UNDERSTANDING THE IMPACT OF HEALTH IT IN UNDERSERVED COMMUNITIES AND THOSE WITH HEALTH DISPARITIES

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Preface

NORC at the University of Chicago (NORC), working under subcontract to the George Washington University, is pleased to present this report, *Understanding the Impact of Health IT in Underserved Communities and Those with Health Disparities,* funded by the Office of the National Coordinator for Health Information Technology (ONC) and the Health Resources and Services Administration (HRSA) within the U.S. Department of Health and Human Services. The NORC project team includes Adil Moiduddin, Prashila Dullabh, Cheryl Austein Casnoff, Jessica Bushar, Ilana Dickman, Ashley Nathanson, Tyne Alexander, Meghan McMahon, Karen Harris Brewer and Elizabeth Babalola. Contract oversight was provided by Leighton Ku, Ph.D. from the George Washington University. NORC would also like to acknowledge the contributions of our consultant, M. Chris Gibbons from Johns Hopkins University.

NORC gratefully acknowledges the contributions of our ONC and HRSA project team, Matthew Swain, Emily Jones and Miryam Gerdine, who provided thoughtful input and guidance throughout the project.

Finally, NORC would like to thank members of the project's Technical Expert Panel (listed below) for their generous assistance and input from September 2010 – June 2012. NORC established and convened the Technical Expert Panel as part of the scope of this project. Members of the panel provided feedback and input to NORC based on an agenda of topics developed by NORC. NORC staff analyzed this feedback and incorporated appropriate elements into key project deliverables.

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Executive Summary

The Health Information Technology for Economic and Clinical Health (HITECH) Act is a component of the American Recovery and Reinvestment Act of 2009. One part of the HITECH Act (cited below) directs the Office of the National Coordinator for Health Information Technology (ONC) within the U.S. Department of Health and Human Services (HHS) to assess the impact of health information technology (health IT) in communities with health disparities and also in areas with a high proportion of individuals who are uninsured, underinsured, and medically underserved.

> *"The National Coordinator shall assess and publish the impact of health information technology in communities with health disparities and in areas with a high proportion of individuals who are uninsured, underinsured, and medically underserved individuals (including urban and rural areas) and identify practices to increase the adoption of such technology by health care providers in such communities, and the use of health information technology to reduce and better manage chronic diseases."*
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> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 13101, 123 Stat. 232 - 233 (2009) (adding § 3001(c)(6)(C) of the Public Health Service Act).

Responding to this provision, ONC contracted with the George Washington University and NORC at the University of Chicago (NORC) to assess current uses of health IT in communities with health disparities. This report presents findings from an extensive review of the literature, a series of discussions with a Technical Expert Panel (TEP), and nine case studies[ii] of community-based programs that are using health IT to address the needs of populations with documented disparities in access, quality of care, and health outcomes. Populations studied include rural populations, racial and ethnic minorities, recent immigrant groups, and individuals with chronic illnesses.

Case studies included communities throughout the nation, in settings ranging from the rural Pacific Northwest, to the Mississippi Delta, to New York City. The sites were implementing programs that use electronic health records (EHRs), telehealth, personal health records (PHRs), health information exchange (HIE), and other IT tools to address the needs of various underserved populations. NORC did not investigate "stand-alone" personal health applications; rather, the study focused on health IT initiatives managed by health care provider organizations. For each case study, NORC met with multiple clinicians, administrators, quality improvement specialists, patients, and other stakeholders involved in health IT initiatives in order to understand their motivations and to explore how they integrated health IT into practice at their organizations, and how they used health IT to address the needs of the populations that are the focus of this study.

[ii] NORC worked closely with ONC and HRSA to identify and conduct nine case studies between April and November of 2011.

Importance of Current Study

Experts estimate national health expenditures will reach $4.6 trillion by 2020. Chronic diseases are a key driver of health care costs. They account for an estimated 75 percent of health care expenditures and disproportionately affect underserved groups.[1,2] Many underserved groups face lower quality of life and life expectancy, due in part to lack of access to timely, high-quality health care. Health IT offers promising tools to address chronic diseases by facilitating the continuity of care and long-term follow-up needed for successful management of these conditions.[3]

Research shows mixed evidence of disparities in technology adoption among providers who care for underserved groups as compared to other providers.[4,5] On the one hand, there is some work that suggests that Federally Qualified Health Centers (FQHCs) have relatively robust adoption of EHRs due to the Health Center Controlled Networks (HCCNs) program and other initiatives.[6,7] Many FQHCs have used chronic disease registries for some time, especially to manage care for patients with diabetes. The Health Disparities Collaborative program was one of the earliest programs to use registries to manage chronic disease.[8] On the other hand, stakeholders express growing concern that adoption of health IT among providers will cause a new form of the digital divide, as the populations served by providers adopting EHRs and exchanging health information experience benefits from improved convenience, coordination, and quality of care compared to populations whose providers have not adopted health IT.[9] Today, the federal government makes significant investments targeting underserved communities and populations that experience health disparities. Examples include funding for FQHCs, Rural Health Clinics, Critical Access Hospitals (CAHs), HITECH initiatives that prioritize support for safety-net providers, and Medicare and Medicaid innovation demonstration projects. To support the effective use of these resources, this study examines the literature, case studies, and a review of other relevant federal programs.

Overview of Key Findings

Health IT has Potential to Impact the Health of Populations Experiencing Health Disparities

Health IT can enable effective redesign of health care systems to advance elements of the "three part aim:" improving the patient experience of care (e.g., quality and satisfaction), improving the health of populations, and reducing the per capita cost of health care.[10] Under some circumstances, health IT used for chronic disease management can yield population health benefits. Underserved populations often have higher rates of cancer, asthma, obesity, behavioral health disorders, and other chronic diseases. Data also show that these populations are more likely to exhibit signs of poor management of chronic disease.

The *National Healthcare Disparities Report 2011*[11] of the Agency for Healthcare Research and Quality (AHRQ) examines hospital admissions rates for short-term complications in individuals with chronic disease such as diabetes and asthma. It reports that differences persist among underserved populations with these conditions.[12] Applying health IT tools like consumer e-health, EHRs, and EHR-based clinical decision support (CDS) can enhance patient engagement, improve patient safety, and reduce adverse events. Prior research suggests that individuals with multiple chronic conditions, or those with less than a college degree, are more likely to benefit from being able to access their health information online.[13]

This study identified multiple cases in which use of telemedicine offered greatly improved access to specialists for rural residents and reduced the stigma associated with obtaining behavioral health care for some groups. The research also highlights instances in which chronically ill patients, such as those with uncontrolled diabetes or congestive heart failure, have utilized home health monitoring applications to improve their ability to manage their conditions and/or health related behaviors (e.g., diet and exercise). One case found marked reductions in emergency department (ED) visits and admissions among congestive heart failure patients who took part in home monitoring programs.[14]

NORC's research also found that some underserved groups are interested in and able to use PHRs, particularly those that are accessible via smartphones and mobile health applications (mHealth). These findings are relevant for stakeholders who are involved in upcoming stages of the Medicare and Medicaid EHR Incentive Programs that encourages "Meaningful Use" of EHRs. The EHR Incentive Programs provide financial incentives for the Meaningful Use of certified EHR technology. CMS has established, through notice and comment rulemaking, objectives for Meaningful Use that eligible professionals, eligible hospitals, and Critical Access Hospitals must meet in order to receive an incentive payment.[15] CMS and ONC establishes Meaningful Use rules in three stages. In Stages 1 and 2, Meaningful Use does not require applications to provide telemedicine, home monitoring or PHRs. Under current law, some providers participating in Medicare and Medicaid programs may not be eligible for EHR incentives, including those practicing in public health, behavioral health or long-term care settings.

Programs are Encouraging the Uptake of Health IT in Underserved Communities

Efforts to encourage health IT adoption in order to improve the quality of service delivery by safety-net providers were taking place before the implementation of HITECH, and they continue today. Such programs have included significant investments in HCCNs, health IT technical assistance, and customized EHR and population health management systems to address the needs of specific groups. Federal entities such as the Health Resources and Services Administration's (HRSA's) Office of Health IT and Quality and Office of Rural Health Policy, and the Indian Health Service have focused on improving health care

delivery and quality. Others such as HHS' Office of Minority Health (OMH) and the Centers for Disease Control and Prevention (CDC) have emphasized public health priorities. Many organizations described in this report continue to receive resources through federal programs that pre-date HITECH. The table below presents a summary of the role that federal programs play in addressing these challenges.

Summary
Resource Challenges
Traditional forms of payment for safety-net providers may need to adapt to sustain progress made through **time-limited grants to evaluate innovation** (e.g., supporting health IT adoption and other infrastructure for health care transformation.) The **Center for Medicare & Medicaid Innovation** (CMMI) of the Centers for Medicare & Medicaid Services (CMS) initiated an advanced primary care pilot for FQHCs to look at the impact of Primary Care Medical Homes (PCMH) on quality of care and Medicare payments to FQHCs. Over time, payment policies might evolve to continue to reward practices that demonstrate the capability to use health IT to improve quality and efficiency of care.
ONC's Workforce Development Program seeks to **increase the qualified health IT workforce** in the nation. Overall, the ONC's Workforce Development Program has trained thousands of new health IT workers and seeks to establish a self-sustaining capacity of colleges and universities to continue training new health IT workers, thus contributing to adoption, Meaningful Use, HIE and use of IT to improve quality of care working with a wide range of provider and technology organizations. The HHS Rural Health Task Force seeks to identify opportunities to assure that rural areas benefit from these activities.
Needs for Technical Assistance
The case studies demonstrate that safety-net providers sometimes struggle to address configuration and customization of health IT applications to address their needs. HHS through, the Office of Minority Health (OMH), establishes partnerships with vendors to assure safety-net requirements are addressed by their products. **Technical assistance investments** made through ONC's Regional Extension Centers (RECs) program, HRSA, and the Agency for Healthcare Research and Quality (AHRQ) may help consolidate and formalize requirements and specifications around case management, capture detailed demographic and language information, make consumer-facing tools useful and usable for underserved populations, and design reports tailored to the specific population(s) served by safety-net providers.
Many HITECH cooperative agreement and grant programs encourage or require collaboration across provider organizations. In addition, HRSA has long supported collaboration across health centers through Health Center Controlled Networks (HCCNs) as a means of reducing the cost of implementation and of gaining access to expertise necessary for effective implementation and use of health IT. Some HCCNs were selected to become RECs and others continue to support health center efforts to become meaningful users of EHRs, develop systems driven quality improvement reports, more effectively engage patients, and achieve economies of scale. HRSA recently issued a guide to health center networks providing details on how networks around the nation might **support providers in different areas**.[16]
Lack of Access to Technology
Currently, Medicare and Medicaid reimbursement for telehealth is limited to use of technologies that allow for real-time video engagement between patients and clinicians. A program supporting **access to distance medicine among rural providers** is the Federal Communication Commission's Universal Service Fund (USF). The USF's Rural Health Care Pilot Program offers providers options to purchase telecommunications services at discounted rates for rural providers.[17] There are benefits of both synchronous telehealth interventions (e.g., real-time interactive video conferencing consultations), and asynchronous telehealth interventions (e.g., home health monitoring.) Such technologies use a store-and-forward format to electronically transfer and store data for subsequent review and analysis by clinical staff, pending an alert.[18] Telehealth may be an effective model for reducing morbidity, utilization, and cost of care associated with specific populations such as those with congestive heart failure. Home health monitoring interventions are incorporated in some advanced primary care models being piloted and evaluated by CMMI and may be appropriate for reimbursement in the future.

NORC's analysis of the case studies demonstrates that tools such as EHRs and patient registries improve the quality of patient documentation, access to records, and the overall efficiency of the care that providers deliver to underserved patients. Case study findings also suggest that specific health IT functionalities, like panel reporting from registries and CDS, can improve adherence to clinical guidelines. These functionalities offer important opportunities for providers to see their care practice reflected across common metrics, and for leaders to identify opportunities to improve patient outcomes.

Although this project uncovered challenges and barriers to the use of health IT in communities with health disparities and underserved communities, NORC also found areas where federal programs directly address these challenges and barriers.

To be Effective in Underserved Settings, Stakeholders Should Tailor Health IT

Underserved groups face specific challenges, and so do the providers who serve them. Examples of issues that providers must address include meeting the needs of patients with limited English proficiency, or assessing the health status of recent immigrants potentially exposed to various health risks in their countries of origin. To improve the health of these populations, it is necessary to address social determinants of health (e.g., issues related to housing, employment, and transportation).

A common theme that emerged was a need to customize technology and processes to meet the needs of target populations. Resources and programs that only address general barriers to health IT adoption may miss some important barriers—such as limited English proficiency, low health literacy, lack of a usual source of care, limited access to broadband connectivity, and lack of comfort with technology—that impede effective health IT use among some safety-net providers and the underserved patients they treat.

Some technology experts believe that by 2014 the number of "mobile only" internet users worldwide will surpass the number of those who access the internet using desktops.[19] A recent national telephone survey of adult cell phone owners suggests that 55 percent use a cellular device to access the Internet. Nearly a third (31 percent) of "cell internet users" say they "mostly go online using their mobile device," and do not use another device such as a computer."[20] Cell internet users in the United States are more likely to be lower income individuals.[21] This trend suggests that mHealth may be an important vehicle for addressing the needs of underserved populations.

Patient education and engagement

Many factors affect patients' level of engagement in their health care, including health literacy, language issues, racial and ethnic concordance between the patient and provider, effects of disabilities on patients' health care experiences, and providers' cultural competency. AHRQ's *National Healthcare Disparities*

Report, 2011 measured patient engagement by examining patient self-reported data on patient-provider communication. Results from 2008 indicate that a significantly higher percentage of poor and middle-income Blacks reported poor communication with their health provider than poor and middle-income Whites (17.1 percent and 12.3 percent compared to 13.1 percent and 7.1 percent).[22]

Health IT can provide useful tools for educating users about their health condition(s) and treatment options, and can deliver information tailored to the needs of populations with health literacy issues. Health IT can also help providers offer more targeted care that addresses the cultural and linguistic needs of patients. Case study findings indicate that patient-facing technologies can dramatically increase patient engagement, resulting in improved chronic disease self-management and health outcomes.

Provider training and support

Case study discussants noted considerable costs associated with adopting health IT. This is due not only to the costs of purchasing and implementing systems, but also to the substantial amount of time, effort, and resources required to configure and customize EHRs, PHRs, and other applications to the needs of underserved groups. Many commercial "off-the-shelf" health IT applications do not come with features and functionalities that are required to address these needs, including integrating case management data within an EHR, and capturing comprehensive language and ethnicity data in a tailored format. Making these customizations requires financial resources and IT expertise, both of which are often lacking in low-income or rural communities.

Conclusions

This project has identified encouraging examples of community-based efforts to incorporate health IT into interventions that drive better health outcomes. Safety-net providers reported the need to use creativity and strategic partnerships to summon the resources for successful implementation and use of health IT. They emphasized that customization of off-the-shelf health IT products was often necessary to ensure that they met the needs of underserved populations. Some of the most successful models in this study involved use of health IT for quality improvement and cost control, such as home monitoring of key vital signs for patients with serious chronic illnesses. These activities currently fall outside of the scope of the HITECH Act's Medicare and Medicaid EHR Incentive Programs. The Center for Medicare & Medicaid Innovation (CMMI) is currently conducting demonstrations that use home monitoring and telehealth to improve quality of life for individuals with chronic disease; the interventions seek to reduce costs due to avoidable emergency department visits and hospitalizations.

The findings from this report suggest that programs and providers responsible for addressing health disparities should focus on population-specific approaches to adopting health IT. Unless there is a specific strategy for using health IT to limit disparities among underserved groups, health IT may improve care for all groups without limiting disparities. In the worst case scenario, without a specific strategy for using health IT to benefit the underserved, its advantages may disproportionately go to those who already enjoy better access to care, health outcomes, and health status, thereby increasing health disparities.

Overall, these findings suggest the importance of continued investment in technical assistance and resources that specifically target safety-net providers and underserved communities. Underserved patients have different needs than the general population (e.g., for enabling services, language accessibility, health literacy support). Thus, practices that serve these communities also need different IT functionalities, training, and technical assistance than their counterparts in areas that do not provide care to underserved populations.

Introduction and Background

On February 17, 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted as a part of the American Recovery and Reinvestment Act of 2009 (ARRA). The HITECH Act includes a variety of provisions intended to advance the adoption of health information technology (health IT) to improve health care quality and efficiency of care, address health disparities, and support the delivery of patient-centered medical care.[23] As noted in the text box below, the HITECH Act requires that the National Coordinator for Health Information Technology (the National Coordinator) examine the impact of health IT on communities with health disparities as well as uninsured, underinsured, and Medically Underserved Areas (MUAs).

> *"The National Coordinator shall assess and publish the impact of health information technology in communities with health disparities and in areas with a high proportion of individuals who are uninsured, underinsured, and medically underserved individuals (including urban and rural areas) and identify practices to increase the adoption of such technology by health care providers in such communities, and the use of health information technology to reduce and better manage chronic diseases."*
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> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 13101, 123 Stat. 232 - 233 (2009) (adding § 3001(c)(6)(C) of the Public Health Service Act).

Responding to this charge, the Office of the National Coordinator for Health IT (ONC) contracted with the George Washington University and NORC at the University of Chicago (NORC) to assess current uses of health IT in communities with health disparities. The study addresses three central questions:

1. What is the potential impact of health IT in communities with health disparities?

2. How do stakeholders use health IT to reduce and better manage chronic diseases in communities and/or populations experiencing health disparities?

3. What practices and programs help increase adoption of health IT in communities with health disparities?

To address these questions, NORC researchers conducted a thorough review of available literature, developed nine community case studies, and examined other relevant federal programs. This report summarizes the findings of these efforts, highlighting innovative examples of how stakeholders use health IT to address and manage chronic disease in underserved communities and communities with health disparities. This report presents factors associated with effective use of health IT in these communities and challenges to adopting and implementing health IT. It also explores the relevance of findings to current and future programs and policies, along with priority areas for future analysis.

It is beyond the scope of this report to formally evaluate the impact of interventions specifically intended to reduce or eliminate health disparities. Disparities in health status and health-related factors (e.g., access to care, quality of care, health risk and protective behaviors, access to environments and resources that promote health) arise in populations through the complex interactions of a web of causal factors that unfold over the life course.[24] For these and other reasons, substantial additional research would be required to enable attribution of reductions in any one specific type of disparity to health IT-based interventions.

In developing this report, NORC and ONC worked in close partnership with agencies of the U.S. Department of Health and Human Services (HHS) such as the Health Resources and Services Administration (HRSA), the Centers for Medicare & Medicaid Services (CMS), the Agency for Healthcare Research and Quality (AHRQ), the Office of Minority Health (OMH), the Indian Health Service (IHS), and others. Agency representatives as well as thought leaders and stakeholders external to government served on a Technical Expert Panel (TEP) that helped to select case studies and to frame discussion of emerging findings. The report builds on the foundation of existing HHS work that documents health disparities, such as the 2011 AHRQ *National Healthcare Disparities Report*.

Importance of the Current Study

Experts suggest that improving the U.S. health care system requires the simultaneous pursuit of three aims: improving the experience of care, improving the health of populations, and reducing per capita costs of health care.[25] Implementing health IT innovations and systems advances these important goals.[26] Yet members of the TEP have expressed concern that if implementation efforts for such innovations are distributed unevenly across communities in the United States (i.e., if they occur at an accelerated pace in areas that are already leaders in health IT usage, while disadvantaged communities continue to fall farther behind), existing disparities in health care quality and outcomes could be exacerbated.

