms.

## Definitions

*PHRs*[g] are a rapidly developing technology that exists in multiple platforms inclusive of, but not limited to, network/interconnected PHRs, Health 2.0 sites, condition-oriented, service-oriented, population-oriented, untethered-USB, desktop, PDA, portals, populated from claims data, and institutional/IDN provider portals.[12] Because of the evolving nature of the instrument, for the purposes of this literature review, the PHR will be defined as follows:

- A universally accessible, layperson-comprehensible lifelong tool for managing health information, promoting health maintenance, and assisting with chronic disease management via an interactive, common data set of electronic health information (EHR) and e-health tools

- Owned, managed, and shared by the consumer or legal proxy

- Secure to protect the privacy and confidentiality of the health information it contains

- Not a legal record unless so defined and, therefore, subject to various legal limitations[13]

*Patient portals* are technologies that use a secure online Web site and provide consumers convenient and instant access to personal health information from anywhere with an Internet connection.[14] Patient portals act as an extension of the EHR and allow the consumer to access data, such as clinical information, published to the portal; submit questions to provider resources; and book appointments.[15] They differ from the PHR because they do provide the opportunity for the consumer to enter or control data. As noted above, some PHRs can contain patient portals; however, for the purpose of this

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[g] Multiple documents use the term patient portal when referring to some aspects related to a PHR. For the purpose of this document, PHRs and patient portals were assessed separately. While patient portals utilize some of the same functionalities of the PHR, their use is more limited.

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document, patient portals will be reviewed independently of the functionalities available to PHRs.

*MHCAs* refer to applications used specifically by consumers to engage in the management of their health care needs through a mobile platform (Smartphone or other mobile cellular device).

*COC* is a broad term most often used to describe groups of racial and ethnic minorities. In this literature review, COC will refer to racial and ethnic minorities identified by the United States Government as statistically distinct groups. These groups consist of Native Hawaiians and other Pacific Islanders; Latinos/Hispanic[h] Asian Americans; American Indians and Alaska Natives; and African Americans, inclusive of immigrants from Africa and the Caribbean. The classification of *white* will refer to a person having origins in Europe, the Middle East, or North Africa. It includes people who indicate their race as "white" or report entries such as Irish, German, Italian, Lebanese, Near Easterner, Arab, or Polish.

*Health information outreach* refers to educational or awareness-promoting activities designed to enhance a community's abilities to access and use PHRs and patient portals.[16]

*Adopters* refer to primary care patients who registered for PHRs, patient portals, or other MHCAs; and *non-adopters* are primary care patients who did not have access to or choose not to adopt these technology platforms.[17]

## Study Design

Over a five-week period, online database literature searches were performed through publically available sources.  Bing and Google search engines were the primary platforms used for research. All sources reviewed are provided in Appendix A*.* The search terms employed during the review include:  *minorities, ethnic, communities of color, personal health records, PHRs, electronic personal records, African American, Black, Hispanic, Latino, Asian, Pacific Islander, ethnicity, ethnic disparity, patient portal, consumer engagement, health information technology, patient engagement health information technology, mobile applications health care, mobile applications management of health care, mobile health information technology, Smartphone, digital health, trust, literacy, privacy, barriers, and electronic health care engagement.*  All literature reviewed was authored prior to and following the Health Information Technology Economic and Clinical Health Act (HITECH) (

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[h] Often the disruptors Hispanic and Latino are used interchangeably. For the purpose of this document, the term Latino will be used to refer to individuals also referred to as Hispanic..

2000-2013) in order to provide an overview of the continuum of the adoption, use, and outreach efforts of patient management technologies. While Asian Americans, Native Hawaiians and other Pacific Islanders, and American Indians were included in the literature scan, there are currently few documents pertaining to the adoption rate and use of HIT tools by members of these communities for personal health engagement. Information concerning these groups is referenced when appropriate. However, the focus of this review concerns mostly African American and Latino consumers.

*Limitations in Study Design*

There were several limitations for this literature review. Overall, there has been minimal research conducted on the adoption rates, use, and outreach of HIT tools for personal health engagement by consumers in COC. Though a number of factors presented in the literature remain present today, a paradigm shift in how individuals access and use technology is rapidly evolving. Smartphones have saturated the market, allowing for instant access to the Internet and the growth of applications of varying usage that can often be tailored to suit the user's needs, particularly in COC. Further, because of the rapidly expanding rate of use of Smartphones and other devices, it is difficult to pinpoint current trends in an ever-changing environment.