For many years, disadvantaged groups in the United States have experienced a "digital divide," characterized by disparities in access to all types of information technology by various segments of the general population. Recent research shows reductions in digital disparities for some non-rural populations,[27,28] but other studies have found that disparities in electronic health record (EHR) adoption persist among providers who care for underserved groups.[29] For example, some hospitals that provide a disproportionate share of care for the underserved have adopted EHRs more slowly than other hospitals.[30]

A growing body of evidence demonstrates the benefits of focusing health IT investments in communities with health disparities or communities with disproportionate numbers of the medically underserved.[31,32]

Chronic diseases disproportionately affect underserved groups and are key drivers of health care costs, accounting for an estimated 75 percent of health care expenditures in the United States.[33] Health IT plays an important role in efforts to improve management of chronic illnesses and reduce health care costs. Experts estimate national health expenditures will reach $4.6 trillion by 2020.[34] Cost aside, many underserved groups face lower quality of life and life expectancy, due in part to lack of access to timely, high-quality health care.[35]

The current study is important because it seeks to advance understanding of effective use of health IT in medically underserved communities and communities with health disparities. The underlying assumptions behind and rationale for the study include the following:

1. Health IT is an important facilitator of improvements in health care, particularly when used to prevent and better manage chronic diseases.

2. Communities with health disparities may not implement health IT as readily as other communities.

3. It is important to understand barriers to and facilitators of effective health IT implementation in underserved communities because they suffer higher rates of chronic disease than the general population, often resulting in a greater burden on patients and the health care system.

Overview of Health Disparities and Gaps in Health Care

The phrase "communities with health disparities," used in Section 3001 of the Public Health Service Act as added by HITECH, could be interpreted in multiple ways. For example, one could interpret it as referring to health status disparities across populations within a single geographically defined community, disparities across geographical communities, disparities in access to resources and services such as health care, or disparities in the quality of those services. In considering the Congressional expectation that ONC publish a study on the impact of health IT in "underserved" communities as well as communities with health disparities, this report takes a broad view of "underserved" communities that includes but is not limited to Medically Underserved Populations, and those residing in MUAs and Health Professional Shortage Areas (HPSAs) as defined by HRSA.[36]

For example, this report also includes discussion of groups disproportionately counted among the uninsured and underinsured in the United States. The Medical Expenditure Panel Survey, co-sponsored by AHRQ and the National Center for Health Statistics, defines uninsured individuals as those who lack any form of health insurance coverage, public or private. Recent findings published by AHRQ researchers

define underinsured as, "insured persons with health care service burdens in excess of ten percent of tax-adjusted income."[37]

The Nature of Health Disparities and Potential Impact of Health IT

Achieving consensus on a single, universally accepted definition of the term "health disparity" is a challenge recognized by health care and public health leaders. Categories of population characteristics typically encompassed by the term "underserved" include: low income, uninsured or underinsured, limited English language proficient, unfamiliarity with the health care system, or residence in areas where providers are not easily accessible.[38] Interventions studied for this project target several of these populations.

This project explores the opportunity for health IT to improve health care delivered in underserved communities and to populations that experience health disparities. Produced annually since 2003, the AHRQ *National Healthcare Disparities Reports* indicate that health disparities have been documented among priority populations that include racial and ethnic minorities; immigrant/limited English proficiency; low health literacy; socioeconomically disadvantaged individuals; disabled individuals and others with special health care needs; older adults; rural residents; children and adolescents; and Lesbian, Gay, Bisexual, and Transgender (LGBT) individuals.[39]

There are many underserved communities in the United States located in a range of settings, from highly urbanized to extremely rural. In some underserved locations there are high concentrations of new immigrants or minority groups; others include predominantly low-income residents. Many suffer from a poor health care infrastructure. Health disparities currently faced by members of these communities are described below. Throughout, the report describes these populations as being "underserved."

Definitions of Key Terms

Health IT - Hardware, software and integrated technologies that are designed for or support the use by health care entities or patients for the electronic creation, maintenance, access, or exchange of health information.

Digital Divide - Disparities in access to all types of information technology by different segments of the general population.

Underserved - Those with economic barriers (low-income or Medicaid-eligible populations), or cultural and/or linguistic access barriers to primary medical care services.

Safety-Net Providers - Providers that by mandate or mission organize and deliver a significant level of health care and other health-related services to the uninsured, Medicaid, and other vulnerable patients.

Quality of Care. Research demonstrates racial, ethnic, and socioeconomic disparities in quality of care that have persisted over time. AHRQ's *National Healthcare Disparities Report, 2011* examines health disparities for measures of quality that include effectiveness (the percentage of patients with a disease or condition who receive clinically indicated care), patient safety, and timeliness. This report provides mixed news in terms of trends in disparities in quality. For some quality measures (such as hospital admissions for heart failure among Hispanics compared to non-Hispanic Whites and Blacks compared to Whites), the report notes reductions in the level of health disparities. For other measures (such as maternal deaths following live births for Blacks compared to Whites and the provision of some cancer screenings for poor compared to high income groups), the report shows worsening health disparities.[40]

Access to Care. Differences in access to care for populations in underserved communities are significant. A number of different measures relate to access to care including health insurance coverage, having a usual source of care, patient perceptions of need, and potentially avoidable hospital admissions, among others.

AHRQ's *National Healthcare Disparities Report, 2011* examines disparities in access to a usual source of primary care. The results indicated that in 2008, Blacks and Asians were less likely than Whites to have a usual primary care provider (72 percent and 72 percent, respectively, compared with 76 percent), that Hispanics were also less likely to have a usual primary care provider compared to non-Hispanic Whites (65 percent compared with 79 percent), and that uninsured individuals under 64 were far less likely to have a usual primary care provider that individuals with insurance.[41]

Health Outcomes. Disparities in quality of and access to care, genetic factors, and environmental factors, among others, influence disparities in health outcomes. Health outcome disparities vary, from differences in morbidity and mortality rates for cancer and other illnesses, to rates of new AIDS cases, to infant mortality. Data from the Commonwealth Fund's 2006 Health Care Quality Survey indicate that disparities in health outcomes for chronic diseases are particularly troubling. For example, of all racial and ethnic minorities, Blacks are most likely to have a chronic illness or disability with almost half reporting such a condition. Furthermore, in comparison to other racial/ethnic populations, Hispanics have a higher incidence rate of infection-related cancers, including stomach, liver, and cervical cancers.[42]

Patient Engagement. About one-third of Americans are not "health literate," meaning they lack the "capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions." [43,44] Lack of health literacy has been shown to impact health for the patient, including: less preventive care, poorer understanding of their conditions and care, higher use of

emergency and inpatient services and higher rates of re-hospitalization, lower adherence to medication schedules, and lower participation in medical decision-making.

Additional factors influencing patient engagement include: language barriers, racial and ethnic concordance between the patient and provider, effects of disabilities on patients' health care experiences, and providers' cultural competency. AHRQ's *National Healthcare Disparities Report, 2011* measured patient engagement by examining patient self-reported data on patient-provider communication. Results from 2008 indicate that income explains some of the racial and ethnic differences in provider-patient communication for patients 18 and older. A significantly higher percentage of poor and middle-income Blacks reported poor communication with their health provider compared with poor and middle-income Whites (17.1 percent and 12.3 percent, respectively, compared to 13.1 percent and 9.3 percent). Further, a higher percentage of low-income Hispanics reported poor communication with health providers compared with low-income non-Hispanic Whites (15 percent compared with 11 percent).[45]

Management of Chronic Diseases. Differences in management of chronic diseases are evident in comparing underserved populations with the rest of the population. This measure is particularly important for the underserved, as groups composing this population often experience higher rates of cancer, asthma, obesity, behavioral health disorders, and other chronic diseases. Data has shown that these populations are more likely to exhibit signs of poor management of chronic disease. AHRQ's *National Healthcare Disparities Report, 2011* examines rates of hospital admissions for short-term complications for individuals with diabetes as an indicator of disease management.

Between 2001 and 2008, the rate of hospital admissions for adults with short-term complications from diabetes increased overall, among Whites, and across all income groups. In 2008, the rate of hospital admissions for short-term complications was nearly three times as high for African Americans as for Whites (156.8 per 100,000 population compared with 52.6 per 100,000 population). Over the seven year period, the rate of hospital admissions for short-term complications from diabetes was significantly higher for adults living in communities with median household incomes in the first, second, and third quartiles than for people living in communities with median household incomes in the fourth quartile.[46] Similar differences persist among underserved populations for patients with asthma and other chronic diseases.

Overview of Health IT

<u>Defining Health IT</u>

The definition of health IT continues to evolve. In most cases, policymakers and health care providers think of health IT in terms of tools—such as EHRs, CDS, and electronic prescribing (e-Prescribing) systems—that providers use. The term can also refer to processes that enable electronic sharing of structured health information across provider settings, often referred to as health information exchange (HIE). Health IT stakeholders also increasingly focus on tools that enhance patients' and consumers' access to health information and health care delivery, such as personal health records (PHRs), telehealth technologies, and mobile health (mHealth) applications.

Section 3000(5) of the Public Health Service Act, as added by section 13101 of the HITECH Act, defines "health information technology" as "hardware, software [and] integrated technologies…that are designed for or support the use by health care entities or patients for the electronic creation, maintenance, access, or exchange of health information."[47] This definition encompasses all types of health IT applications, including EHRs, PHRs, mHealth and telemedicine, and all forms of HIE. This report defines health IT broadly for the purposes of this study to include applications primarily used by providers as well as applications used by consumers. Examples of health IT products and functionalities are presented in Table 1 below.

Table 1:   Key Functionalities of Health IT

Product or Functionality	Description
Electronic Health Record (EHR)	A real-time patient health record with access to evidence-based decision support tools that can be used to aid clinicians in decision-making. The EHR can automate and streamline a clinician's workflow, ensuring that all clinical information is communicated. It can also prevent delays in response that result in gaps in care. The EHR can also support the collection of data for uses other than clinical care, such as billing, quality management, outcome reporting, and public health disease surveillance and reporting.[48]
Clinical Decision Support (CDS)	Health IT functionality that builds upon the foundation of an EHR to provide persons involved in care processes with general and person-specific information, intelligently filtered and organized, at appropriate times, to enhance health and health care.[49]
Consumer E-Health Tools	*Personal Health Record (PHR)* An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be drawn from multiple sources while being managed, shared and controlled by the individual.[50]
	Health Kiosks Publicly available computer terminals are designed to allow patients to obtain information on health conditions or to access information on their own health.
	Mobile/Smart Phone Applications Applications used to record and send health-related information and/or deliver email or short message services (SMS) messaging that reinforce healthy behavior.

Product or Functionality	Description
Telehealth/Telemedicine	Telehealth is a broad term for describing use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration.[51] Telemedicine involves the use of telecommunication technologies to deliver medical information and services. Typically, these technologies involve the use of phone or video conferencing and remote monitoring systems.[52]
Population Health Information Systems	A population health record system is a mechanism for recording, retrieving and manipulating information in population health records, which are defined as a repository of statistics, measures and indicators regarding the state of and influences on the health of a defined population, in computer readable form, stored and transmitted securely, and accessible by multiple authorized users.[53]
Electronic Registry	A registry is a database feature that includes key clinical data, usually on a subset of chronically ill patients, for the purpose of tracking their condition and managing treatment.[54]
Health Information Exchange (HIE)	HIE is the electronic movement of health-related information among organizations according to nationally recognized standards.[55]

Health IT and the Digital Divide

The Risk that Health IT Could Increase the Digital Divide

For many years, disadvantaged groups in the United States have experienced a "digital divide," defined as disparities in access to all types of information technology by different segments of the general population. Although recent research shows reductions in many digital disparities for non-rural populations,[56,57] other evidence shows disparities in EHR adoption may persist among providers caring for underserved groups.[58] For example, some hospitals that disproportionately care for the underserved have adopted EHRs more slowly than other hospitals.[59]

The literature reflects mixed evidence on the adoption of health IT among primary care providers in underserved areas as compared to other providers.[60,61] On the one hand, some work suggests that FQHCs have relatively robust adoption of EHRs due to the HCCN program and other initiatives.[62,63] For example, many FQHCs have used chronic disease registries for some time, especially to manage care for patients with diabetes; the Health Disparities Collaborative program was one of the earliest programs to use registries to manage chronic disease.[64] Yet, analysis of recently published local area data suggests that areas with high concentrations of minority populations, low-income populations, and metropolitan status were more likely to be below the 25th percentile in EHR adoption rates.[65] Even as the United States moves ahead with unprecedented efforts to increase health IT use by ambulatory care providers and hospitals, recent ONC evidence regarding the uptake of EHRs shows that, on average, minority and low-income areas lag behind other areas on this metric.[66]

Stakeholders express growing concern that increased overall adoption of health IT will cause a new form of the digital divide, as populations served by providers adopting EHRs and exchanging health

information experience benefits from improved convenience, coordination, and quality of care compared to counterparts whose providers have not.[67] Unintended negative consequences can arise if these technologies are developed and implemented in a manner that excludes the underserved.

HITECH programs such as the Regional Extension Centers (RECs) seek to address this disparity directly, by prioritizing engagement with safety-net providers. Reports recently published by ONC show that the REC program has enrolled the vast majority of FQHCs and FQHC "look-alikes" (83 percent or 954 total organizations) and that among REC enrolled providers working at FQHCs and "look-alikes," 80 percent (or 14,355 individual providers) have adopted EHRs.[68] Among small rural hospitals and Critical Access Hospitals (CAHs) approximately 67 percent (1,164 total) have enrolled with a REC. Among those enrolled, almost half have adopted an EHR and 19 percent (225 total) have achieved Meaningful Use.[69]

NORC's case studies found that rural providers face barriers due to lack of infrastructure to support connectivity across providers, as well as between providers and patients. In discussing plans for building a patient portal, discussants in some parts of the country noted that their patient populations not only lack access to both broadband and cellular connectivity, but even to electricity. Thus, lack of IT infrastructure in rural and frontier areas denies the benefits of telehealth and telemedicine to populations in great need.

The Potential for Health IT to Decrease the Digital Divide

The passage of ARRA and the Affordable Care Act (ACA) has highlighted the importance of providing effective and equitable care for underserved populations and communities through the Meaningful Use of health IT. Many potential benefits of health IT exist for underserved populations and communities, particularly in terms of facilitating behavior change, improving health care, and enhancing health outcomes.[70] The promise of health IT is that it can address specific health disparities in many areas and potentially reduce the digital divide.

Overview of Project Approach

This report contributes to the understanding of how providers in medically underserved communities and communities with health disparities can effectively implement health IT. After an initial overview of underserved communities as well as key functionalities of health IT, the report examines the potential impact of health IT in communities with health disparities, as well as how health IT is being used to reduce and better manage chronic disease is these communities. The report then goes on to present in-depth information about policies and programs that are being used to increase adoption of health IT in communities with health disparities, including strategies that underlie the programs and efforts to address barriers to health IT implementation. The report concludes with a summary of key take-away points,

challenges and opportunities related to implementing health IT in communities with health disparities, and conclusions that crystalize the lessons learned through this study.

The NORC team used a three-pronged approach to conduct this project. To begin, NORC conducted an environmental scan and summarized existing knowledge on principal research themes. The team then conducted nine case studies to learn from innovative applications of health IT to address the needs of underserved. These case studies examined a diverse selection of programs and interventions from throughout the nation. In addition, NORC formed a TEP to offer guidance on the project. The TEP convened formally at three points in time and NORC sought their informal feedback at key stages of the project. Below, Table 2 presents content domains and key research questions for the study. An overview of methods for each project component follows.

Table 2: Project Domains and Key Questions

Key Points	Domain	Key Questions
Potential use of health IT to address health disparities	Impact of Adoption and Consequences	■ Which specific health IT tools have the potential for greatest impact in communities with health disparities? ■ Are there health IT tools especially well-suited to address the clinical and personal health needs of these groups? ■ In what ways can the adoption of health IT improve chronic disease management? ■ To what extent can health IT help reduce or eliminate health care disparities and/or improve access for the medically underserved?
Role of federal programs	Encouraging Adoption	■ What policy approaches for promoting adoption of health IT among providers in communities with health disparities and areas with a high proportion of uninsured and underserved show the most promise for success?
Challenges, opportunities, and what needs to be done	Health IT Barriers	■ What unique barriers to health IT adoption—financial, structural, cultural, etc.—exist among the providers who serve these vulnerable populations? ■ What particular barriers, including those associated with privacy and distrust, impede use of health IT by vulnerable patients?
	Policy/ Organizational Factors	■ What public- and private-sector policy options exist for maximizing the ability of health IT to redress health disparities, increase access for the medically underserved, and improve health outcomes for these populations do communities find most promising?
	Key Factors Associated with Success	■ Which factors impact the use of health IT to address the health care needs of the underserved and deal with health disparities?

Environmental Scan

The NORC team searched commonly used databases, including PubMed and Google Scholar, for key words related to health IT, the underserved, and health disparities. Searches included use of specific health IT applications (e.g., EHRs, e-Prescribing, CDS, and PHRs) in combination with words such

as "underserved," "safety-net," and "disparities." The team accessed unpublished materials, (e.g., federal reports or white papers), by using search engines like Google and Scirus to review websites of relevant government agencies and foundations. The search yielded over 1,000 individual documents that addressed key research topics. The Environmental Scan Briefing Paper developed at the conclusion of the environmental scan presents more information on search terms and methods.[71]

Technical Expert Panel (TEP)

NORC convened and consulted a TEP for the purposes of this study to receive insight from individuals with extensive knowledge and experience in the fields of health IT, underserved communities, and/or health disparities. TEP members represent a wide range of federal organizations, safety-net providers, consultants, foundations, provider associations, quality improvement organizations, and advocacy groups. The TEP convened three times—September 14, 2010; January 31, 2011; and September 8, 2011.

During the initial meeting, the TEP reviewed preliminary activities including the draft Environmental Scan Briefing Paper. In the second and third meetings, the TEP provided input on which cases to examine and how to frame results to yield greatest impact. They reviewed and provided direction on relevant research themes to include in the case studies, and reviewed case study selection criteria as well as results from the early set of case studies.

Case Studies

NORC identified and selected candidates for case studies through a multi-phase process. First, candidates were identified based on information collected through the environmental scan, as well as suggestions from members of the TEP. NORC prioritized projects that included a goal that was explicitly related to health disparities, targeted specific populations of interest, and gathered some evidence on outcomes associated with the intervention. NORC sought to identify cases that represent a variety of health IT applications (both provider- and patient-facing),[72] populations, locations, and settings. Finally, the team sought cases that were not already captured in the existing literature.

NORC's Institutional Review Board (IRB) reviewed and approved all processes used to conduct discussions. Each case study consisted of a series of discussions on five research domains: 1) impact and consequences of adoption, 2) health IT barriers, 3) encouraging adoption, 4) policy/organizational factors, and 5) key factors associated with success. NORC conducted these discussions in both group and individual settings, and sometimes requested a demonstration of health IT applications by the discussants. Case studies were conducted in 2011.

NORC employed a structured approach to analyze the data obtained from these activities. They used QSR International's NVivo 9 software to store and analyze notes captured during each case study, and developed a coding scheme to identify factors for success in using health IT in targeted communities. NORC developed individual reports summarizing key factors associated with each case study. The team then synthesized relevant factors across case study sites and combined these findings with the results of the environmental scan for this report. The processes used to conduct and analyze the case studies findings are described in detail in the Appendices.

Benefits and Limitations of the Approach

While the approach employed in conducting this project provides important insights into an emerging area of practice, it also has limitations. For example, because the project focused on a small number of cases, this report does not present generalizable findings or ones that permit meaningful statistical inference. The cases described here also do not represent all geographic areas of the United States, as some organizations that NORC contacted declined to participate. Organizations that did agree to take part in the study were, for the most part, safety-net providers such as FQHCs with a history of using health IT in innovative ways to address the needs of underserved populations.

Because the case study selection criteria focused on community-based projects that researchers had not previously studied in depth, the team did not visit the most "high-profile" cases of success with respect to health IT and health disparities. Nevertheless, by combining findings from a comprehensive literature review and environmental scan with nine in-depth case study illustrations, this report highlights emerging practices and hypotheses regarding effective use of health IT in communities with health disparities and underserved populations.

Potential Impact of Health IT in Underserved Communities and Communities with Health Disparities

Evidence from the literature and the nine case studies completed for this study illustrate the benefits of health IT in providing health care to underserved populations and communities. These often include facilitating behavior change among patients; improving the quality, efficiency, and effectiveness of health care services; and enhancing health outcomes.[73] Table 3, below, highlights key areas in which health IT offers promise for addressing various types of health disparities.

Table 3: Areas of Health Disparity and Examples of the Potential Impact of Health IT

	Current Disparities	Potential Impact of Health IT
Access to Care	Health disparities exist in health insurance coverage, patient perceptions of need, and potentially avoidable hospital admissions.	Health IT, including telehealth and distance medicine, can improve access to specialist services and ancillary services (e.g., case management, transportation, and translation) and can assist in providing free or low-cost preventative health services.
Quality of Care	Health disparities exist for underserved populations for measures of quality that include effectiveness, patient safety, and timeliness.	Health IT tools can improve providers' decision-making processes as they pertain to the needs of special populations, facilitate quality improvement reporting, and increase access to a broader range of quality health care services.
Patient Engagement	When patients are not involved in their own care it can impact health, resulting in less preventive care and poorer understanding of their medical conditions and treatment options, among other impacts. Lack of involvement may be due to lack of cultural sensitivity on the part of providers, health literacy on the part of patients, or a general feeling that it is not the patient's prerogative or responsibility to take an active role.	Health IT can aid in educating users about their condition and their treatment options as well as deliver information that is tailored to the needs of populations with health literacy issues. Health IT can also aid providers in offering more targeted care that addresses the cultural and linguistic needs of their patients. This, in turn, encourages patients to remain actively involved in their own health care plan.
Chronic Disease Management	Data has shown that underserved populations are more likely to exhibit signs of poor management of chronic disease. For example, they often have higher rates of hospital admissions for short-term complications associated with chronic diseases.	Health IT tools can facilitate improved coordination of care for individuals with chronic diseases, and consumer-oriented health IT tools can promote more active patient involvement, resulting in better management of chronic disease.
Health Outcomes	Underserved populations are more likely to experience health outcome disparities, which vary from differences in morbidity and mortality rates for cancer and other illnesses to other measures of health.	The impact of health IT on health care delivery, safety, and patient engagement has the potential to improve health outcomes for the underserved.

Table 4, below, provides a basic summary of IT tools and functionalities being used for each case study subject. It also describes the specific populations served with these tools. Additional details on the relationship between health IT and quality of care for avoiding and managing chronic disease are described in a later section of this report.

Table 4: Descriptions of Case Study Subjects and Health IT Tools Being Used

Organization	Project Description
Association of Asian Pacific Community Health Organizations (AAPCHO) Multiple Sites: Seattle, WA, New York, NY, Oahu (Waianae & Honolulu), HI	Pacific Innovation Collaborative (PIC) and Enabling Services Accountability Project (ESAP) (Examples of enabling services include transportation, translation, education, and case management.) PIC: Uses regional and central data repositories housing aggregate health information. The intent is to provide cross-health center benchmarks on enabling service needs and services delivered. ■ ESAP: Collects and stores enabling services data alongside clinical data in patients' health records allowing for coordination between medical services and social services related to health and well-being such as counseling, housing assistance and mental health services and for tracking the relationship between enabling services and health outcomes.
Columbia Basin Health Association (CBHA) Othello, WA	Medical and Dental EHRs, Caesy Patient Educational Video Software & Health Kiosks ■ Utilizes **EHR** to track chronic disease ■ Uses videos to educate limited English proficient and low health literacy patients ■ Patient-accessible computer kiosks linked to WebMD
Wind Youth Services Sacramento, CA	HealthShack ■ Youth-driven **PHR** system (modeled after MiVia[74]) ■ PHR stores health, contact, and personal information
Aaron E. Henry Community Health Services Center (AEH) Clarksdale, MS	Patient Care Management and Rewards Program ■ Utilizes **case management software** to track patient behavior and health status changes related to Body Mass Index (BMI), medication compliance, and number of aerobic minutes ■ Patients receive financial stipends based on progress
St. Elizabeth's Health Center (St. Elizabeth's) & University of Arizona Department of Psychiatry (University of Arizona) Tucson, AZ	Telepsychiatry Treatment of Depression ■ Provides depression treatment through **internet videoconferencing** (webcam)
Roanoke Chowan Community Health Center (RCCHC) & Piedmont Health Services (Piedmont) Ahoskie and Carrboro, NC	Patient Provider Telehealth Network: IDEAL LIFE's **Remote Monitoring System** ■ Utilizes a digital body weight scale and blood pressure device to track patients with diabetes and/or cardiovascular disease
Georgia Health Information Technology Regional Extension Center (GA-HITREC)[75] Atlanta, GA	GA-HITREC ■ Assists GA providers with selection, implementation, and Meaningful Use of certified **EHR** systems ■ Partners with a telemedicine organization to assist rural providers
Howard University Hospital (HUH) Washington, DC	Diabetes Treatment Center (DTC): NoMoreClipboard ■ Web-based **PHR** system integrated with the EHR ■ PHR accessible via cell phone to record blood sugar measurements
Cherokee Indian Hospital Authority (CIHA) Cherokee, NC	Resource and Patient Management System (RPMS) and Western North Carolina (WNC) Datalink ■ Utilizes **EHR** and practice management system for data aggregation and reporting ■ Longitudinal EHR can be accessed and updated in real time

Benefits of Health IT: Examples from Environmental Scan and Case Studies

This section examines the benefits of health IT in relation to the Institute for Healthcare Improvement's "three part aim" framework, which presents an approach to optimizing health system performance by simultaneously pursuing progress along the following three dimensions:[76]

- Improving the patient experience of care (including quality and satisfaction)

- Improving the health of populations

- Reducing the per capita cost of health care

The federal government's approach to addressing the "three part aim" centers on developing a National Quality Strategy. [77] Justification for pursuing this strategy includes the federal role in addressing health disparities, population health, and quality of care for underserved groups. Among other activities, the strategy calls for an alignment of quality measures that can be used to assess national progress, including those appropriate for monitoring progress related to reducing health disparities.

The discussion that follows combines insights from the literature with examples from the nine case studies to help illustrate how health IT may help to address the needs of underserved communities and populations that are experiencing health disparities. The next section provides a summary of basic ways that health IT can improve quality of care in the paragraphs below, and offer a more detailed set of examples of potential improvements in quality from case study findings presented in the section entitled *"Use of Health IT to Reduce and Better Manage Chronic Diseases in Communities/Populations with Health Disparities."*

Quality

Evidence shows that lack of access to quality care contributes to health disparities among the underserved.[78] There are differences in performance measures related to how well providers deliver clinically indicated services to patients (e.g., providing children with needed immunizations). Health outcome measures (e.g., death rates from cancers detectable by screening), and patient assessments of how well providers meet their needs (e.g., clear communication) may be affected by the quality of health care received.

In some cases, robust health IT solutions have helped providers to improve the quality of care they provide to underserved populations. Health IT can target the various factors influencing the occurrence of health care disparities. For instance, tools such as CDS can offer providers accurate, up-to-date, and timely information that can improve their adherence to evidence-based guidelines of care.[79] Providers can also use data from EHR and chronic disease registries to identify individuals who are in need of

preventive care services or other health interventions. These tools can also facilitate quality improvement, including reporting and collection of customized quality data for performance reporting.

Patient Engagement

Interactive health IT applications that encourage consumers to participate in their own health care (e.g., consumer e-health technologies) have value, both as a means of educating users about their condition and their treatment options, and as a potential avenue for improving health literacy.[80] Robust PHR tools, including functionality to support behavior change, can provide patients with personalized information and support that helps them to better manage their own health. Evidence is growing that self-management interventions, such as self-monitoring and decision making, lead not only to improvements in health outcomes and health status, but also to reductions in health care costs as a whole and increased patient satisfaction.[81,82]

Due to the often fragmented nature of health care—particularly in underserved communities—individuals often visit multiple providers who do not have access to their complete health record. Patient-facing health IT tools can be instrumental in ensuring continuity of care for such patients. Further, interactive patient technologies allow for real-time feedback and service alerts, which can help inform processes for improving patients' perceptions of care and satisfaction.

Consumer e-health technologies can also help underserved populations communicate and share information more effectively with their providers. Features such as secure messaging enable patients and providers to exchange written messages. (Insurers do not generally cover this form of communication, although it has the potential to replace unnecessary office visits, potentially increasing efficiency and provider availability).

Some tools enable patients to supply clinicians with results from online assessments (e.g., psychological assessments or assessments of patient activation) that they can take in languages other than English. They can also offer the ability to integrate data from physiologic monitors into an electronic format accessible by providers. Many EHR systems feature culturally appropriate health literacy education materials that providers can print for patient visits.[83] These systems can potentially facilitate linguistic access by allowing providers to flag patients' language needs in the EHR so that other providers across the continuum of care are aware of the need to offer language appropriate services and materials.

Case Study Examples: Use of Health IT to Improve the Patient Experience

At **Columbia Basin Health Association** (CBHA), the implementation of interoperable health IT systems has resulted in efficiency gains that simplify patients' experience of obtaining care and enhance

the quality of care that they receive. The integration of CBHA's EHR, which is linked to its electronic dental record (EDR) through an interface with its practice management system, allows for standardized scheduling across clinics. Moreover, the EHR's panel management functions enable automated communications with patients about medication recalls or reminders for upcoming appointments. Links between the internal pharmacy system and EHR allow e-Prescribing and easy prescription transfer among multiple CBHA clinics.

Providers who have access to patients' complete medical history are able to provide more efficient care. Access to more complete documentation via linked health records across sites can be particularly beneficial for underserved individuals who lack a regular source of care or the time, resources, or capacity to manage their own health information. Health IT applications at CBHA enable providers to save time that had previously been wasted in tracking down paper charts and deciphering hard-to-read or incomplete documentation. Providers at CBHA report that they are better able to make decisions due to improved access to patients' medical information, such as laboratory results and medications.

Providing patients access to health information through multiple platforms can enhance the impact of patient-facing technologies. For example, as part of the implementation of **Howard University Hospital's** (HUH's) NoMoreClipboard PHR, patients who signed up for a PHR through the hospital's Diabetes Treatment Center (DTC) were able to access the application via computer or by using a smartphone with an internet browser. The PHR's smartphone functionality allowed diabetics to enter their blood glucose into the PHR while they were "on the go," or when a computer with internet access was unavailable. Patients praised the convenience and instant feedback they received with this feature. They reported that once they started keeping track of their glucose readings, the PHR helped them stay disciplined.

Other initiatives involving the implementation of patient-facing technologies among underserved populations are yielding evidence in support of health IT as an important tool for engaging patients in their own health care. For example, the **Institute for Family Health** (IFH), a network of FQHCs providing primary care to a predominantly low-income population in New York City and the Hudson River Valley, implemented a patient portal and found their patients—especially those with chronic diseases—have eagerly adopted and used the technology. IFH did note disparities in access to and usage of the portal by income, but these disparities were smaller than those previously reported in studies with other populations. IFH researchers recommended continued efforts to ensure use of PHRs and portals by disadvantaged groups so that all patients can benefit equally from these technologies.[84]

Health IT implementations must use patient-oriented strategies to engage the participation of underserved patient populations. Most importantly, it is critical to integrate health IT tools into a broader program of support. For example, **Wind Youth Services** staff considered the HealthShack PHR to be one component of a larger, comprehensive approach. Other aspects included training and coordination of staff, the integration of HealthShack into programs already offered at the center, and a HealthShack website to provide additional information and support.

Several case study sites employed a peer-to-peer approach to encourage technology adoption among patients, often using a trusted intermediary. For example, both **St. Elizabeth's Health Center** and **CBHA** used linguistically and culturally competent liaisons to encourage Hispanic patients to adopt and use health IT; Wind Youth Services used youth health ambassadors to introduce HealthShack to homeless youth. Howard University Hospital's telehealth self-management intervention used health navigators, including community and church leaders, to introduce the tool and explain its use to urban African American patients. To enhance the comfort of Hispanic patients and reduce the stigma associated with receiving mental health treatment, one provider participating in the St. Elizabeth's telepsychiatry intervention recommended housing the project at the St. Elizabeth's clinic, where patients regularly receive primary care services.

Clinicians also play an important role as patients' "trusted sources" for information, with the credibility to encourage patients' use of health IT. For example, at HUH's DTC, the provider team consistently emphasized the PHR's role with patients to facilitate its effective use. Younger providers, in particular, supported use of the PHR. Some providers encouraged patients to go to the PHR to learn their lab results and suggested that they would find out results more quickly that way, rather than waiting for a phone call.

Improving the Health of Populations

Health Outcomes

Research has demonstrated that underserved individuals are at greater risk for poorer health outcomes and have higher rates of morbidity and mortality.[85] Application of consumer e-health tools has great potential to address these disparities. Studies show that patients who are informed and active participants in their health care have better outcomes.[86] The impact of health IT on intermediate outcomes, such as delivery of health care services, improved patient safety, and patient engagement, can lead to better health outcomes.[87] Moreover, EHR-based CDS features, such as error identification, drug interaction checking, improved medication dosing, and the ability to alert physicians of results that are out of range, can improve patient safety and reduce the occurrence of adverse events.[88]

A study of primary care practices for underserved diabetic patients in and around Cleveland, Ohio, showed that use of an EHR instead of paper-based records for patient assessments improved composite measures of standards for diabetes care and outcomes by 10.2 percentage points annually (for care processes) and 4.1 percentage points annually (for care outcomes).[89] The study found that even when exposed to the same quality improvement assistance program, sites using EHRs achieved better outcomes than those not using EHRs, including better outcomes among uninsured and Medicaid patients.[90]

Case Study Examples: Health IT May Improve Population Health by Supporting Better Patient Care

The case studies show that effective use of health IT tools such as templates, reminders, registries, and panel reporting can support improved quality of care. In many sites that NORC visited for this study, implementation of health IT facilitated the delivery of comprehensive care, often integrated with social services when appropriate and necessary. Sites noted the need for linkages to reduce fragmentation of safety-net services that are critical to the well-being of the underserved. These linkages support the overall health and well-being of underserved populations, who frequently rely on safety-net providers for more than just regularly scheduled primary care visits, by helping them to access the services they need.

> "We noticed our colorectal cancer screenings were down in the 20 percent - 25 percent range and we looked at what was possible, what the literature showed, and what it should be. We said we are not where we want to be so we made a focused effort on that and we are now up to 53 percent, which is really good."
>
> *CIHA Administrator*

Using health IT to capture information related to the social determinants of patients' health can enhance the quality of care provided by those who treat underserved populations. The work of FQHCs that are members of the **Association of Asian Pacific Community Health Organizations** (AAPCHO) illustrates one example of health IT use for this purpose. AAPCHO is a membership association comprising FQHCs that primarily serve Asian American, Native Hawaiian, and other Pacific Islander populations. FQHCs that are members of AAPCHO are implementing two efforts—the Enabling Services Accountability Project (ESAP) and the Pacific Innovation Collaborative (PIC)—to improve service quality through the application of health IT. Participating sites that NORC visited for this study reported integrating data on enabling services (e.g., case management, social service referrals, health education, and counseling) into their EHRs.

Several sites visited by NORC for this case study were taking part in the PIC. The PIC allows multiple health centers to submit a subset of their data on enabling services needs and encounters to a single data warehouse, allowing for comparisons across sites. By examining patient data and outcomes at different

sites, individual clinics are able to identify specific strategies employed by other centers that could also benefit their patients. Although the effort was in early stages at the time of the site visit, participants anticipate that reviewing cross-site reports based on patient data will enable them to adopt and deliver services that produced beneficial results at other sites.

CDS tools also support quality improvement for providers caring for the underserved by encouraging standardized and systematic adherence to guidelines. At CBHA, the EHR's CDS functionality increases providers' adherence to care protocols, including providing recommended preventive care to patients. Staff indicated that the "check protocol" reminder functionality of their EHR serves to alert providers of care that is required according to a standard of care protocol. It offers the provider with easy access to evidence-based guideline information to increase the likelihood that the patient will receive needed care during a visit. The "check protocol" functionality also gives nursing and outreach staff information that can help them efficiently contact patients who miss appointments.

Using health IT to track outcomes can facilitate quality improvement for underserved populations. Clinicians and surrogates use patient panels and provider scorecards to target patients for follow-up or to encourage providers to focus on adherence to clinical guidelines. For example, staff members at the Cherokee Indian Hospital Authority (CIHA) use their EHR and registry systems to produce reports that show patient trends on specific outcomes (e.g., weight, hemoglobin A1c [HbA1c], and blood pressure).

Reducing the Per Capita Cost of Health Care

Some research establishes a link between health IT implementation and improvements in health outcomes associated with cost, efficiency, and productivity.[91] A cross-sectional study of urban hospitals in Texas using data from 2005 and 2006 found that hospitals with automated notes and records, order entry, and CDS experienced fewer complications, lower mortality rates, and lower costs.[92] Additional research shows that implementation of an EHR leads to increased physician productivity as measured by average monthly patient visit volume and provider work relative value units,[93] and that primary care practices utilizing EHRs achieve significantly better outcomes for diabetes compared to paper-based counterparts.[94]

The seminal studies underlying policy efforts to enhance the use of IT applications in health care, including the IOM's 1999 report *To Err is Human,* decry the lack of systematic tools available to providers to support basic efficiency and safety objectives.[95] The literature demonstrates the potential for health IT solutions to enhance the structure of health care delivery leading to tangible improvements in efficiency, medication reconciliation in inpatient facilities,[96] decreased incidence of adverse drug events, reduced length of stay, and fewer patients leaving the ED without treatment.[97] Findings from the

study support conclusions about potential benefits of adopting and using health IT as a tool for quality improvement. The team found examples of community-based providers using health IT as structural tools that support improvements in the quality and efficiency of care delivered to their underserved patients.

Safety-net providers who took part in this study reported the need to apply creativity and strategic partnerships to summon the resources to successfully implement and use health IT. Some of the most successful models involving health IT use for quality improvement and cost control (e.g., home monitoring of vital signs for patients with serious chronic illnesses), currently fall outside of the scope of EHR Incentives Programs.

Health Care Costs

Underserved populations frequently face barriers in access to health care.[98] For example, uninsured and underinsured individuals often experience barriers related to the cost of care, and individuals who reside in remote areas face obstacles such as lack of transportation. Health IT offers solutions that can address these barriers. Telemedicine and telehealth have been successful in improving access to specialist services for patients residing in rural areas. The solutions offered by health IT can be more cost-effective than other options (e.g., commuting to urban areas for a consultation). Furthermore in some situations, remote clinic visits using new and increasingly advanced technology, such as high-definition cameras and instant videoconferencing, can have a similar level of effectiveness as a face-to-face visit.

Health IT can help provide access to free or low-cost health services for individuals who would otherwise be likely to forgo or delay them. Community-based health IT interventions such as patient kiosks, websites, or portals that are accessible to the underserved population can be used to assist these groups in learning about opportunities to access health care as well as ancillary services, such as case management, transportation and translation, that can help them make effective use of available health care services.