# Health Information Technology in Communities of Color

This section provides information on PHR, patient portal, and MCHA adoption rates, use, and outreach activities in COC. Adoption rates refer to the actual adoption of the technologies; use refers to the exchange of data through HIT in COC; and outreach reviews efforts by both public and private organizations to increase the rates of HIT adoption and use in COC.

## *PHRs*

Overall, very few studies have considered the adoption rates of PHRs by consumers. Of the literature available, evidence suggests that, while rates of PHR adoption are low across all consumer groups, members of COC adopt PHRs at an even lower rate when compared to members of the white community.[i] Reasons for low adoption include historical gaps in access to Internet-based platforms[j], perceptions of the usefulness of the technology, and lack of adoption by providers who treat COC. Despite barriers to adoption, studies show that members of COC are interested in the use of PHRs to manage health care needs.

For example, a 2009 cross-sectional survey of PHR adoption within a northeastern health system consisting of eight hospitals and 6,000 providers concluded that, while 43 percent of patients adopted a PHR between 2002 and 2009, African Americans and Latinos were less likely than whites to adopt PHRs.[18] The study also found that, when compared to non-adopters, adopters were more likely to have more than two comorbidities. The survey concluded that among multiple factors assessed, lack of access to the Internet was the predominant cause in the disparity of adoption of PHRs by COC. Likewise, a 2009 survey by Kaiser Permanente of Georgia reported a significant gap in racial and ethnic minority PHR registrants. Among African American members, only 30.1 percent registered, compared with 41.7 percent of whites.[19] Similar to the study of the northeastern hospital system, barriers to access to the Internet by COC directly affected PHR adoption. Moreover, communities with a baseline access to the Internet were more likely to register, without

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[i] It must be stated that a majority of research was performed prior to the wide use of mobile technology amongst communities of color. In these instances, these platforms were reviewed independent of mobile technology access.

[j] This is commonly referred to in literature as the "digital divide" which is a gap between those who have ready access to computers and the Internet, and those who do not.

distinction to race. Interestingly, differences in education and income did not account for statistical disparities in PHR registration by race in either study.

Despite limitations of access to Internet-based platforms, consumers in COC are interested in the benefits of PHRs. A report published by the *Journal of Medical Internet Research*, which analyzed data from a 2007 Health Information National Trends Study, found that Latino consumers reported a 95 percent confidence rate in the use of PHRs and were more likely to use the Internet to look up health care information online than any other racial/ethnic group, including whites.[20] Despite these findings, the report noted that Latinos were also less likely to have access to the Internet than whites, causing an overall lower PHR adoption rate.

Other studies indicate interest in adoption of PHRs by COC with high chronic disease rates. In a study of mostly African American (38 percent) and Latino (eight percent) HIV patients, respondents expressed interest in using a PHR to manage their disease.[21] Of the consumers surveyed, 70 percent expressed interest in being taught how to use PHRs to communicate with their provider, receive test results, and schedule online appointments. Patients surveyed also voiced concerns regarding Internet access, data privacy, cost, lack of interest, and unfamiliarity with the technology as barriers to the use of the platform.

Studies also suggest that the adoption and use of HIT by providers who serve COC have a correlative effect on their patients' use of PHR tools. A recent study by the Society of General Internal Medicine reported that, while patients who currently participate in such digital technologies as SMS, e-mail use, and the Internet were interested in electronic communication with their medical provider, providers that serve predominantly COC (safety net providers) did not offer these services to patients, greatly hampering adoption rates.[22]

## Patient Portals

Similar to the literature concerning PHRs, available information on the adoption rate and use of patient portals is also scant.[k] According to available literature, rates of use of patient portals among COC mirror trends their PHR adoption rates. While COC use patient portals more than PHRs, use of the platform lags significantly behind white counterparts.

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[k] Similar to PHRs, patient portals were also accessed independent of access through mobile technology platforms.