Dearth of Literature Documenting the Impact of Health IT on Health Disparities

Despite a growing body of evidence suggesting that health IT leads to improved quality of care,[99] to date few studies have focused on the effectiveness of health IT implementation efforts in communities with health disparities.[100] A 2012 literature review of studies reporting on the use of EHRs to improve quality in underserved U.S. communities found some evidence that EHRs can improve documentation, process measures, adherence to guidelines, and (to a lesser extent) outcome measures; however, the overall quality and quantity of this evidence was weak. The number of studies that took place in underserved communities was small. These studies used predominantly used descriptive study designs, and most took place in urban settings.[101]

A 2010 systematic review of 105 peer-reviewed studies that took place in diverse settings during the years 2004-2009 sought to identify evidence on the impact of health IT on quality outcomes in under-resourced communities.[102] Only 15 of the identified studies took place in under-resourced settings, and of these only eight actually focused on under-resourced settings. Most of the studies identified were either quasi-experimental or descriptive. The review identified four major gaps in these areas, including the need for research on health IT applications that providers implement in under-resourced settings.[103]

Use of Health IT to *Reduce* and *Better Manage* Chronic Diseases in Communities/Populations with Health Disparities

Examples from NORC Case Studies

This section offers concrete examples of how providers who work with underserved communities and communities with health disparities are using health IT to reduce the incidence of chronic illnesses and better manage chronic conditions when they do occur. In a number of instances, providers are using health IT as a tool for chronic disease prevention. Each of the nine case studies is summarized below. Although many of the case studies employed multiple health IT functionalities, the discussion focuses on one or two types of functionalities in each case to highlight innovative uses of the different technologies. Each summary presents information about the target population, the technology used, funding sources and start-up processes, data sources and methods of analysis, and key take-away messages.

Electronic Health Records (EHR)

Georgia Health Information Technology Regional Extension Center. Providers from Morehouse Medical Associates, a family medicine clinic affiliated with the Georgia Health Information Technology Regional Extension Center (GA-HITREC), used panel reporting capabilities built into their EHR to document improvements in outcomes metrics as measured against national benchmarks. The ability to actively track this information led them to employ additional structural interventions, such as posting in-room reminders for physicians to conduct diabetic foot exams. Ultimately, they experienced an increase in the percentage of patients receiving the recommended exams. These interventions can play an important role in treating populations with a high incidence of diabetes. The GA-HITREC's relationship with the Georgia Partnership for Telehealth also increased rural patients' access to specialists and primary care providers. Table 5 presents a summary of how GA-HITREC was able to use group purchasing plans to lower the cost of implementing an EHR system. Stakeholders used the EHR to support patient engagement, a key component of Meaningful Use.

Table 5:   Georgia Health Information Technology Regional Extension Center

	Case Study Summary
Intervention and Setting	Georgia Health Information Technology Regional Extension Center (GA-HITREC)
Target Population	All eligible providers in Georgia, with a particular focus on rural and minority providers.
Technology Description	Health IT available through GA-HITREC: ■ Five electronic health record (EHR) systems endorsed and offered through a Group Purchasing Plan Health IT available through partner organizations: ■ Telehealth technologies (Georgia Partnership for TeleHealth) ■ Various EHR systems (Georgia Association for Primary Health Care) ■ EHR and Personal Health Record (PHR) system/Patient Portal (Morehouse Medical Associates)
Funding and Start-Up	■ GA-HITREC is federally funded through the Department of Health and Human Services' (HHS) Office of the National Coordinator for Health Information Technology (ONC) ■ Morehouse Medical Associates' health IT was funded through 2001 and 2007 grants from the Health Resources and Services Administration (HRSA) ■ The Georgia Association for Primary Health Care (GAPHC) also receives outside funding as a Primary Care Association and has previously received health IT funding from HRSA as a Health Center Controlled Network (HCCN)
Key Take-Away Messages	■ Group purchasing plans and lab hubs are centralized strategies that can help lower costs of EHR implementation. ■ Although outside of the scope of Meaningful Use, telemedicine can be extremely helpful, especially for rural providers. ■ PHRs and EHRs can support patient engagement, a key component of Meaningful Use. ■ Conflicting priorities for national programs may work against the goals of supporting minority and rural providers.

Columbia Basin Health Association. At CBHA, the EHR's CDS functionality increases providers' adherence to care protocols, including the provision of recommended preventive care. Staff said that their EHR's "check protocol" functionality alerts providers to clinical services that are required by a set standard of care protocol. The EHR offers the provider easy access to information, thereby ensuring that they are aware of a patient's care needs during a visit. Discussants also commented that the "check protocol" functionality provides nursing and outreach staff with information that enables them to efficiently reach out to patients who miss appointments. Table 6 summarizes how the CBHA effort employed creative strategies, such as integrating new mobile tools or educational videos with EHRs, to overcome patient literacy and language barriers. It also highlights that data integration with internal and external sources improves efficiency. The text that follows Table 6 provides additional details about CBHA's participation in HIE efforts.

Table 6: Columbia Basin Health Association

	Case Study Summary
Intervention and Setting	Columbia Basin Health Association (CBHA) is an FQHC operating three clinics in the rural Columbia Basin of Washington. CBHA developed a strong health IT infrastructure and implemented innovative IT pilot projects with the goal of improving quality of care and access for the rural and migrant populations they serve.
Target Population	A low-income, primarily Spanish-speaking population; 78% of CBHA patients identify as Hispanic. Approximately half (48%) of the patient population are migrant or seasonal farmworkers.
Technology Description	■ Electronic health record (EHR), including bi-directional interface with state immunization registry ■ Electronic dental record (EDR), including multimedia dental patient education software ■ WiredMD educational materials and videos ■ Innovative pilot projects ■ Mobile ultrasound device ■ Teledermatology intervention
Funding and Start-up	CBHA capital expenditures and small seed funding for pilot projects
Key Take-Away Messages	■ Multimedia strategies using new mobile tools or educational videos integrated with EHRs can overcome patient literacy and language barriers. ■ Strong leadership and committed staff are important to sustaining a health IT program. ■ Innovative customization of systems to meet the needs of providers who care for the underserved encourages buy-in. ■ Quality reporting directed at providers can lead to improved patient outcomes. ■ Data integration with internal and external sources improves efficiency.

Health Information Exchange

Columbia Basin Health Association, continued. Health IT supports increased access to data between ambulatory and inpatient providers. At CBHA (summarized above), the EHR enables the provision of better coordinated care by providing access to patient records at the local hospital. Similarly, CBHA providers have access to DataLink, which includes hospital discharge data from 17 Western North Carolina hospitals. Access to these data help providers avoid unnecessary duplicative tests and procedures, and ensure more accurate, effective, and comprehensive patient care. CBHA developed a template for their EHR allowing users to manually record data from DataLink and incorporate these data into the patient record.

Implementing interoperable health IT systems at CBHA resulted in efficiency gains. The site's linked EHR and EDR allow standardized scheduling across clinics; the EHR's panel management functions allow automated communications with patients (e.g., appointment reminders or medication recalls). Links between the internal pharmacy system and EHR allow e-Prescribing and prescription transfer among CBHA clinics.

Providers save time that was previously wasted tracking down paper charts and deciphering hard-to-read or incomplete documentation. Efficiency and more complete documentation are of particular benefit to safety-net providers because the populations that they serve may lack a regular source of care or the time, resources, and capacity to manage their own health information. CBHA providers report improved decision-making due to timely access to laboratory results and medications. Integration between CBHA's EHR and practice management system enables more complete, efficient billing and collection from third party payers.

At CBHA, providers deliver medical and dental care to a primarily low-income, Spanish-speaking population. Dental providers and patients cited the benefit of Caesy Enterprise videos on dental topics, which interface directly with the EDR. Patients found the videos—offered in both English and Spanish— easier to understand and more effective than written educational materials given their literacy and language needs. Providers often use the videos to explain different procedures or give the patient the option to choose between procedures. As a result, patients get actively involved in the provision of care by asking questions and being involved in the decision-making process.

Through a teledermatology pilot program, CBHA integrated dermatology services into the primary care visit for migrant farm workers and low-income Hispanics. Store-and-forward digital imaging applications imbedded on a mobile device allow primary care providers and patients to receive specialized consultation from a dermatologist at a distant site quickly and efficiently (often within 24 hours). Telemedicine offers particular benefits to providers and patients in rural areas. In addition, primary care providers increase their knowledge of dermatological conditions by reviewing the dermatologist's feedback and diagnosis.

Association of Asian Pacific Community Health Organizations. NORC visited sites of the Association of Asian Pacific Community Health Organizations (AAPCHO) Enabling Services Accountability Project (ESAP) and Pacific Innovation Collaborative (PIC), which are integrating patient and enabling services data (e.g., case management, social service referrals, health education, and counseling) into EHR systems. Integrating different types of data allows providers to report on the prevalence of specific patient needs among the populations that they serve, to track and monitor the programs' efforts to address these needs, and to document potential positive impacts on patient outcomes.

Documenting patients' language and interpreter needs in the EHR provides essential information to ensure that physicians' instructions are useful. Furthermore, use of the EHR to track patient needs for non-clinical services such as interpretation or health education helps clinics to ensure thorough follow-up

and to better document the enabling services they provide. For example, staff from one AAPCHO health center discussed how the EHR facilitates tracking of patients who receive referrals for additional social services or non-clinical enabling services; this allows patients to receive such services more efficiently. One social worker described how the EHR improved his ability to provide additional services to his patients when referred by clinicians.

Across all AAPCHO sites, providers and staff noticed an improved ability to coordinate patient care and enabling services because of tracking enabling services through their EHRs. The PIC, an AAPCHO initiative, allows multiple health centers to submit a subset of their data on enabling services needs and encounters to a single data warehouse, allowing for comparisons across sites. By examining patient data and outcomes at different sites, individual clinics can identify specific strategies employed by other centers that could also benefit their patients. Table 7 describes the AAPCHO health IT intervention. It highlights the value of HIE in increasing access and quality of health care for medically underserved communities by providing data to adequately compensate providers delivering enabling services.

Table 7: Association of Asian Pacific Community Health Organizations

	Case Study Summary
Intervention and Setting	The Enabling Services Accountability Project (ESAP) is a collaborative effort between the Association of Asian Pacific Community Health Organizations (AAPCHO) and four project sites included in this case study: ■ International Community Health Services (ICHS) – Seattle, WA ■ Charles B. Wang Community Health Center (CBWCHC) – New York, NY ■ Waianae Coast Comprehensive Health Center (WCCHC) – Waianae, HI ■ Kalihi-Palama Health Center (KPHC) – Honolulu, HI ESAP's work standardizes definitions of enabling services and develops a systematic method for collecting data on usage of these services in a consistent manner. For this case study, NORC explored: 1) the specific role electronic health records (EHRs) play in documenting and tracking these enabling services at each of these sites, 2) how broader efforts, such as the Pacific Innovation Collaborative (PIC), can allow for cross-health center comparisons of the needs and provision of enabling services, and 3) the relationship between enabling services and improved outcomes.
Target Population	Demographics vary by project site, but generally include low-income, uninsured and/or underinsured Asian Americans, Native Hawaiians, and other Pacific Islanders (AA/NHOPI).
Technology Description	Use of templates to capture enabling services using EHRs and manage detection and treatment of Hepatitis B: ■ NextGen (ICHS, WCCHC) ■ GE Centricity (CBWCHC, KPHC)
Funding and Start-Up	PIC funding: Health Resources and Services Administration (HRSA) Office of Health Information Technology and Quality (OHITQ) ESAP funding: Initially funded by the U.S. Department of Health and Human Services' (HHS) Agency for Health Research and Quality (AHRQ) and Office of Minority Health (OMH) as well as the California Wellness Foundation

	Case Study Summary
Key Take-Away Messages	■ Enabling services play a substantial role in patient care and positive patient outcomes at these health centers. ■ Tracking enabling services in a standardized and consistent way using health IT can improve patient care and outcomes. ■ Creating EHR templates and flow sheets plays a critical role in meeting specific patient needs.

Clinical Decision Support

Cherokee Indian Hospital Authority. CDS in electronic health records (EHRs) or other health IT systems can present advice in different ways, such as filters or highlighted electronic information displays to uniquely tailored documentation templates, annotated work lists, order sets, reference information, and messages or alerts. Staff members at the Cherokee Indian Hospital Authority (CIHA) use their EHR and registry systems to produce reports illustrating patient trends on specific outcomes variables (e.g., weight, hemoglobin A1c [HbA1c], and blood pressure). These reports fall within the category of "filtered or highlighted electronic information."

Clinicians and surrogates use patient panels to target patients for follow-up. Provider scorecard reports can encourage provider adherence to clinical guidelines. Use of provider scorecards can improve quality of care by allowing individual providers to monitor their performance and identify ways to improve care. At CIHA, providers receive scorecards each month, which include clinical indicators and quality review scores, as well as information on their productivity and patient concerns. Table 8 summarizes elements of CIHA's health IT efforts, including the use of panel reports to improve performance and accountability.

Table 8:   Cherokee Indian Hospital Authority

	Case Study Summary
Intervention and Setting	Cherokee Indian Hospital Authority (CIHA) uses an electronic health record (EHR), population management system, and health information exchange (HIE) to provide care for members of the Eastern Band of Cherokee Nation. They supplement their base EHR with various interfaces to gain additional functionality, such as access to electronic lab reporting, an electronic oral health record, and a digital imaging system.
Target Population	Over 10,000 members of the Eastern Band of Cherokee Indians
Technology Description	Indian Health Services' (IHS) Resource and Patient Management System (RPMS), EHR, and iCare population management software. Access to outside health information technology (health IT) systems and registries, including: Western North Carolina (WNC) DataLink, North Carolina Controlled Substance Registry, and North Carolina Immunization Registry. Independent teleretinopathy and telepsychiatry programs.
Funding and Start-Up	■ As a tribal facility, the Cherokee Indian Hospital Authority receives federal funding from IHS and funding directly from the Eastern Band of Cherokee Indians ■ $2.5 million in federal funds; $1 million from the Duke Endowment funded WNC DataLink ■ IHS funded the telepsychiatry program through the Methamphetamine Suicide Prevention Initiative (MSPI), a suicide prevention program ■ IHS funded the teleophthalmology program through the Joslin Vision Network

	Case Study Summary
Key Take-Away Messages	■ Dedicated health IT staff and leadership facilitate adoption of health IT. ■ Effective use of EHRs and registries requires ongoing customization and improvement. ■ Panel reports serve as tools for performance improvement and accountability. ■ Utilization of an EHR, coupled with a medical home model, can drive improvements in patient care and outcomes. ■ EHRs can facilitate better documentation of care and subsequently improve third party reimbursement.

Consumer eHealth

Wind Youth Services. Wind Youth Services provides a comprehensive resource in their PHR, HealthShack. Among other important functionalities, HealthShack allows youth experiencing homelessness to track and maintain important documents. This is a particularly important resource due to their transient living situation. Easy access to these documents and information facilitates the young persons' efforts to apply for public insurance benefits (e.g., Medicaid) or complete job applications. In the absence of this resource, respondents noted challenges with tracking and producing necessary documents that impair the young persons' ability to apply for and efficiently access needed services. Prior research confirms that certain underserved and high-need groups are more likely to benefit from accessing their health care information online compared to others.[104]

Table 9: HealthShack Personal Health Record

	Case Study Summary
Intervention and Setting	HealthShack is an untethered personal health record (PHR) implemented at Wind Youth Services in Sacramento, CA, in collaboration with FollowMe, Inc., an electronic health information vendor, and University of California - Davis Children's Hospital. UC Davis conducted developmental research to understand the acceptability of a PHR among vulnerable youth.
Target Population	System-based and vulnerable youth, including the homeless and those aging out of foster care
Technology Description	HealthShack PHR: A web-based, patient-owned repository for electronic health information, information on community resources, and other functionality.
Funding and Start-up	$50,000 start-up funding from the Sierra Health Foundation in 2007 $400,000 from the United Health Group and $125,000 from the Sierra Health Foundation in 2008 to design and implement HealthShack
Key Take-Away Messages	■ HealthShack empowers vulnerable youth to find and access the health care and social service resources they need. ■ User-centered design and peer outreach can facilitate acceptance and buy-in. ■ Non-primary health care providers can effectively manage PHR projects, but interoperability, resources, and sustainability remain important challenges. ■ Despite limited resources, youth are eager and capable of using IT and are resourceful in their ability to find access to the Internet.

<u>Case Management Software</u>

Aaron E. Henry Community Health Services Center. At Aaron E. Henry Community Health Services Centers (AEH), case management program software empowers case managers to improve the quality of services they provide by reminding them of best practices and improving their clinical knowledge, increasing their confidence, and encouraging them to take more ownership of their cases.

Although outcomes achieved depend on the intervention, case study stakeholders attributed benefits such as increased quality of life and functional ability for patients with chronic heart failure, better control of HbA1c levels for diabetics, and improvements in compliance with medication and weight management directly to interventions involving health IT. Importantly, providers used health IT in conjunction with other strategies to improve outcomes among underserved populations. For example, at AEH, implementation of case management program software and an accompanying incentive program led to anecdotal improvements in weight management observed by several staff. Patients taking part in the program also noted improvements in their overall health.

Table 10:   Patient Care Management and Rewards Program

	Case Study Summary
Intervention and Setting	The Patient Care Management and Rewards Program implemented at Aaron E. Henry Community Health Services Centers (AEH) in the Mississippi Delta, in collaboration with Altruista Health, Inc., uses Altruista GuidingCare (Altruista)—a care management software system—to track three health behavior indicators: weight management, aerobic activity, and medication compliance. The program provides patients with financial rewards for progress toward meeting health goals. The patient-centered program incorporates health coaching, care support service delivery, and direct financial incentives; it focuses on patient education and self-management.
Target Population	Mississippi Delta residents with diabetes and/or hypertension
Technology Description	Altruista GuidingCare: A web-based, population care management software system
Funding and Start-Up	$100,000 from Heinz Family Philanthropies for a pilot project $175,000 from the Robert Wood Johnson Foundation (RWJF) in 2009 to replicate the pilot project on a larger scale
Key Take-Away Messages	■ Customizing systems to meet the needs of providers who care for the underserved encourages buy-in. ■ Technology can facilitate the provision of integrated interdisciplinary care. ■ Technology-driven case management can help engage both ancillary providers and patients. ■ Lack of interoperable systems poses serious barriers to sustainability.

<u>Telehealth and Telemedicine</u>

St. Elizabeth's Health Center & University of Arizona Department of Psychiatry. In general, minorities, including Blacks and Hispanics, experience a smaller likelihood of receiving treatment for depression compared to Whites and non-Hispanic Whites, respectively.[105] While some research suggests

under-treatment of depression results from under-reporting of mental illness by minorities, others attribute lower acceptance and use of mental health services among minorities to patient-related as well as health system factors.[106,107] Telehealth technology can improve acceptability of using mental health services in these populations.

The implementation of telehealth—defined as the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration[108]—increased patients' access to providers at many sites studied. At St. Elizabeth's Health Center (St. Elizabeth's), the telepsychiatry intervention increased low-income Hispanic patients' access to psychiatrists. Implementing telepsychiatry at St. Elizabeth's increased their capacity to provide mental health services, making routine screening for depression an integrated part of primary care and enabling better identification of patients with depression.

St. Elizabeth's providers who took part in the study said that integrating mental health services into the broader system of care and using culturally and linguistically competent patient liaisons led to greater patient acceptance of mental health services. They reported improved outcomes for patients who received telepsychiatry, including faster and more sustained improvements in depression (measured by the PHQ-9) than would typically result from treatment with a primary care provider. Researchers found significant improvements in functional ability and quality of life over the six month intervention period; most patients indicated satisfaction with treatment.