Enrollment in patient portals has shown marked improvements in patient engagement in COC. In 2011, a study was conducted among African American diabetic patients in the Washington, D.C., area. The study concluded that the use of patient portals – partnered with online social networking support, the design of culturally inclusive tools, and technology training – created a vast improvement in not only health care outcomes, but also in provider/patient relationships and perceptions of health care by participants.[23]  Notably, the participants received significant tutoring on the provided portal and  also received an in-home visit from trained staff to explain the tool.

Despite the potential for positive health care outcomes, a study conducted in 2008-2009 in an urban academic primary care practice showed that minorities were less likely to adopt patient portals when compared to the white patient population within the clinic. [24] In the study, a total of 7,088 consumers were offered enrollment to a patient portal of which 69 percent reported enrollment. Of the 69 percent that enrolled, only 55 percent of African Americans, 64 percent of Latinos, and 66 percent of Asians enrolled compared to 74 percent of white consumers.[25]  Also, research within the study showed that, even when providers encourage consumer enrollment in the technology platform, rates of enrollment were significantly lower among COC. However, it must be noted that once technology was adopted, white and patients from COC were equally likely to use the patient portal to communicate with their providers and request medication refills.

Notwithstanding the lack of enrollment, there is interest in use of the platform.  A recent survey (2013) published in the *Journal of General Internal Medicine* reported strong interest in patient portal platforms by COC serviced by public health clinics in San Francisco, CA. Of the 416 patients surveyed – 81 percent of whom reported as non-white – 78 percent expressed interest in electronic communication to manage their health.[26]  The study also reported a strong correlation between the use of e-mail among consumers and interest in the use of a patient portal; three out of four surveyed were interested in using e-mail platforms to communicate with their providers.[27] Similar to research conducted on PHRs, interest in communication through e-mail platforms was highest among Spanish speaking groups. The study further concluded that interest among those surveyed were consistent with the general U.S. population – suggesting that there is no deficit in the desire of the consumer population to have digital access to health care.


## *Mobile Health Care Applications*

In tandem with the trend in rapid growth of Smartphone use by consumers, a study conducted in 2012 by Manhattan Research reported that the number of U.S. adults using

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mobile phones for health information tools grew from 61 million in 2011 to 75 million in 2012.[28] Similarly, health tools for tablet use nearly doubled – from 15 million in 2011 to 29 million in 2012.[29] As of 2012, there were an estimated 40,000 MHCAs available on Smartphones and tablets that supported tools like accessing medical records, gamifying[l] health care, and managing care needs.[30]

In contrast to PHRs and patient portals, MHCAs have gained strong adoption amongst COC. A recent study showed that among MHCA adopters, Latinos and African Americans were more likely to use an MHCA when compared to whites. [31] A similar study of MHCA users reported that African American Smartphone owners (15 percent) were more likely than whites (seven percent) and Latinos (11 percent) to use these applications.[32] Of the MHCAs used, African Americans (59 percent) were more likely than Latinos (51 percent) to track basic health indicators such as diet, weight, and exercise.[33] Latinos, however, were more likely than any other patient group to research health information on their mobile phone (25 percent for Latinos, 19 percent for African Americans and 15 percent for whites). [34]

A separate study also found that Latinos were highly receptive and trusting of health-related text messages. In this study reviewing the effectiveness of text messaging for the testing and treatment of tuberculosis, human immunodeficiency virus, and syphilis, Latino consumers were more likely to feel that text message reminders for appointments or medications were helpful, when compared to white consumers.[35] An alternative study also reported similar results; Latino consumers preferred more detailed information in text messages for immunization reminders when compared to white consumers.[36]

Further studies suggest that MHCAs have the potential to improve both the cost and efficiencies of health care in certain COC. Specifically, in a study of mobile health interventions in Latino diabetic consumers, researchers calculated that mobile-based interventions had the potential to effectively increase medication adherence and reduce overall medical costs significantly.[37] By analyzing the base population of Latinos with diabetes, the study found that if mobile based health interventions were effective, in as little as 10 percent of the 3.4 million diagnosed Latinos with diabetes, it would result in a net cost savings due to disease-related medical costs of $183 million annually.

In addition to text messages and Internet use, streaming videos to Smartphones has shown to be effective in improving health care behaviors in African American females. In a study of the effectiveness of Smartphones in managing sexual behavior, streaming educational

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[l] The term gamifying is best used to describe the use of game mechanics and game design techniques in non-game contexts (Mashable.com)

videos to the Smartphones of African-American females created a 20 percent reduction rate in high-risk sexual behavior.[38]

## Factors Contributing to Low Adoption of HIT to Manage Personal Health in COC

Despite the proven successes of HIT in increasing consumer engagement in personal health management, multiple external factors, including technical, practical, and cultural challenges, play a role in inhibiting adoption by COC. These factors include, but are not limited to: health literacy; perceived benefits of the tool; adoption of patient centered care by providers that serve COC; immigration status; language barriers; and trust in available platforms.

Health literacy, or the extent to which a consumer can access, process, and understand health information and services in order to make appropriate health decisions, is cited as one of the main factors contributing to inequitable adoption of HIT for personal health management within COC. Latinos have the highest reported rate of low health literacy amongst COC. The 2003 National Assessment of Adult Literacy reported that 41 percent of Latinos were below basic levels of health literacy and 65 percent had basic to below basic levels of health literacy.[39] A 2010 study published in the *Journal of Health Communication* reviewed the link between the uses of a patient portal to manage diabetic care among a 78 percent diverse[m] minority population.[40] The study found that, even when controlling for Internet availability, individuals with limited health literacy were less likely to activate their patient portal, sign in, and to use the available functions. The study ultimately suggested that those with limited health literacy also showed correlative difficulties navigating patient portals.  Moreover, the study found that disparities in use of the patient portal by health literacy, race, and education mirror well documented disparities in diabetes health outcomes. Another study published in *Perspectives in Health Information Management* stated that the perception of understanding information in a PHR correlated strongly with adoption rates of the technolog*y.*[41]  The authors of this survey stressed the need for providers to support patients with qualified staff and tools to help them become comfortable with accessing their information online and to learn how to interpret their information correctly. The correlation between health literacy and access is supported

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[m] This included African American, Hispanic, Asian, and multiracial patients.

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again in another cross-sectional study of African Americans. This study explored the relationships between health literacy and health access through HIT tools and ultimately supported previous findings that those with lower health care literacy rates were less likely to use online tools to access or store health information.[42]

Perception of their effectiveness also plays a role in the use of technology platforms. Literature suggests that if consumers do not perceive a benefit, from using an electronic health tool, they will be less likely to engage with the technology.  In addition, factors such as cumbersome instructions, inconvenient access, and lack of adoption among other consumers affect the adoption rate of a HIT tool. A study published in 2012 in the *Journal of Medical Information Associations* found that African Americans were less likely to enroll in patient portals because of a perceived lack of use for the tool.[43] African American respondents were also less likely than white respondents to endorse features in patient portals that assisted self-management, including receiving test results, managing medical problems, and scheduling medical appointments.[44] Likewise, a correlative study concerning African American patients' lack of enrollment in patient portals, reported related views on the non-importance of the technologies use for self-management.[45]   In a separate study, Latinos were less likely than whites to agree that health information on the Internet improved both patients' understanding of disease states and treatments and patient/provider relations, and increased access to treatment.[46] Moreover, Latinos were more likely to agree that accessing health information on the Internet promoted excessive visits to providers when compared with whites.[47]

Likewise, trends in the use of these tools by providers influence the adoption among consumers.  Data from a 2009 U.S. National Health Interview Survey indicated that there is an uneven development in the rate in which providers are prepared to adopt a "patient-centered technology" practice.[48]  This disparity is especially prevalent among those who serve socially and economically disadvantaged consumers, such as minorities and senior citizens. In addition, in the previously cited study concerning portal adoption rates in a San Francisco clinic, respondents reported feelings of concern that HIT would create more work for clinical staff and could not replace face-to-face visits.[49]

Immigration status plays a large role in whether consumers will participate in digitalized technology. A study, sponsored by the Asian & Pacific Islander American Health Forum, California Pan-Ethnic Health Network, Consumers Union, and The National Council of La Raza, found that consumers with an immigration status (some members eligible for public programs and others not) are more fearful of exposing undocumented family members by enrollment in HIT applications.[50]