Table 11: University of Arizona and St. Elizabeth's Health Center

	Case Study Summary
Intervention and Setting	The University of Arizona College of Medicine, Department of Psychiatry (University of Arizona), in partnership with St. Elizabeth's Health Center (St. Elizabeth's), an FQHC in Tucson, AZ, conducted a project to examine the acceptability and accessibility of telepsychiatry depression treatment for low-income Hispanic adults through internet videoconferencing to patients at their primary care medical home.
Target Population	Hispanic adult patients with major depressive disorder
Technology Description	Commercial webcams & computers; Adobe Macromedia Breeze software
Funding	$275,000 from the Robert Wood Johnson Foundation (RWJF)
Key Take-Away Messages	■ Culturally and linguistically congruent liaisons can facilitate acceptance of health information technology (health IT). ■ Telepsychiatry can be embraced and accepted by patients who are limited-technology users. ■ Telepsychiatry improves access to mental health services and can improve quality of care. ■ Integrating IT into a broader system of clinic and provider function provides essential support for sustainability.

Roanoke Chowan Community Health Center & Piedmont Health Services. Through the Patient Provider Telehealth Network intervention, Roanoke Chowan Community Health Center (RCCHC) and Piedmont Health (Piedmont) providers noted that the additional information gained through the transmission of data from devices (e.g., weight scales, pulse-oximeters, and blood pressure monitors) in patients' homes to a central repository monitored daily by nursing staff helps to inform their care decisions. The application of telehealth technology at RCCHC and Piedmont enables earlier detection and quicker assessment of potential problems using evidence-based information. This mechanism leads to improvements in provider efficiency and quality of care and, specifically, reduces ED visits for congestive heart failure patients.

Both RCCHC and Piedmont providers noted that the telehealth summary reports showing the trajectory of home readings over time were useful. In addition, they were able to make immediate adjustments to treatment in response to unexpected changes in patients' weight or blood pressure. An internal evaluation of the telehealth project at RCCHC and Piedmont revealed significant improvements in blood pressure and cost savings related to hospital bed days and ED visits.[109] Researchers observed a significant decrease (4.8 mmHg, p = .003) in blood pressure from their baseline for participating patients through three years post intervention.[110] Although evaluation analyses did not show significant changes in weight, patients and providers felt that the health of patients who received telehealth remote monitoring had improved compared to their baseline.

Stakeholders from the RCCHC and Piedmont remote monitoring intervention agreed that despite rural patients' limited use of computers and mobile devices in their everyday lives, the patients were willing to embrace the telehealth technology installed in their homes. Both clinics reported that very few patients declined to participate in the program. When prompted, RCCHC and Piedmont patients did not express concerns related to privacy or security risks associated with the electronic transfer of personal health information because of the benefits and peace of mind afforded by the monitoring program. As a result, RCCHC and Piedmont staff strongly agreed that telehealth remote monitoring dramatically improved patient engagement in their care, resulting in improvements in access to care and self-management of chronic conditions by patients.

Table 12:   Patient Provider Telehealth Network

	Case Study Summary
Intervention and Setting	Members of the North Carolina-based Patient Provider Telehealth Network use a telehealth remote monitoring system to monitor key health indicators for rural, high-risk patients throughout the state. Members leverage their electronic health records (EHRs) to share data collected through remote monitoring devices with patients' providers.
Target Population	Uninsured or underinsured high-risk individuals with diabetes, cardiovascular disease, and hypertension
Technology Description	Software-based telehealth remote monitoring systems and corresponding health indicator measure devices
Funding and Start-Up	**Phase 1 (2006–2009):** NC Health and Wellness Trust Fund Commission ($360,000) in 2006; additional funding (2007-2009) from Kate B. Reynolds Charitable Trust, the Obici Foundation, Pitt County Foundation, and the Roanoke Chowan Community Benefit to expand Roanoke Chowan Community Health Center's (RCCHC's) remote monitoring program and implement a post discharge remote monitoring and chronic care management for diabetes patients at Roanoke Chowan Hospital. **Phases 2 and 3 (2009–present):** NC Health and Wellness Trust Fund Commission ($870,000); Funding (amount unknown) from Duke Endowment to continue in-house at Piedmont (2010). **Health Resources and Services Administration (HRSA) Telehealth Network Grant (2010– present):** $250,000
Key Take-Away Messages	■ Introduction of health information technology (health IT) tools through a trusted source is fundamental to successful adoption. ■ Remote monitoring can dramatically increase patient engagement and result in improved outcomes for chronic disease self-management and reductions in hospital-related costs. ■ Interoperability with other IT systems and reimbursement for telehealth care are critical to further adoption and sustainability.

Howard University Hospital. Technologies that engage patients in their care, including PHRs, telehealth, and remote monitoring technologies, also led to improvements in health outcomes for underserved patients. Through the PHR implemented at Howard University Hospital's (HUH's) Diabetes Treatment Center (DTC), providers at the DTC can access information that patients self-enter from their own devices (e.g., blood glucose monitors or pedometers) or obtain information from visits to other providers. Providers recounted instances where they used information in the PHR to adjust treatment or better manage office visits. Staff reported that PHR patients as a whole reduced their HbA1c markedly over the course of their use. The NoMoreClipboard PHR used at the DTC also helps some patients track key markers of disease risk such as cholesterol and lower it to the normal range.

Table 13:   Howard University Hospital Diabetes Treatment Center

	Case Study Summary
Intervention and Setting	The Howard University Hospital (HUH) Diabetes Treatment Center (DTC), located in Washington, DC, uses an electronic health record (EHR), personal health record (PHR), patient portal, and two innovative health information technology (health IT) pilot projects with the goal of improving quality of care and access for high-risk urban patients with diabetes.
Target Population	Urban Black adults and children with diabetes, (many members of this population are enrolled in Medicaid or are uninsured/underinsured).
Technology Description	Core health IT: ■ EHR ■ PHR and patient portal Innovative pilot projects: ■ Telehealth self-management intervention ■ Smartphone pilot
Funding and Start-up	DC Department of Health Grant National Institutes of Health's (NIH) National Institute on Minority Health and Health Disparities (NIMHD) Research to Reduce Ethnic Disparities in End Stage Renal Disease (ESRD) Export Grant – $1,474,087 (2005)
Key Take-Away Messages	■ Introduction of health IT tools through a trusted source is fundamental to successful implementation. ■ Intensive technical assistance is important when working with underserved populations. ■ Providing access to health IT tools through multiple technology platforms can increase uptake. ■ Patient-facing technologies can dramatically increase patient engagement and result in improved outcomes in chronic disease self-management.

Challenges of Using Health IT to Address Health Disparities

Research shows that health IT tools can play a role in improving health care and outcomes; it also shows that health IT alone cannot reduce or eliminate health disparities.[111] Even though well-designed quality improvement interventions that utilize health IT can result in meaningful outcomes improvements, these interventions may do little to eliminate health disparities.

An academic general internal medicine ambulatory care practice in Chicago that serves over 25,000 patients each year implemented a quality improvement initiative using provider-directed point-of-care CDS tools and quality feedback. The practice serves a population that is diverse in terms of both race/ ethnicity and insurance type: the patient population was 49 percent White, 34 percent "other/ unknown," 12 percent Black, and 5 percent Hispanic. Approximately 68 percent of patients had private insurance, 22 percent had Medicaid, 5 percent had Medicare, and 5 percent were uninsured. The intervention sought to improve processes of care and intermediate outcome measures for coronary heart disease, heart failure, hypertension, and diabetes.

The practice had been using a commercially available EHR system for over 10 years. Thus, the quality improvement initiative was able to focus on 17 quality measures in the system. The initiative led to improvements in 14 of 17 measures among White patients, and 10 of 17 measures among Black patients.

Of the seven measures that revealed racial disparities at baseline, only two showed a lessening of disparities after implementation; disparities remained stable for four measures, and for one measure they actually increased.[112] This study highlights the persistent nature of racial and ethnic disparities in health outcomes even after the implementation of health IT-supported quality improvement interventions.[113] There are challenges associated with achieving improvements in health outcomes and eliminating health disparities among underserved populations that health IT alone cannot solve.

Although Health IT Alone is Not a Solution, It Plays a Role in Broader Initiatives

Successful implementation of health IT in underserved communities must incorporate technology as one element of a broader initiative. The technology should target known problems that burden institutions, patients, and communities.

The Charles B. Wang Community Health Center (CBWCHC) used their EHR to address a critical clinical need of the population they serve. Serving a primarily Asian Americans/Native Hawaiians and Other Pacific Islanders (AA/NHOPI) population with elevated rates of Hepatitis B, staff at the center found that their population was experiencing a rate of Hepatitis B prevalence as high as one in eight patients (rates that were nearly as high as the occurrence of hypertension in that population). To address the needs of patients with Hepatitis B, CBWCHC customized their EHR to include forms, flow sheets, and a registry specific to Hepatitis B. These customizations allow CBWCHC providers to easily access information on lab tests and various metrics important for tracking their Hepatitis B patients.

CBWCHC also developed Hepatitis B care cards for their patients to help them track information about their disease. While not electronic, these cards contain information from their providers on medications, required screenings, and lab results. Patients at CBWCHC reported that their Hepatitis B care cards were invaluable and provide peace of mind that their disease is under control.

Practices and Programs Being Used to Increase Adoption of Health IT in Communities/Populations with Health Disparities

Federal Programs to Encourage and Support Health IT Adoption

Overview of Federal Efforts Preceding the HITECH Act

Several federal agencies focus on issues related to health IT and health disparities and manage programs related to addressing objectives and barriers outlined in this report. Efforts to encourage health IT adoption for quality improvement among safety-net providers that care for underserved populations were taking place prior to the implementation of HITECH. The bullets below highlight several of these agencies and programs.

- HHS' Office of Minority Health Programs (OMH). OMH's Public-Private Partnerships stimulate adoption of health IT in underserved communities, and include Memorandums of Understanding (MOUs) with MedPlus/Quest Diagnostics, AT&T, the American Health Information Management Association, and Emdeon. Funding by the National Health Information Technology Collaborative provides education, outreach, and collaborative opportunities for the implementation of health IT in underserved communities.

- Health Care for Special Populations. HRSA funds an array of programs focused on improving the health of special populations. For example, the HRSA Office of Rural Health Policy (ORHP) administers grant programs designed to build health care capacity at both the local and state levels. These grants provide funds to 50 State Offices of Rural Health to support ongoing improvements in care, and to rural hospitals through the Medicare Rural Hospital Flexibility Grant. The Bureau of Primary Health Care (BPHC) supports funding for over 1,300 community-based primary care providers who target services towards Medicaid and uninsured populations. Additionally, the HRSA HIV/AIDS Bureau administers the Ryan White program which awards funds to meet the needs of different communities and populations affected by HIV/AIDS.

- Health Center Controlled Networks. HRSA's HCCNs are networks controlled by and acting on behalf of health centers as defined and funded under Section 330(e)(1)(C) of the Public Health Service Act and must consist of at least three collaborator organizations. The purpose is to ensure access to health care for the medically underserved populations through the enhancement of health center operations, including health IT.

- Indian Health Service (IHS) Programs. IHS provides care to individuals at locations throughout the United States, including a significant number of remote, rural reservation communities. IHS views information technology as essential to effective quality health care delivery and efficient resource management in the IHS. The IHS information technology program is fully integrated with the agency's other programs.

- Agency for Health Care Research and Quality (AHRQ) Programs. AHRQ funds an array of programs focused on improving the health of special populations. Minorities are one of their priority populations, and, annually, AHRQ publishes the National Healthcare Disparities and Quality Reports, which highlight current research on health disparities. Additionally, AHRQ has developed a National Resource Center for Health Information Technology described as "a public resource for sharing research findings, best practices, lessons learned, and funding opportunities with health IT researchers, implementers, and policymakers."[114]

As demonstrated above, the federal government has been providing ongoing support to encourage the use of health IT to improve access to high-quality health care. For example, prior to the adoption of HITECH, ORHP invested $25 million in the Critical Access Hospital Health Information Technology Network Implementation Program to promote HIE in CAHs serving residents of rural areas.[115]

Additionally, through its HCCN program, HRSA has provided grants to health centers to work in consortia with their peers in order to plan and implement EHRs and use them for reporting, CDS, and quality improvement. Similarly, the IHS has worked to create an EHR system and population health reporting tools using open-source software. These efforts preceded the HITECH Act.[116]

Background: Strategies Behind Federal Health IT Programs

In 2011, HHS launched the *HHS Action Plan to Reduce Health Disparities*, outlining goals and actions that HHS plans to take to reduce health disparities among racial and ethnic minorities. A second strategic planning document, the Federal Health IT Strategic Plan 2011–2015, also addresses the topic of health disparities.[117]

The Health IT Strategic Plan supports adoption and Meaningful Use of health IT in underserved communities. It includes strategies to improve quality of health care and health outcomes for patients in both rural and urban underserved communities who may have limited access to primary and specialty health care. There is need for improved health outcomes at both the individual and population/system-wide levels in underserved communities. Federal planning efforts focused at reducing health disparities,

including the *HHS Action Plan to Reduce Racial and Ethnic Health Disparities*, call for the spread of Meaningful Use of health IT within underserved communities as an explicit objective.[118]

HHS Rural Health IT Strategy

In the summer of 2010, the Secretary of HHS convened an HHS Rural Health IT Task Force of seven member agencies, co-chaired by ONC and HRSA to collaborate with federal and private sector partners to support rural communities in their efforts to adopt and meaningfully use health IT. A year later, the President convened the White House Rural Council to streamline and improve the effectiveness of programs serving rural America. The Task Force sought to identify and realign HHS resources that may benefit rural health IT, addressing lack of capital to purchase health IT among rural providers, the lack of affordable broadband connectivity in some areas, and a shortage of qualified health IT workers.

Concurrent with these efforts, ONC provided almost $20 million in funding to nearly 75 percent of the 62 RECs to help CAHs and other rural hospitals convert from paper-based records to certified EHR systems. RECs received another $12 million in supplemental funding for RECs to assist CAHs and other rural hospitals to adopt EHRs.[119] ONC also put in place a Health IT Workforce Development Program to train skilled health IT professionals to assist providers in adopting and meaningfully using EHRs. The program provides training for health workers who work in rural practices and facilities and offers distance learning opportunities.[120]

Rural providers face special challenges related to participating in HIE, including lack of expertise and infrastructure. To build the capacity for electronic information exchange nationwide, ONC awarded cooperative agreements to states, eligible territories, and qualified state-designated entities to develop governance, policies, technical services, business operations, and financing mechanisms necessary to facilitate HIE.[121] The State HIE Cooperative Agreement Program supports providers who exchange clinical information. ONC and its collaborators developed the Direct protocol as a simple, secure standard-based way for providers and other participants to send encrypted health information directly to trusted recipients over the Internet.[122] Many states are using their awards to launch Direct exchange services to a wide base of providers, including those in rural and underserved areas. According to State HIE Program data from the fourth calendar quarter of 2012, 39 states have made directed exchange broadly available.[123] Another four states have directed exchange available regionally but not statewide and five states are piloting directed exchange solutions.[124] States are also providing local technical support and services to independent labs, rural hospitals, and others that lack health IT expertise and infrastructure to participate in exchange.[125]

<u>Barriers to Health IT Adoption and Meaningful Use in Underserved Communities</u>

As federal programs to encourage the adoption of health IT continue to evolve, challenges and opportunities that are specific to underserved communities are emerging. Safety-net providers such as FQHCs, CAHs and others vary from private sector providers in their governance, operations, and access to resources. These variations have an impact on their capacity to adopt health IT. Prior research has demonstrated that factors such as high costs, limited access to capital, unique reporting and functional requirements, and lack of in-house IT expertise inhibit effective adoption of health IT among safety-net providers.[126] While many of these factors are specific to providers that disproportionately care for the underserved, many of the barriers to health IT adoption in underserved settings resemble those faced by providers generally. This similarity suggests that wider efforts to address some of the difficulties in health IT adoption may prove beneficial in underserved environments. Thus, to provide high-quality care to underserved patients, providers who use health IT must respond to these issues. Existing federal programs address many of the challenges described by case study participants.

Financial barriers

Efforts such as the Medicare and Medicaid EHR Incentive Programs, the HCCN initiative, the HRSA Health IT Technical Assistance Center, and the REC program provide safety-net providers with options for obtaining funding, technical support, and expertise necessary to adopt and use health IT. As of April 2013, REC programs from around the nation reported signing up approximately 140,000 providers to adopt certified EHR technology and pursue Meaningful Use goals, including over 25,000 providers practicing in rural areas or small cities, over 18,000 providers working in FQHCs, and over 17,000 providers serving in other underserved settings.[127]

ONC and HRSA co-chair the HHS Rural Health IT Task Force (Task Force). It works to address several of the barriers facing rural providers taking part in the case studies. The Task Force identified federal programs relevant to rural areas and motivated the redirection of $31.8 million for RECs to target CAHs. In 2011, HRSA made available $12 million for a Rural Health IT Network Grant program to offset some of the costs of health IT acquisitions for rural network organizations that are unable to reach the first stages of Meaningful Use.

To address barriers associated with lack of capital, in August 2011, ONC and HRSA signed a Memorandum of Understanding (MOU) linking rural health care providers to U.S. Department of Agriculture grants and loans to support the acquisition of health IT infrastructure.[128] In the area of broadband connectivity, the Task Force has been working with Federal Communications Commission (FCC) to maximize the extent to which rural health care providers may benefit from two relevant FCC

programs—the Rural Health Care Pilot Program (Pilot Program) and the Connect America Fund (CAF). For example, the Task Force, on behalf of HHS, developed comments to FCC's 2010 proposed rule for the Pilot Program[129] as well as the 2011 proposed rule for the CAF.[130] The comments recommended alignment of the Pilot Program's performance goals with Meaningful Use and an increase in the level of capital support for rural health care.[131]

Lack of access to technology

Stakeholders acknowledged difficulties that underserved populations face in adopting expensive mobile devices, computers, and high-speed internet connectivity. Despite these challenges, the findings indicate that the underserved in communities NORC visited have better than expected access to technology. For example, as part of the intervention implemented jointly by St. Elizabeth's and the University of Arizona, staff noted a willingness to embrace use of the technology in telepsychiatry among Hispanic patients, even those who had limited personal experience with computers. This may suggest that members of underserved populations are able to use health IT, even if they do not have regular access to computers.

Another resource challenge that affects the feasibility of telemedicine as well as any form of HIE is the lack of IT infrastructure in some rural areas. To provide capital to develop infrastructure, agencies such as HRSA, USDA and the FCC have established a series of special funds and pilot programs, described elsewhere in this report, that support necessary investments in infrastructure including broadband to facilitate use of health IT.

Meaningful Use and the EHR Incentive Programs

The HITECH Act authorized incentive payments under Medicare and Medicaid for eligible professionals, eligible hospitals, and Critical Access Hospitals that adopt and meaningfully use certified EHR technology. CMS has established in regulation the criteria for Stages 1 and 2 of Meaningful Use. Meaningful Use puts forth specific objectives that eligible professionals and hospitals must meet to qualify for incentive payments. Incentives encourage the use of EHRs in a way that will lead to quality improvement. Importantly, the definition of eligible professionals excludes many providers that provide care in behavioral health settings, long-term care facilities or public health clinics. Each of these excluded groups support underserved populations in different ways.

The total dollar amount of incentive payments available to an eligible professional is higher under Medicaid than under Medicare ($63,750 over 6 years for Medicaid compared to $44,000 over 5 years for Medicare). In their first year, providers may qualify for Medicaid incentive payments for adoption, implementation or upgrading (A/I/U) of certified EHR technology rather than demonstrating Meaningful

Use as required for providers under Medicare. Providers also have a longer window to achieve Meaningful Use and receive incentive payments under Medicaid compared to Medicare. In addition, eligible professionals who predominantly furnish services in an area designated as a Health Professional Shortage Area (HPSA) may receive a 10% increase in their annual EHR incentive payments under Medicare.[132]

Programs to Address the Three Types of Barriers

Several federal initiatives, both those funded under HITECH and ongoing investments under separate programs—some initiated before HITECH was enacted—work to address the significant barriers that arise in responding to the needs of underserved consumers and the providers that treat them using health IT-based interventions. These efforts are wide ranging and flexible initiatives varying from efforts on the part of the Federal Communications Commission to increase availability of broadband access to underserved communities to direct support for health IT adoption and quality improvement for safety-net providers using HCCNs. In each case, these projects have had some positive impact on the capacities for health IT to help reduce disparities. Table 14, below, summarizes these efforts and their relationship to barriers identified during this project.

Table 14:   Federal and State Efforts to Address Barriers and Challenges

Summary
Resource Challenges
Traditional forms of payment for safety-net providers may need to adapt to sustain progress made through time-**limited grants to evaluate innovation** (e.g., supporting health IT adoption and other infrastructure for health care transformation.) The Center for Medicare and Medicaid Innovation (CMMI) of the Centers for Medicare & Medicaid Services (CMS) initiated an advanced primary care pilot for FQHCs to look at the impact of Primary Care Medical Homes (PCMH) on quality of care and Medicare payments to FQHCs. Over time, payment policies might evolve to continue to reward practices that demonstrate the capability to use health IT to improve quality and efficiency of care.
ONC's Workforce Development Program seeks to **increase the qualified health IT workforce** in the nation. Overall, the ONC's Workforce Development Program has trained thousands of new health IT workers and seeks to establish a self-sustaining capacity of colleges and universities to continue training new health IT workers, thus contributing to adoption, Meaningful Use, HIE and use of IT to improve quality of care working with a wide range of provider and technology organizations. The HHS Rural Health Task Force seeks to identify opportunities to assure that rural areas benefit from these activities.
Needs for Technical Assistance
The case studies demonstrate that safety-net providers sometimes struggle to address configuration and customization of health IT applications to address their needs. One approach HHS has undertaken through the Office of Minority Health (OMH) is to establish partnerships with vendors to assure that their products address safety-net requirements. **Technical assistance investments** made through ONC's RECs program, HRSA, and AHRQ may help consolidate and formalize requirements and specifications around case management, capture detailed demographic and language information, make consumer-facing tools useful and usable for underserved populations, and design reports tailored to the specific population(s) served by safety-net providers.

Summary
Many HITECH cooperative agreement and grant programs encourage or require collaboration across provider organizations. In addition, HRSA has long supported collaboration across health centers through HCCNs as a means of reducing the cost of implementation and of gaining access to expertise necessary for effective implementation and use of health IT. Some HCCNs were selected to become RECs and others continue to support health center efforts to become meaningful users of EHRs, develop systems driven quality improvement reports, more effectively engage patients, and achieve economies of scale. HRSA recently issued a guide to health center networks providing details on networks around the nation about how they might **support providers in different areas**.[133]

Lack of Access to Technology
Currently, Medicare and Medicaid reimbursement for telehealth is limited to use of technologies that allow for real-time video engagement between patients and clinicians. A program supporting **access to distance medicine among rural providers** is the Federal Communication Commission's Universal Service Fund (USF). The USF's Rural Health Care Pilot Program offers providers options to purchase telecommunications services at discounted rates for rural providers.[134] There are benefits of both synchronous telehealth interventions (e.g., real-time interactive video conferencing consultations), and asynchronous telehealth interventions (e.g., home health monitoring.) Such technologies use a store-and-forward format to electronically transfer and store data for subsequent review and analysis by clinical staff, pending an alert.[135] Telehealth may be an effective model for reducing morbidity, utilization, and cost of care associated with specific populations such as those with congestive heart failure. Home health monitoring interventions are incorporated in some advanced primary care models being piloted and evaluated by CMMI and may be appropriate for reimbursement in the future

EHR Incentive Programs and EHR adoption / Meaningful Use

The Medicare and Medicaid EHR Incentive Programs encourage all eligible health care providers to adopt EHRs and utilize the technology in ways that are "meaningful" to improve the quality, safety, and efficiency of patient health care. Eligible Professionals (EPs),[136] Eligible Hospitals, and Critical Access Hospitals for Medicare[137] and Medicaid[138] can earn incentive payments by meeting program requirements to demonstrate meaningful use of EHRs.[139]

As seen in Table 15, over six in ten eligible professionals had registered for either the Medicare or Medicaid Meaningful Use EHR incentive program by October 2012, and three in ten eligible professionals had received payment. There was no disparity in registration or payment rates for rural providers and those located in HPSAs, compared with providers located in non-HPSA metropolitan areas. About 12 percent of all ambulatory providers were in non-metro areas and three percent were in HPSAs, mirroring the percentages of registered professionals in non-metropolitan areas (12 percent, or 38.6 thousand of 322.8 thousand) and in HPSAs (three percent, or 10.0 thousand of 322.8 thousand). Similarly, 12 percent of professionals who received payment were located in non-metropolitan areas (20.3 thousand of 161.3 thousand) and three percent were in HPSAs (4.9 thousand of 161.3 thousand).

Table 15:   Medicare and Medicaid EHR Incentive Program Participation among Eligible Professionals as of October 2012

	Total	Non-Metropolitan Areas	Primary Care HPSA
Number of Eligible Professionals Registered (thousands)			
Total	**322.8**	**38.6**	**10.0**
Medicaid	**100.6**	15.8	5.6
Medicare	**222.2**	22.8	4.5
Number of Eligible Professionals Receiving Payment (thousands)			
Total	**161.3**	**20.3**	**4.9**
Medicaid	**62.2**	10.4	3.3
Medicare	**99.3**	10.0	1.5
Total Estimated Eligible Professionals	**521.6**		
Total Estimated Ambulatory Physicians, Nurse Practitioners, and Physician Assistants	**716.1**	**82.6**	**22.1**

Notes: Non-metropolitan areas defined as counties that are outside of a Metropolitan Statistical Area. Primary care Health Professional Shortage Areas (HPSAs) are defined as zip codes considered by CMS to be eligible for primary care HPSA bonus payment (http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HPSAPSAPhysicianBonuses/index.html). Total eligible professionals estimate is from the Final Rule for Stage 1 of the Medicare and Medicaid EHR Incentive Program. Information on total ambulatory physicians, nurse practitioners, and physicians' assistants is derived from SK&A Information Services Office-Based Provider Database, 2011.

Table 16 shows that among hospitals, 78 percent of CAHs in the nation have registered for EHR incentive payments and half of all CAHs received payments as of October 2012. These registration and payment rates are lower than the overall percentage of hospitals that have registered (83 percent) and received payment (65 percent). Among hospitals that are not Critical Access Hospitals, a slightly higher percentage of the facilities that are located in non-metropolitan areas have registered and received payment (88 percent registered and 74 percent paid), compared with hospitals located in metropolitan areas (84 percent registered, 69 percent paid).

Table 16: Medicare and Medicaid EHR Incentive Program Participation among Eligible Hospitals and Critical Access Hospitals as of October 2012

Hospital Type	Number (Percent) of Hospitals, in Hundreds Registered with either Medicare or Medicaid Incentive Program	Number (Percent) of Hospitals, in Hundreds Received payment for adopting certified EHR under Medicaid Incentive Program	Number (Percent) of Hospitals, in Hundreds Attested to Meaningful Use	Number (Percent) of Hospitals, in Hundreds Received payment from either Medicare or Medicaid Incentive Program	Number (Percent) of Hospitals, in Hundreds Total hospitals
Total	41.3 (83%)	25.7 (52%)	23.2 (47%)	32.3 (65%)	49.8
Critical Access Hospitals	10.4 (78%)	5.2 (39%)	5.8 (44%)	6.7 (50%)	13.3
Hospitals (not including Critical Access Hospitals)					
In non-metropolitan areas	8.4 (88%)	5.8 (61%)	5.0 (53%)	7.1 (74%)	9.5
In metropolitan areas	22.6 (84%)	14.6 (54%)	12.5 (46%)	18.6 (69%)	27.0

Notes: Estimates of total hospitals reflect the number of hospitals certified by the Centers for Medicare & Medicaid Services as of June 2012 with hospital sub-types of short term, children's, or Critical Access Hospital. Non-metropolitan areas defined as counties that are outside of a Metropolitan Statistical Area.

Reimbursement for telehealth services

Medicare reimburses for telehealth services involving real-time communication using audio and video connections between a patient presenting in rural areas (HPSA or counties outside of a metropolitan area) and a range of providers. Medicare also added the following services as reimbursable under telehealth in calendar year 2012: individual medical nutrition therapy, consultations, and smoking and tobacco use cessation counseling visits.[140] These steps will likely increase the number of rural residents with access to telehealth services. Medicare's fee-for-service benefit does not reimburse for forms of telehealth involving store-and-forward technologies or remote patient monitoring except as special pilots or demonstrations. Under Medicaid, reimbursement for telehealth services varies from state to state.

Although a limited number of states do not reimburse for telehealth service, most state Medicaid offices allow reimbursement for office or outpatient visits. These visits may include individual psychotherapy, psychiatric diagnostic interview examinations, and pharmacologic management, conducted by providers using telehealth technologies. Medicaid reimbursement for the use of remote monitoring devices varies by state and by device.[141]
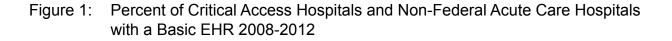
Federal agencies have undertaken a major effort to upgrade the health IT capacity of FQHCs. As one example, the 2009 Recovery Act provided $1.5 billion in funding for capital improvements at FQHCs, which included making improvements to health IT systems.[142] In addition to this investment under HITECH, other HRSA investments described in this report include the Health Disparities Collaborative program, BPHC funding for HCCNs, ORHP health IT funding for rural health networks, and a host of other initiatives that facilitate the adoption of health IT for quality improvement among safety-net and rural providers.
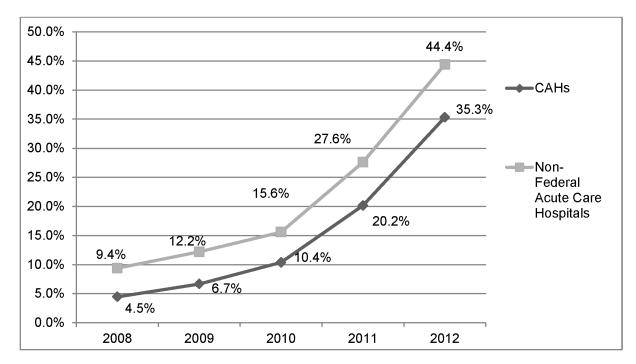
Need for Assistance to Adopt, Implement, and Optimize Use of IT

Regional Extension Centers (RECs) / HITRC

ONC funded 62 RECs to help 100,000 primary care providers adopt and effectively use EHRs over the course of the program's four-year project period. RECs ensure that primary care clinicians get the help they need to use EHRs. RECs provide training and support services to individual and small practices, medical practices lacking resources to implement and maintain EHRs, and those who provide primary care services in public hospitals and CAHs, FQHCs, and other settings that mostly serve those who lack adequate coverage or medical care. REC services include outreach and education, EHR support, and technical assistance in implementing health IT and using it to improve care.[143] ONC also established the Health IT Research Center (HITRC) learning management system to provide training resources on EHRs, health IT, and Meaningful Use to the staff of the RECs.[144] At their inception, RECs prioritized assistance to FQHCs and other safety-net providers.

The most recent analysis from ONC shows that 72 percent of CAHs and 41 percent of other small rural hospitals have enrolled with an REC as of September 2012. Among CAHs enrolled with RECs, almost half are live on EHRs and 18 percent have demonstrated Meaningful Use. Similarly, among other small rural hospitals enrolled with an REC, 52 percent are live on EHRs and 27 percent have demonstrated Meaningful Use.[145] Other recent analyses show that enrollment among REC providers is highest in rural areas and HPSAs and notes that in efforts to reach out to rural providers, RECs have effectively collaborated with HRSA and State Offices of Rural Health Policy.[146]

Figure 1:   Percent of Critical Access Hospitals and Non-Federal Acute Care Hospitals
with a Basic EHR 2008-2012

Source: Data provided by ONC from ONC/AHA Annual Survey Information Technology Supplement

Figure 1 shows the percent of all non-federal acute care hospitals and Critical Access Hospitals with adoption of a basic EHR system. Adoption of a basic EHR system more than tripled since 2009 for both non-federal acute care hospitals (from 12% to 44%) and Critical Access Hospitals (from 7% to 35%). The percent of Critical Access Hospitals possessing a basic EHR system increased by 15 percentage points between 2011 and 2012, rising from 20% to 35%.

Workforce

To address health IT workforce shortages in rural communities, HHS seeks to train thousands of students nationwide through the Community College Consortia program by March 2013 and the University-Based Training (UBT) program by July 2013. Recently, ONC in conjunction with one of the Community College awardees, Bellevue College, released a free training program in health IT and evidenced based medicine aimed at rural and safety-net providers.[147] As of February 2012, the Community College Consortia program has trained over 1,000 students living in rural areas.[148] Recent efforts by the White House Rural Council, underscores the challenges associated with effective use of health IT in areas

lacking qualified health IT practitioners. Collaboration between HHS, the Department of Education and several other federal entities are addressing these issues working together through this council.[149]

ONC and HRSA signed a MOU with the U.S. Department of Labor (DOL) to leverage current resources to promote availability of a health IT workforce in sufficient numbers and skills to support health IT needs, including adoption and Meaningful Use of health IT. This MOU will help the administration achieve HHS's targets. Importantly, through this MOU, the administration will leverage current resources to promote the development of a health IT workforce, especially in rural areas.[150] In addition, clinical health IT leaders have emphasized the importance of training clinicians around effective use of health information technology as part of regular education and professional development activities.[151]

<u>Federal Support for Using Health IT for Clinical Transformation</u>

There are a number of ways that federal programs, including those funded by HITECH support best practices for using health IT to improve clinical care and improve population health. While some of these programs focus specifically on the needs of the underserved, others support broader initiatives that contribute to population health. For example, the **State HIE Cooperative Agreement program**, referenced under Section 3013 of HITECH, provides $564 million to states, territories or State Designated Entities to support HIE, including the types of exchange necessary to help provider achieve Meaningful Use.

ONC's **Standards and Interoperability (S&I) Framework** represents another federal effort supporting effective exchange of health care information. Using S&I framework, ONC orchestrates input from the public and private sectors to create harmonized health IT specifications for use throughout the United States. These specifications promote the implementation and harmonization of standards allowing for seamless exchange of health care data between different providers across the nation.[152]

Related efforts support more effective design of EHRs to make it easier to use EHRs to support functionality such as CDS. This includes EHR testing guidelines developed through a partnership between ONC, AHRQ, and the **National Institutes for Standards and Technology** (NIST) that help systems developers demonstrate they are taking the experience of providers and patients who use the system into account in the design of EHRs.[153]

The **Beacon Community Cooperative agreement program** provides $250 million over three years to 17 communities selected through a competitive process in 2010. Each of the communities, with its unique population and regional context, is actively pursuing the following areas of focus: building and strengthening the health IT infrastructure and exchange capabilities, positioning to pursue a new level

of sustainable health care quality and efficiency over the coming years; translating investments in health IT in the short run to measureable improvements in cost, quality, and population health; and testing innovative approaches to performance measurement, technology, and care delivery to accelerate evidence generation for new approaches. These investments demonstrate the possibilities for health IT to reduce health disparities and improve the coordination of care provided within safety-net systems.

In 2011, HRSA and the ONC announced a funding opportunity for all **FQHCs in Beacon catchment areas** to drive alignment and coordination between safety-net providers and the broader health care community. Each FQHC organization receives $100,000 for one year, which supports their participation in initiatives that include a strong health IT component and help achieve their quality improvement goals. In total, Beacon Communities are working with 85 FQHC grantee organizations that operate 734 sites.

The federal government has also invested in research programs focused on improving health IT systems or making effective use of data from these systems to support care improvement. For example, ONC's **Strategic Health IT Advanced Research Program (SHARP)** funds research to support secondary uses of data captured in health IT systems, the security of health information stored and transmitted using health IT, the usefulness of EHRs for decision support, and the development of platforms and protocols that would allow providers to find the health IT functionality they need through an "app store" model. Additionally, the Office of the Chief Privacy Officer (OCPO) within ONC recently completed a series of focus groups exploring the views of consumers, including underserved populations, regarding mHealth privacy and security. A HRSA program called the **Community Health Applied Research Network (CHARN)** supports the use of data from EHRs used in FQHCs and other safety-net settings in studying the effectiveness of different clinical interventions targeting the health and health care needs of the underserved.

HHS is providing support for health IT implementation efforts that specifically reach out to underserved communities. For example, HHS recently signaled support for mHealth applications targeting a range of special populations through the **Text4Health platform**—an SMS-enabled research program developed by investigators at the Mailman School of Public Health at Columbia University. The program demonstrated benefits of text messaging as a support and education strategy to improve immunization rates among low-income groups.[154] A recent study using Text4Health showed that adding SMS-reminders coupled with usual care improved influenza immunization rates among low-income, urban children and adolescents.[155]

Finally, the **Center for Medicare and Medicaid Innovation** (CMMI) is fostering health care transformation by finding new ways to pay for and deliver care that improve quality and outcomes while lowering costs. The CMMI identifies, develops, supports, tests, and evaluates innovative models of payment and service delivery for Medicare, Medicaid, and CHIP beneficiaries. Health IT may be useful as a tool for supporting these processes of health care transformation. Demonstrations by CMMI incorporating home monitoring and telehealth may represent an effective approach to improving quality of life for these individuals, while significantly reducing costs associated with avoidable ED visits and hospital stays.

Conclusions

This report ends by highlighting key findings and describing potential next steps for program and policy officials and other relevant stakeholders.

Risks associated with a digital divide are real. Findings from the environmental scan and literature review show that the digital divide remains an issue in health IT. Disparities in EHR adoption may persist among providers who deliver health care services to underserved groups including disproportionate share hospitals.[156] Primary care providers who work in metropolitan areas with high concentrations of minority and low income populations are often in the bottom quartile for EHR adoption rates.[157]

Because minority and low-income areas lag behind other areas on EHR adoption, there is concern among health IT experts that increased adoption of health IT among U.S. health care providers as a whole will exacerbate existing health disparities. Compared to their counterparts who do not use health IT, providers who adopt health IT, and those who exchange health information, may experience benefits in terms of improved convenience, coordination, and quality of care. It is therefore important to ensure that health IT applications are developed and implemented in a way that meets the specific needs of the underserved.

Customization and innovation are required to meet the needs of underserved groups. NORC found some important conditions for successful implementation of health IT in settings of care focused on underserved groups. Stakeholders must be creative about implementing, configuring, and customizing applications to meet the needs of the communities with whom they work. For example, providers who participated in the AAPCHO case study reported a need to capture specific types of demographic data above and beyond the standard in forms provided by EHR vendors.

Many individuals in underserved communities face competing priorities in managing their health that limit the impact of health IT tools on health outcomes. For example, the case study involving Wind Youth Services demonstrated that youth experiencing homelessness expend a tremendous amount of time and effort to meet basic needs for food, clothing, shelter, and jobs. For these young people, use of the main health IT intervention, HealthShack, is not a priority, and neither is their health care in general.

Successful implementations recognize such challenges and use innovative approaches to engage underserved populations in their care with the help of health IT. Providers in one case study effectively use health IT to capture information related to the social determinants of patients' health to enhance the quality of care. Using EHRs, providers use these data to coordinate and track provision of enabling

services such as case management, social service referrals, health education, and counseling. In another case study, providers worked with program staff to walk patients through the process of creating accounts and passwords for an online patient portal to help diabetic patients track and manage their disease.