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Language barriers have also become a significant determinant regarding the adoption of HIT tools for personal health management. One study suggests that Spanish speakers are less likely to use online platforms and, when they do use them, are significantly more likely to seek out in-person assistance as a result of a Spanish/English language barrier. [51] Likewise, while there are multiple health care sites authored in English, there are minimal online platforms available in Spanish or other languages, which increases access and health literacy disparities as a function of language barriers.[52]

Lack of trust in both health care services and HIT also creates a barrier affecting adoption rates in COC. While studies have found that Latinos are the most likely minority group to look up and use the Internet for health information, it is also reported that Latinos have a higher rate of hesitation in the receipt of online medical information from unqualified sources.[53] Similarly, a recent study reported that African American respondents were more likely than whites to have concerns about personal privacy and the potential for harmful experimentation in hospitals.[54] Despite concerns of privacy, African Americans were more likely to rate online content and social media as trusted wellness sources.[55] In addition, all consumers report concerns about providing information about their race or ethnicity online for fear of misuse. [56]

In addition to these barriers, the technical infrastructure to support the use of these technologies remains a challenge in rural and urban communities. Specifically, today there remains insufficient investment in 3 and 4G networks that would enable the support of mobile-based technologies in largely urban areas.[57]

## Growing with Innovation: Leveraging Mobile Health Care Technology to Engage COC

As the literature suggests, factors contributing to the slow adoption of HIT for personal health management in COC are varied and complex. While the adoption of PHRs and patient portals may never gain ubiquitous use among COC through traditional technologies, such as the personal computer, other HIT applications, specifically MHCAs, have the potential to provide similar functionalities and close the gap in health care outcomes.

Mobile cellular devices provide multiple advantages for online access over traditional technologies. Unlike a desktop or laptop computer, mobile devices are often always near the consumer, carried on the person, or typically within immediate access.[58] These tools also provide important functionalities to facilitate instant access to health care information including, but not limited to: portable access to the Internet and other online tools, continuous uninterrupted data streaming, and the ability to access and support multiple

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computing and software applications. In addition, economic benefits have been shown when paired with other telehealth technologies for health care outreach.[59] Studies suggest that the use of mobile cellular phones to support communication between providers and consumers is more effective in monitoring and managing chronic disease, when compared to telehealth services alone.[60]

Recent reports show that the United States currently has more than 326.4 million wireless subscriber connections – averaging more than one per person in the United States.[61]  It is further reported that two-thirds of cellphone-owning U.S. residents use their phones to access the Internet and check e-mail, a rate that has doubled since 2009, when only 31 percent of people reported the use of phones to go online.[62] Of these users, 61 percent reported the use of a Smartphone, with 21 percent of these users reporting the technology as their primary way of accessing the Internet[n]. Of the adopters, African Americans and Latinos (87 percent) were statistically more likely to own a mobile cellular phone than whites (80 percent).They were also more likely than any other group to use their cellular device as the sole method for gaining online information.[63]  Interestingly, overall members of COC are more likely to possess a wider array of data options on their Smartphones when compared to whites.[64] Studies also show that members of COC were more likely to use Smartphones for "non-voice" functions when compared to their white counterparts, indicating an overall comfort level with technology.[65]

Literature suggests that both the rapid rate of adoption and accessibility of MHCAs have not only the potential, but also the capacity to significantly change health care outcomes in COC. However, to do so, MHCAs must be mindful of incentives and barriers to adoption rates in COC when developing technology platforms. To create appropriate technologies through MHCAs, it is recommended that the following be observed:

●      MHCAs must be both accessible to those with low literacy rates and available in multiple languages.  Designing tools that use voice recognition and touch screen technologies will be crucial to the success and adoption of these tools.[66]

●      Tools must be transparent and open about why information is collected, who has access to it, and how it is used.

●      To increase adoption and perception of their effectiveness, tools must be accompanied by the appropriate training and outreach by health providers.

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[n] This was in comparison to the use of personal computers or tablets

- Pilot projects should be implemented by vendors in partnership with COC agencies to create and test MHCAs aimed at reducing/eliminating disparities in such conditions as diabetes, hypertension, and asthma.

- Tools must be supported, endorsed, and paired with provider technology to promote coordinated care.

- Tools should be designed to respond to individual preferences. Applications must be presented in a manner in which the consumer will both understand and desire to use.