Safety-net providers who took part in this study also reported creativity and strategic partnerships to summon the resources needed to successfully implement and use health IT. Some of the most successful models, involving health IT use for quality improvement and cost control (e.g., home monitoring of vital signs for patients with serious chronic illnesses), currently fall outside of the scope of the EHR Incentives Program.

Health IT adoption in safety-net settings presents challenges, but several federal programs help address these challenges. Both before and after the enactment of HITECH, federal agencies including HRSA have supported adoption of health IT applications (e.g., chronic disease registries and EHRs) by FQHCs, other safety-net providers, and providers serving rural areas. Building on these efforts, ONC identified these three types of providers as a priority for the RECs. RECs have focused on these providers and as of September of 2012 had enrolled 72 percent of CAHs and 42 percent of primary care providers in HPSAs.[158, 159]

Findings from NORC's case study of the GA-HITREC illustrates one RECs approach to supporting health IT adoption among safety-net providers and providers serving predominantly rural and minority patients. In particular, federal programs target common challenges facing safety-net providers including lack of funding for health IT investments, lack of support and expertise necessary to implement projects and lack of adequate IT infrastructure.

> *"The patient population doesn't always have the money to pay for [phone and internet] bills."*
> *RCCHC Care Manager*

Rural providers and populations face unique challenges in adopting and implementing health IT; lack of technology infrastructure represents a key constraint. A survey conducted by the Pew Internet and American Life Project from April–May 2010 revealed that, although some of the previously existing gaps in Internet access have narrowed, disparities in access among rural populations remain largely unchanged. In 2010, 50 percent of rural individuals were broadband users, a 4 percent increase from 2009. In comparison, 70 percent of non-rural individuals have broadband internet access.[160] As noted in this report, the FCC works to address these issues through the Universal Services Fund (USF) and other programs. In 2010, the USF contributed over $164 million to support the needs of rural health care providers.[161]

Health care providers at the case study in the Mississippi Delta region identified distance between caregivers and providers as a problem for patients seeking care. While case management software implemented at the site presents opportunities for providers to engage patients in holistic care, rural patients often lack access to transportation or must travel greater distances to obtain services. A limited number of tertiary care centers and primary care providers are available to see patients further complicate access issues.

Telehealth initiatives offer some solutions, but barriers persist. The case studies revealed a commitment to using telehealth in new ways. Providers participating in the program at the Columbia Basin in Washington state successfully piloted health IT solutions to increase access to testing and specialist services for rural, underserved patients. For example, recently completed pilot tests of a mobile ultrasound device illustrated a number of viable use cases for the tool in a rural setting.

Increasing access to quality imaging can contribute to improvements in care delivery and may even enhance patient engagement. In the context of OB/GYN care, one IT professional discussed how once people see images of a fetus, it improves engagement on the part of pregnant women and their families by making the pregnancy less abstract and more tangible. Similarly, through a teledermatology pilot program, the same provider enhanced patient access to dermatology services. Store-and-forward technology combined with a mobile platform allowed primary care providers and patients to receive specialized consultation quickly and efficiently (often within 24 hours).

While telehealth can offer an important solution, providers face infrastructure and financial constraints in areas with inadequate access to high-speed Internet and cellular phone service. NORC witnessed these constraints in a site visit to the Piedmont region of North Carolina where providers implementing the IDEAL LIFE home monitoring software in patient homes faced challenges equipping patients who lived in communities with limited cellular coverage and homes without phone jacks or, in some cases, consistent access to electricity. NORC found similar issues in Cherokee, North Carolina where the Indian Health Authority hospital reported that lack of broadband internet access and reliable cellular coverage hampered use of a patient portal and limited the usefulness of a local HIE project.

Potential next steps for policymakers, program officials and other stakeholders. This project describes encouraging examples of community-based efforts to incorporate health IT into interventions that drive better health outcomes. Take-aways for current and future initiatives include:

- The importance of gearing technical assistance around customization and configuration of health IT tools to help address the needs of specific populations and the caregivers that treat them.

- Potential gains from highlighting, disseminating, and replicating local innovation where rural providers and safety-net providers have achieved success.

- The value of continuing to support improvements in infrastructure and health IT workforce training, particularly in rural and underserved areas.

- The potential for multiple forms of telehealth to improve quality and reduce cost of care for underserved and vulnerable groups.

- The potential benefits for safety-net providers to use health IT in ways that go beyond the current definition of Meaningful Use and expand the use of health IT for patient engagement and monitoring and tracking conditions from a patient's home.

This report demonstrates that programs and providers responsible for addressing health disparities should focus on population-specific approaches to adopting health IT. Unless there is a specific strategy for using health IT to limit health disparities among underserved groups, health IT may improve care for all groups without limiting disparities. In the worst case scenario, without a specific strategy for using health IT to benefit the underserved, its advantages may disproportionately go to those who already enjoy better access to care, health outcomes, and health status, thereby increasing health disparities.

Ultimately, additional research will address the relationship between use of different interventions involving health IT and specific health disparities. However, this study identifies potential models for success and next steps to help assure that the most vulnerable individuals and groups benefit from the nationwide advance of health IT.

Appendices

Appendix 1. Case Study Overview

Using the case study selection approach described above, NORC worked closely with ONC and HRSA to identify and conduct nine case studies between April and November of 2011. Table A, below, summarizes the organizations and locations for each case study, and provides a brief description of the intervention of focus at each site. NORC conducted on-site data collection at each of the locations listed except for the sites located in Hawaii; NORC staff contacted Hawaiian sites by telephone.

Table A: Case Study Overview

Organization	Project Description
Association of Asian Pacific Community Health Organizations (AAPCHO) Multiple Sites: Seattle, WA, New York, NY, Oahu (Waianae & Honolulu), HI	Pacific Innovation Collaborative (PIC) and Enabling Services Accountability Project (ESAP) ■ PIC: Uses regional and central data repositories housing aggregate health information ■ ESAP: Collects and stores enabling services data alongside clinical data in patients' health records
Columbia Basin Health Association (CBHA) Othello, WA	Medical and Dental EHRs, Caesy Patient Educational Video Software & Health Kiosks ■ Utilizes EHR to track chronic disease ■ Uses videos to educate limited English proficient and low health literacy patients ■ Patient-accessible computer kiosks linked to WebMD
Wind Youth Services Sacramento, CA	HealthShack ■ Youth-driven PHR system (modeled after MiVia[iii]) ■ PHR stores health, contact, and personal information
Aaron E. Henry Community Health Services Center (AEH) Clarksdale, MS	Patient Care Management and Rewards Program ■ Utilizes case management software to track patient behavior and health status changes related to Body Mass Index (BMI), medication compliance, and number of aerobic minutes ■ Patients receive financial stipends based on progress
St. Elizabeth's Health Center (St. Elizabeth's) & University of Arizona Department of Psychiatry (University of Arizona) Tucson, AZ	Telepsychiatry Treatment of Depression ■ Provides depression treatment through internet videoconferencing (webcam)
Roanoke Chowan Community Health Center (RCCHC) & Piedmont Health Services (Piedmont) Ahoskie and Carrboro, NC	Patient Provider Telehealth Network: IDEAL LIFE's Remote Monitoring System ■ Utilizes a digital body weight scale and blood pressure device to track patients with diabetes and/or cardiovascular disease

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[iii] MiVia is an untethered PHR initially developed for seasonal and migrant farm workers. Retrieved from: https://www.mivia.org/about_us.aspx on July 17, 2012.

Organization	Project Description
Georgia Health Information Technology Regional Extension Center (GA-HITREC)[iv] Atlanta, GA	GA-HITREC ■ Assists GA providers with selection, implementation, and Meaningful Use of certified EHR systems ■ Partners with a telemedicine organization to assist rural providers
Howard University Hospital (HUH) Washington, DC	Diabetes Treatment Center (DTC): NoMoreClipboard ■ Web-based PHR system integrated with the EHR ■ PHR accessible via cell phone to record blood sugar measurements
Cherokee Indian Hospital Authority (CIHA) Cherokee, NC	Resource and Patient Management System (RPMS) and Western North Carolina (WNC) Datalink ■ Utilizes EHR and practice management system for data aggregation and reporting ■ Longitudinal EHR can be accessed and updated in real time

As detailed above, the case studies selected vary by geographic location, type(s) of health IT implemented, disease(s) of focus, and population(s) targeted, among other factors. The case studies covered a number of underinsured, uninsured, and underserved populations that experience disparities in health status. Five of the case studies included a focus on rural areas, five included some focus on urban areas, and one related to a statewide program.[v] Four interventions focused on diabetes and two addressed cardiovascular disease; one site focused on depression, and another included a focus on Hepatitis B.[vi] Case study stakeholders implemented several different health IT tools across the nine sites.

Table B below demonstrates how the cases reflected benefits and challenges of using health IT to address the needs of different racial/ethnic minority groups and priority populations, as well as the variation in the types of health IT studied. Notably, the populations included in the cases track closely with priority populations highlighted in AHRQ's 2010 and 2012 Annual National Health Disparities Reports.

[iv] The GA-HITREC works with a number of partners throughout the state. Their partners include: Morehouse Medical Associates, Coalition of Athens Area Physicians (CAAP), Health One Alliance (HOA)/NW GA Healthcare Partnership, Georgia Association for Primary Health Care (GAPHC), Community Health Works (CHW), Georgia Medical Care Foundation (GMCF), GA Institute of Technology, HyBrid Health IT, GA Board of Regents, American College of Physicians, East Georgia Health Cooperative, GA Academy of Family Physicians, GA State Medical Association, GA Partnership for Telehealth, Georgia Hospital Association, 712 Exchange, ACR2 Solutions, Ambit Consulting, Benita L. Bowers, Georgia Cancer System, HealthNovation, Jabo Industries LLC, Joel Duhl Inc., Latinos in Information Sciences and Technology Association (LISTA), Pristine Technology Solutions Inc., SouthCoast Medical Group, HealtheIT LLC, Georgia Rural Health Association, and HomeTown Health. Retrieved from: http://www.ga-hitrec.org/ on July 17, 2012.
[v] Totals do not add to nine because categories are not exclusive.
[vi] Totals do not add to nine because categories are not exclusive.

Table B: Summary of Interventions and Populations Represented

	Summary
Community	■ Black – 4 ■ Hispanic – 3 ■ Asian Americans/Native Hawaiians and Other Pacific Islanders (AA/NHOPI) – 1 ■ American Indian/Alaska Native (AI/AN) – 1 ■ Migrant – 2 ■ Youth Experiencing Homelessness– 1
Technology	Patient-Facing ■ Telehealth – 4[vii] ■ PHR – 2 ■ Health kiosk/video – 2 ■ Short Message Service (SMS) messaging – 1

Case Study Selection Methods

NORC employed a multi-phased approach to select potential case studies. First, candidates were identified based on information collected through the environmental scan, as well as suggestions solicited from members of the TEP. The team focused on communities where health IT has been implemented, communities with underserved populations or where health disparities exist, and communities that use health IT to address one or more specific disparity.

For each potential case study, the team collected available information on the specific initiative or project through online searches and follow-up with TEP members and others who recommended case studies. NORC used a two-tiered approach for selecting sites. At the first level, projects prioritized included an explicit health disparities-related goal, targeted specific populations of interest, and presented some information on outcomes associated with the intervention. The second level consisted of a set of cases representing a variety of health IT applications (both provider- and patient-facing[viii]), populations, locations, and settings. Finally, the team sought cases not already captured in the existing literature.

Appendix 2. Case Study Process

For each case study, the project team conducted a series of discussions to address each of the key research domains: 1) impact of adoption and consequences, 2) health IT barriers, 3) encouraging adoption, 4) policy/organizational factors, and 5) key factors associated with success. NORC conducted discussions in

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[vii] Telehealth technologies are technically both patient- and provider-facing.
[viii] Provider-facing health IT applications are those which are accessed by those persons providing care, for example EHRs, HIE or disease registries. Patient-facing health IT applications are those designed for patient use, for example PHRs, health portals or health kiosks.

both group and individual settings, sometimes involving a demonstration of specific applications by the discussants. NORC's IRB reviewed and approved all processes used in conducting discussions.

In carrying out discussions, the team engaged various key stakeholder groups across case study sites. Discussion participants varied, but generally included: 1) program administrative staff associated with the intervention of interest, 2) providers, including ancillary providers, 3) patients, 4) vendors and other health IT professionals, and 5) funders. To augment findings from individual and group discussions, in some case studies the team directly observed use of health IT by consumers and providers at their site. In these cases, the team asked participants to describe their experience with the health IT application and to model several specific tasks when appropriate.

NORC employed a structured approach to analyze the data obtained from these activities. The team used QSR International's NVivo 9 software to store and analyze notes captured during each case study. The team also developed a coding scheme for each of the key research domains to identify factors relevant to successful employment of health IT in targeted communities. The team applied this scheme to all data collected, and organized factors and trends emerging from this exercise around specific dimensions of the study.

NORC developed individual reports summarizing key factors associated with each case study. The team then synthesized relevant factors across case study sites and combined this synthesis with the results from the environmental scan to develop the comprehensive findings found in this report. The literature review used to inform this report was conducted in an ongoing manner, and the data presented reflects the most current information available.

Appendix 3. Summaries of Case Studies and Links to Health IT.gov

University of Arizona and St. Elizabeth's Health Center,

Telepsychiatry Depression Treatment Program

http://www.healthit.gov/sites/default/files/pdf/StEsandUofA_CaseStudyReport.pdf

The University of Arizona College of Medicine, Department of Psychiatry (University of Arizona), in partnership with St. Elizabeth's Health Center (St. Elizabeth's), a faith-based FQHC look-alike in Tucson, AZ, conducted a project to examine the acceptability and effectiveness of telepsychiatry depression treatment for low-income Hispanic adults with major depressive disorder through internet videoconferencing using commercially available webcams and computers. The initiative built upon a previous intervention that sought to assess the feasibility of using commercially available webcams to provide mental health services to patients at their primary care medical home.

Association of Asian Pacific Community Health Organizations (AAPCHO),

Enabling Services Accountability Project and Pacific Innovation Collaborative

http://www.healthit.gov/sites/default/files/pdf/AAPCHO%20case%20study%20report.pdf

The Enabling Services Accountability Project (ESAP) is a collaborative effort between AAPCHO and four project sites: International Community Health Services (ICHS) in Seattle, WA; the Charles B. Wang Community Health Center (CBWCHC) in New York, NY; the Waianae Coast Comprehensive Health Center (WCCHC) in Waianae, HI; and the Kalihi-Palama Health Center (KPHC) in Honolulu, HI. The health centers participating in the ESAP track enabling services (such as financial counseling, housing and food assistance programs, language services, immigration support, and health education) and are using their EHRs to illustrate the positive impact of these services on health outcomes and to better measure use of these services in each clinic. Each clinic incorporates standardized data elements developed by the ESAP into templates built into their EHR. These templates allow caseworkers and other staff to document the type of enabling service provided and the amount of time spent during each encounter. Data are captured in the EHR to track the impact of these services on patient care, access, and health outcomes. The Pacific Innovation Collaborative (PIC) initiative assists with cross-health center comparisons of needs and enabling services delivery, as well as outcomes for health centers serving AA/NHOPI groups throughout the nation.

Aaron E. Henry Community Health Services Centers (AEH),

Patient Care Management and Rewards Program

http://www.healthit.gov/sites/default/files/pdf/AEH_CaseStudyReport.pdf

AEH, an FQHC located in the Mississippi Delta, implemented in collaboration with Altruista Health, Inc. a patient care management and rewards program targeting Delta residents with diabetes and/ or hypertension. The program uses Altruista GuidingCare, a web-based population care management software system, to track three health behavior indicators: weight management, aerobic activity, and medication compliance. Patients enrolled in the program receive financial rewards for progress in meeting health goals related to the three indicators measured. The patient-centered initiative incorporates health coaching, care support service delivery, and financial incentives; it also focuses on patient education and self-management.

Columbia Basin Health Association (CBHA),

Medical and Dental EHRs, Caesy Patient Educational Video Software and Health Kiosks:

http://www.healthit.gov/sites/default/files/pdf/CBHA_CaseStudyReport.pdf

CBHA is an FQHC operating three clinics in the rural Columbia Basin of Washington State. CBHA developed a strong health IT infrastructure and implemented several innovative IT pilot projects with the goal of improving quality of care and access for their rural, primarily Spanish-speaking patient population. CBHA's health IT infrastructure is comprised of an EHR with bi-directional interface with the state's immunization registry, an electronic dental record that interfaces with multimedia dental patient education software, and WiredMD educational materials and videos. CBHA's health IT pilot projects include a teledermatology initiative and a project using the world's first smartphone-based mobile ultrasound imaging system.

Cherokee Indian Hospital Authority (CIHA),

Resource and Patient Management System (RPMS) and Western North Carolina (WNC) DataLink

http://www.healthit.gov/sites/default/files/pdf/CIHA_CaseStudyReport.pdf

Through their main location in rural Cherokee, NC, the CIHA provides oversight, supervision, and direction of the health system serving over 10,000 members of the Eastern Band of the Cherokee Indians. CIHA uses an EHR, population management system, and HIE to provide care for members. CIHA supplements their base EHR with various interfaces to gain additional functionality such as access to electronic lab reporting, an electronic oral health record, and a digital imaging system. CIHA also

utilizes information collected via health information exchange and registries, including the Western North Carolina (WNC) DataLink, North Carolina Controlled Substance Registry, and North Carolina Immunization Registry. Further, CIHA implemented two telemedicine initiatives—teleretinopathy and telepsychiatry—to increase patient access to these specialty services.

Wind Health Services,
HealthShack Personal Health Record
http://www.healthit.gov/sites/default/files/pdf/HealthshackCaseStudyReport.pdf

Located in Sacramento, CA, Wind Youth Services is a non-profit organization comprised of a 12-bed shelter and separate day center providing an array of supportive services such as employment assistance, housing referrals, and on-site accredited education programs, to homeless youth and those aging out of foster care, aged 11 to 22. In collaboration with FollowMe, Inc., an electronic health information vendor, and the University of California Davis Children's Hospital, Wind Youth Services implemented HealthShack, an untethered PHR. The intervention explored the acceptability of a PHR among vulnerable youth. HealthShack serves as a web-based, patient-owned repository for personal information on health, education, employment, and other related community resources.

Howard University Hospital Diabetes Treatment Center (DTC),
NoMoreClipboard Personal Health Record and Patient Portal
http://www.healthit.gov/sites/default/files/pdf/HowardCaseStudyReport.pdf

The Howard University Hospital DTC, located in the District of Columbia, uses an EHR, PHR, and a patient portal with the goal of improving quality of care and access for high-risk, primarily urban Black patients with diabetes. Further, in order to facilitate better provider decision-making at the point of care, conduct active outreach to patients and encourage greater patient engagement in self-management of their chronic disease, the DTC implemented a diabetes-focused telehealth self-management program and a smartphone pilot program, both of which focused on increasing use of the patient portal and PHR. The smartphone pilot utilized funds from the DC Department of Health to supply smartphones with free data plans to DTC patients to facilitate patient access and use of their PHR via smartphone to track and monitor their disease.