- Trusted organizations with proven outreach capacity should be resourced to inform and educate COC about the benefits of HIT for health improvement and consumer empowerment.

- HIT policies should support the improvement of technologies in COC inclusive of: 3 and 4G access support, creating incentives for providers to engage in mobile-based health care, and reforming regulatory barriers that discourage the use of nontraditional medical treatment strategies (e.g., telemedicine) in COC. [67]

## Outreach

While the literature describes multiple barriers to the adoption and use of HIT for consumer engagement by COC, there are health information outreach programs that were specifically designed to increase the PHR adoption rates by COC. Here are examples of successful outreach programs:

*Howard University's Diabetes Treatment Center* – Diabetes is the seventh leading cause of death in the United States and disproportionately affects members of the

African American community.[68] In 2004, 8.2 percent of residents in Washington, D.C., reported being diagnosed as diabetic, with a prevalence rate of 23 percent in the African American community.[69] To curb the effects of diabetes in the African American community, the Howard University Diabetes Treatment Center offered patients access to a free, online PHR that monitored blood sugar, blood pressure, weight, and cholesterol – among other clinical indicators associated with diabetes. The PHR was tethered to the Center's' electronic medical record and allowed the sharing of information in the PHR with other authorized individuals, communication with providers in between visits, the aggregation of trended data, and providers' monitoring of patients' health status. The program enhanced levels of patient engagement, particularly among Medicaid patients, and improved blood glucose control of participants.

*MiVIA* – This PHR platform, which was originally launched in Sonoma Valley, California, in 2003 for migrant and seasonal workers, now provides connectivity across the nation.[70] Each member gets a personal identification card from community-based outreach organizations and can set up a private, secure account. The card also has detailed instructions on how to access records from online anywhere, at any time. In addition, the platform allows for family accounts that hold up to eight separate family member records. When surveyed, 40 percent of users reported using MiVIA on a regular basis, with 87 percent not owning a computer.[71] Equally, the use of the platform has reduced the digital divide; and users report feeling empowered and having peace of mind, knowing that important health information is securely stored and accessible.

*Text 2 Survive* – A recent text messaging pilot in Illinois showed positive results in educating teens and young adults (13—35) about HIV/AIDS. Text 2 Survive provides accurate information about human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) and connects users' locations to testing sites and related preventive services.[72] Due to privacy concerns, the study is not able to specifically report the growth in HIV/AIDS services to participants; however, testing centers reported patients sought out information as a direct result of receipt of an informative text message, indicating positive effects of the program.

*Total Health for African American Christians* – This nationwide app takes a mind, body, and spirit approach to addressing racial health disparities targeted within the African American community. The app focuses on information about heart disease, HIV/AIDS, and diabetes. It includes functionality for doctor's appointments, lab results, and wellness management.

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*Reducing Cancer Among Women of Color* – This Health and Human Services-based app challenge focused on addressing health disparities among racial and ethnic minorities.   The winning applications linked women of color to information for preventative screening locations, support groups, and care services. These applications are:

- Big Yellow Star
- Team Broadstone
- HW-Technology
- Counterguard
- Support Health

*The Health Information Gateway* – This is the first nationwide searchable database of diabetes health information directed at Asian Americans, Native Hawaiians, and other Pacific Islanders (AANHOPI). It is a free online resource for materials contributed by the community and reviewed for medical accuracy, as well as for cultural and linguistic appropriateness. The resource is available to doctors, health educators, parents, teachers, and patients who need to easily access a wide range of diabetes materials in more than a dozen different AA&NHOPI languages. Three main values are at the core of The Gateway:

- AA&NHOPI-Centered –Highlight and address the need for high-quality health education and prevention materials for AA&NHOPIs
- Community-Based – Alter the face of health education through increased community–based ownership and input
- Easily Accessible –  Increase the ease of access with which anyone can search for a wide range of in-language, health education materials[73]

Due to the diversity of these platforms, it may seem daunting to determine the most appropriate path to understand the best use of technology in improving personal health management. However, understanding and leveraging the use of mobile technology will be essential to increasing the adoption of personal health management platforms.  Because this is a new frontier for users and providers as a whole, there is potential for exponential growth, success, and norming of these tools in COC.

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