Roanoke Chowan Community Health Center and Piedmont Health Services (RCCHC), Patient Provider Telehealth Network

http://www.healthit.gov/sites/default/files/pdf/RCCHCandPHS_CaseStudy.pdf

An FQHC located in rural northeastern North Carolina, RCCHC operates three clinics. Piedmont, also an FQHC, operates six clinics—two semi-urban and four rural—serving patients across 14 counties. As part of the Patient Provider Telehealth Network (PPTN), RCCHC and Piedmont use remote monitoring applications, such as IDEAL LIFE's Body Manager (a software-based telehealth system which includes a digital body weight scale and blood pressure device) to track clinical and financial outcomes of patients with cardiovascular disease, diabetes, and hypertension. Placed in participating patients' homes, the IDEAL LIFE remote monitoring telehealth system transmits daily readings from patients' blood pressure and scale devices as encrypted data through landline or cellular connection platforms to the IDEAL LIFE secure web server. Telehealth nurse care managers from RRCHC and Piedmont monitor patients' data via the system's dashboard and contact patients with abnormal readings via phone to conduct a nursing assessment and/or provide patient education. The monitoring dashboard allows care managers to create summary reports and trend patient data longitudinally. As part of the PPTN, if a telehealth care manager determines there is need for a change in a patient's medical regime during the nursing assessment, they can share the health data collected through remote monitoring technology via the respective center's EHR to alert the patient's primary care provider of the possible need for further medical intervention.

Georgia Health Information Technology Regional Extension Center (GA-HITREC), Electronic Health Records to Achieve Meaningful Use

http://www.healthit.gov/sites/default/files/pdf/GAHITREC_CaseStudy.pdf

The GA-HITREC in Atlanta, housed at Morehouse School of Medicine's National Center for Primary Care (NCPC), is the only REC in the state. The GA-HITREC uses a community-based approach to aid eligible providers in reaching Meaningful Use of certified EHR systems. In their original application and subsequent charge, the GA-HITREC was to focus on bringing EHRs and Meaningful Use to rural communities and minority providers and leveraging their work with the NCPC to help these communities address areas of health disparities. To do this, the GA-HITREC seeks to engage eligible providers throughout the state of Georgia and assist them in the process of selecting, implementing, and meaningfully using certified EHR systems and other health IT tools to improve the health outcomes of rural and minority Georgians. Located in a neighborhood designated a medically underserved area, they rely on a combination of outreach and partnerships to implement their community-based approach and

encourage adoption of various EHR systems. They also rely on partnerships with the GA Partnership for TeleHealth and the GA Rural Health Association to assist providers throughout the state.

Appendix 4. Understanding the Impact of Health IT on Underserved Communities and those with Health Disparities (Link to Environmental Scan)

http://www.healthit.gov/sites/default/files/pdf/hit-underserved-communities-health-disparities.pdf

This Briefing Paper provides an overview of findings from an environmental scan and literature review of topics related to health information technology and its potential impact on communities with health disparities and disproportionate numbers of medically underserved individuals.

*These reports were completed by NORC at the University of Chicago under contract to ONC. The findings and conclusions of this report are those of the authors and do not necessarily represent the views of ONC or the U.S. Department of Health and Human Services.

Appendix 5. Table of Health IT Interventions in Communities with Health Disparities (Case Study Examples)

Project/ Organization Name	Type of HIT	Health Disparities Target Population[5]	Health Focus Area (if specified)	Setting	Targets Patients/ Providers/ Both	Location (Rural/ Urban)
Aaron E Henry Community Health Services Center	EHR	UUU; AA	Diabetes and/or hypertension	FQHC or look alike	Both	R
Columbia Basin Health Association	EHR; Electronic Dental Record; health kiosk/ videos	UUU; Hispanic; Migrant; LEP	N/A	FQHC or look alike	Providers	R
Wind Youth Services	PHR	UUU; Homeless youth	N/A	Non-Profit	Patients	U
Association of Asian Pacific Community Health Organizations sites	EHR	UUU; AI/AN/NA	N/A	FQHC or look alike	Providers	Both
Roanoke Chowan Community Health Center & Piedmont Health	Telemedicine	UUU; AA	Cardio Disease; Diabetes; Hypertension	FQHC or look alike	Both	R
St. Elizabeth's Health Center & University of Arizona, College of Medicine, Department of Psychiatry	Telemedicine	UUU; Hispanic	Depression	FQHC or look alike; University	Both	U
Georgia Regional Extension Center	Support for EHR adoption	UUU; AA	N/A	All	Providers	Both
Cherokee Indian Hospital Authority	EHR	UUU; AI/AN/NA	Diabetes	Hospital	Both	R
Howard University Diabetes Treatment Center	PHR; cell phone	UUU; AA; Women	Diabetes	Hospital	Both	U

[1] Centers for Disease Control and Prevention (CDC). (2009). Chronic disease: The power to prevent, the call to control: At a glance 2009. Retrieved from: http://www.cdc.gov/chronicdisease/resources/publications/AAG/chronic.htm on July 17, 2012.

[2] Agency for Healthcare Research and Quality (AHRQ). (2012). National Healthcare Disparities Report. AHRQ Publication No. 12-0006. Retrieved from http://www.ahrq.gov/research/findings/nhqrdr/nhdr11/nhdr11.pdf on May 5th 2013.

[3] Tenforde, M., Jain, A., and Hickner, J. (2001). The value of personal health records for chronic disease management: What do we know? Family Medicine 4(5).

[4] Hing, E., and Burt, C.W. (2009). Are there patient disparities when electronic health records are adopted? J Health Care Poor Underserved 20(2):473-88.

[5] Jha, A.K., Bates, D.W., Jenter, C., Orav, E.J., Zheng, J., Cleary, P., and Simon, S.R. (2009). Electronic health records: use, barriers and satisfaction among physicians who care for black and Hispanic patients. J Eval Clin Pract 15(1):158-63.

[6] Health Resources and Services Administration (HRSA). (2012). What is a Health Center Controlled Network? Retrieved from http://www.hrsa.gov/healthit/toolbox/HealthITadoptiontoolbox/OpportunitiesCollaboration/abouthccns.html on November 1, 2012

[7] Department of Health Policy School of Public Health and Health Services, The George Washington University. (2012). Quality Incentives for Federally Qualified Health Centers, Rural Health Clinics and Free Clinics: A Report to Congress. Submitted to the Office of the Secretary, January 23, 2012. Under Contract No. HHSP23320095635WC. Retrieved from http://www.healthit.gov/sites/default/files/pdf/quality-incentives-final-report-1-23-12.pdf on November 1, 2012.

[8] Ibid.

[9] Blumenthal, D., and Graham, G. (2010). A Letter to the Vendor Community: Health IT and Disparities. October 18, 2010. Retrieved from: http://healthit.hhs.gov/portal/server.pt?open=512&mode=2&objID=3197 on September 4, 2012.

[10] Berwick, D.M., Nolan, T.W., and Whittington, J. (2008). The triple aim: Care, health and cost. Health Affairs 27(3). http://content.healthaffairs.org/content/27/3/759.full.pdf+html

[11] Agency for Healthcare Research and Quality (AHRQ). (2012). National Healthcare Disparities Report. AHRQ Publication No. 12-0006. Retrieved from http://www.ahrq.gov/research/findings/nhqrdr/nhdr11/nhdr11.pdf on May 5th 2013.

[12] Ibid.

[13] California Health Care Foundation. (2012). Retrieved from: http://www.chcf.org/publications/2010/04/consumers-and-health-information-technology-a-national-survey#ixzz20qFIN9BE on July 12, 2012.

[14] HealthIT.gov. NORC. Roanoke Chowan Community Health Center and Piedmont Health Services (RCCHC), Patient Provider Telehealth Network Case Study. Retrieved from: http://www.healthit.gov/sites/default/files/pdf/RCCHCandPHS_CaseStudy.pdf on January 21, 2013.

[15] Medicare and Medicaid Programs; Electronic Health Record Incentive Program; Final Rule, 75 Fed. Reg. 44,314 (July 28, 2010).

[16] Health Resources and Services Administration (HRSA). 2012. Network Guide. Retrieved from: http://www.hrsa.gov/healthit/networkguide/ on March 22, 2013.

[17] Federal Communications Commission. Rural Health Care Program. July 2012. Retrieved from: http://transition.fcc.gov/wcb/tapd/ruralhealth/welcome.html on July 16, 2012.

[18] Hincapie, A, Warholak T.L., and Armstrong E.P. (2011). Social impact of mandated health coverage for telemedicine in the state of Arizona. The University of Arizona College Pharmacy. Retrieved from: http://crh.arizona.edu/sites/crh.arizona.edu/files/Telemedicine%20Report%20V12Ana-1.pdf on August 30, 2012.

[19] Meeker, M. (2010). Internet Trends. Retrieved from: http://www.slideshare.net/CMSummit/ms-internet-trends060710final on May 6, 2013.

[20] Pew Internet. (2012). 17 percent of cell phone owners do most of their online browsing on their phone, rather than a computer or other device. Pew Research Center. Retrieved from: http://www.pewinternet.org/~/media//Files/Reports/2012/PIP_Cell_Phone_Internet_Access.pdf on August 30, 2012.

[21] Hill, A. (2010). The "Mobile Only Internet Generation". Retrieved from: http://www.slideshare.net/OnDevice/the-mobile-only-internet-generation on July 16, 2012.

[22] Agency for Healthcare Research and Quality (AHRQ). (2012). National Healthcare Disparities Report. AHRQ Publication No. 12-0006. Retrieved from http://www.ahrq.gov/research/findings/nhqrdr/nhdr11/nhdr11.pdf on May 5th 2013.

[23] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 3001, 123 Stat. 230. (2009).

[24] Adler, N.E., and Rehkpf, D.H. (2008). Disparities in health: Descriptions, causes, and mechanisms. Annual Review of Public Health 29:235-252. Retrieved from: http://www.annualreviews.org/doi/abs/10.1146/annurev.publhealth.29.020907.090852 on November 1, 2012.

[25] Berwick, D.M., Nolan, T.W., and Whittington, J. (2008). The triple aim: Care, health and cost. Health Affairs 27(3). http://content.healthaffairs.org/content/27/3/759.full.pdf+html

[26] Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., et al. (2005). Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. Health Affairs 24(5):1103-1117.

[27] Smith, A. (2010). Home Broadband 2010. Pew Internet & American Life Project. Retrieved from: http://pewinternet org/Reports/2010/Home-Broadband-2010.aspx on July 17, 2012.

[28] Institute for Alternative Futures. (2006). Cell Phones and Reducing Health Disparities. The DRA Project, Report 06-02. Retrieved from: http://www.altfutures.com/pubs/DRA/Report_06_02_Cell_Phones_and_Health_Disparities.pdf on July 17, 2012.

[29] Shields, A.E., Shin P., Leu, M., Levy, D.E., Betancourt, R.M., Hawkins, D., and Proser, M. (2007). Adoption of health information technology in community health centers: results of a national survey. Health Affairs 26(5):1373-83.

[30] Jha, A.K., DesRoches, C.M., Shield, A.E., et al. (2009). Evidence of an emerging digital divide among hospitals that care for the poor. Health Affairs 28(6): w1160-70.

[31] Gibbons, M.C. (2005). A historical overview of health disparities and the potential of eHealth solutions. J Med Internet Res 7(5):e50.

[32] Weinfeld, J.M., Davidson, L.W., Mohan, V. (2012). Electronic health records improve the quality of care in underserved populations: A literature review. Journal of Health Care for the Poor and Underserved 23(2012): 136-153.

[33] Centers for Disease Control and Prevention (CDC). (2009). Chronic disease: The power to prevent, the call to control: At a glance 2009. Retrieved from: http://www.cdc.gov/chronicdisease/resources/publications/AAG/chronic.htm on July 17, 2012.

[34] Centers for Medicare & Medicaid Services (CMS), Office of the Actuary. (2009). National health care expenditures projection 2010- 2020. National Health Statistics Group. Retrieved from: https://www.cms.gov/NationalHealthExpendData/downloads/proj2010.pdf on July 17, 2012.

[35] Agency for Healthcare Research and Quality (AHRQ). (2012). National Healthcare Disparities Report. AHRQ Publication No. 12-0006. Retrieved from http://www.ahrq.gov/research/findings/nhqrdr/nhdr11/nhdr11.pdf on May 5th 2013.

[36] Health Resources and Services Administration (HRSA). (2012). Health Professions. Retrieved from: http://bhpr.hrsa.gov/shortage/ on October 27, 2012

[37] Banthin, J., and Bernard, D. (2006). Changes in Financial Burdens for Health Care: National Estimates for the Population Younger than 65 Years, 1996–2003. Journal of American Medical Association 296:2712-2719.

[38] Moiduddin, A., and Moore, J. (2008). The underserved and health information technology – issues and opportunities. Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. Retrieved from: http://aspe.hhs.gov/sp/reports/2009/underserved/report.pdf on July 17, 2012.

[39] Data on the LGBT population was first reported in AHRQ's National Healthcare Disparities Report, 2011.

[40] Agency for Healthcare Research and Quality (AHRQ). (2012). National Healthcare Disparities Report. AHRQ Publication No. 12-0006. Retrieved from http://www.ahrq.gov/research/findings/nhqrdr/nhdr11/nhdr11.pdf on May 5th 2013.

[41] Ibid.

[42] H. L. Howe et al., "Annual Report to the Nation on the Status of Cancer, 1975–2003, Featuring Cancer Among U.S. Hispanic/ Latino Populations," Cancer, Oct. 15, 2006 107(8):1711–42.on January 16, 2013.

[43] Gazmararian J.A., Williams M.V., Peel J., et al. (2003). Health literacy and knowledge of chronic disease. Patient Education and Counseling 51(3):267-75.

[44] Parker R.M., Ratzan S.C., Lurie N. (2003). Health literacy: a policy challenge for advancing high-quality health care. Health Affairs 22(4):147-53.

[45] Agency for Healthcare Research and Quality (AHRQ). (2012). National Healthcare Disparities Report. AHRQ Publication No. 12-0006. Retrieved from http://www.ahrq.gov/research/findings/nhqrdr/nhdr11/nhdr11.pdf on May 5th 2013.

[46] Ibid.

[47] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 3000, 123 Stat. 229. (2009).

[48] The Office of the National Coordinator for Health IT. Tools & Resources: Glossary. Retrieved from http://www.healthit.gov/policy-researchers-implementers/glossary on May 5, 2013.

[49] Ibid.

[50] Ibid.

[51] Health Resources and Services Administration (HRSA), Office of Rural Health Policy. (2012) Telehealth. Retrieved from: http://www.hrsa.gov/ruralhealth/about/telehealth/ on July 17, 2012.

[52] American Telemedicine Association. (2010). Telemedicine Defined. Retrieved from: http://www.americantelemed.org/i4a/pages/index.cfm?pageid=3333 on July 17, 2012.

[53] Friedman, D., and Parrish, R. (2010). The population health record: concepts, definition, design and implementation. Journal of American Medical Informatics Association 17; 359-266.

[54] Gaylin, D., and Moiduddin, A. (2007). Health Information Technology Adoption Among Health Centers: A Digital Divide in the Making? Retrieved from: http://www.nhpf.org/library/background-papers/BP_HealthCenterIT_07-23-07.pdf.

[55] HealthIT.gov. Retrieved from http://www.healthit.gov/providers-professionals/health-information-exchange?utm_source=google&utm_medium=cpc&utm_campaign=technology on January 21, 2013.

[56] Smith, A. (2010). Home Broadband 2010. Pew Internet & American Life Project. Retrieved from: http://pewinternet.org/Reports/2010/Home-Broadband-2010.aspx on July 17, 2012.

[57] Institute for Alternative Futures. (2006). Cell Phones and Reducing Health Disparities. The DRA Project, Report 06-02. Retrieved from: http://www.altfutures.com/pubs/DRA/Report_06_02_Cell_Phones_and_Health_Disparities.pdf on July 17, 2012.

[58] Shields, A.E., Shin P., Leu, M., Levy, D.E., Betancourt, R.M., Hawkins, D., and Proser, M. (2007). Adoption of health information technology in community health centers: results of a national survey. Health Affairs 26(5):1373-83.

[59] Jha, A.K., DesRoches, C.M., Shield, A.E., et al. (2009). Evidence of an Emerging Digital Divide Among Hospitals that Care for the Poor. Health Affairs 28(6): w1160-70.

[60] Hing, E., and Burt, C.W. (2009). Are there patient disparities when electronic health records are adopted? J Health Care Poor Underserved 20(2):473-88.

[61] Jha, A.K., Bates, D.W., Jenter, C., Orav, E.J., Zheng, J., Cleary, P., and Simon, S.R. (2009). Electronic health records: use, barriers and satisfaction among physicians who care for black and Hispanic patients. J Eval Clin Pract 15(1):158-63.

[62] Health Resources and Services Administration (HRSA). What is a Health Center Controlled Network? (2012). Retrieved from: http://www.hrsa.gov/healthit/toolbox/HealthITadoptiontoolbox/OpportunitiesCollaboration/abouthccns.html on Nov. 1, 2012.

[63] Department of Health Policy School of Public Health and Health Services, The George Washington University. (2012). Quality Incentives for Federally Qualified Health Centers, Rural Health Clinics and Free Clinics: A Report to Congress. Submitted to the Office of the Secretary, January 23, 2012. Under Contract No. HHSP23320095635WC. Retrieved from http://www.healthit.gov/sites/default/files/pdf/quality-incentives-final-report-1-23-12.pdf on November 1, 2012.

[64] Ibid.

[65] King, J., Furukawa, M., and Buntin M. (2012). Geographic Variation in Ambulatory EHR Adoption and Implications for Underserved Communities. AcademyHealth 2012 Annual Research Meeting. Orlando FL. Presented June 26, 2012.

[66] Ibid.

[67] Blumenthal, D., and Graham, G. (2010). A Letter to the Vendor Community: Health IT and Disparities. October 18, 2010. Retrieved from: http://healthit.hhs.gov/portal/server.pt?open=512&mode=2&objID=3197 on September 4, 2012.

[68] Heisey-Grove, D., K. Hawkins, and E. Jones, et al. (2013). Supporting Health Information Technology Adoption in Federally Qualified Health Centers. ONC Data Brief, no 8. Washington DC: Office of the National Coordinator for Health Information Technology, February 2013. Retrieved from: http://www.healthit.gov/sites/default/files/rec-fqhc_data_brief_final.pdf on March 27, 2013.

[69] Heisey-Grove, D,, M. Hufstader , and I. Hollin I, et al. (2012). Progress towards the meaningful use of electronic health records among critical access hospitals and small rural hospitals working with Regional Extension Centers. ONC Data Brief, no. 5. Washington, DC: Office of the National Coordinator for Health Information Technology, November 2012. Retrieved from http://www.healthit.gov/sites/default/files/databrief05_cahandsmallrural.pdf on March 27, 2013.

[70] Graham, G. (2009). Using Technology to Improve Minority Health. Office of Minority Health. Retrieved from: http://www.e-healthpolicy.org/docs/2009_Sessions/20090313_Dr%20Garth%20Graham_Hill_Briefing.pdf on January 15, 2013.

[71] NORC at the University of Chicago. (2010). Briefing Paper on Understanding the Impact of Health IT in Underserved Communities and Those with Health Disparities. Retrieved from: http://www.healthit.gov/sites/default/files/pdf/hit-underserved-communities-health-disparities.pdf. on August 28, 2012.

[72] Provider-facing health IT applications are those which are accessed by those persons providing care, for example EHRs, HIE or disease registries. Patient-facing health IT applications are those designed for patient use, for example PHRs, health portals, or health kiosks.

[73] Graham, G. (2009). Using Technology to Improve Minority Health. Office of Minority Health. Retrieved from: http://www.e-healthpolicy.org/docs/2009_Sessions/20090313_Dr%20Garth%20Graham_Hill_Briefing.pdf.

[74] MiVia is an untethered PHR initially developed for seasonal and migrant farm workers. Retrieved from: https://www.mivia.org/about_us.aspx on July 17, 2012.

[75] The GA-HITREC works with a number of partners throughout the state. Their partners include: Morehouse Medical Associates, Coalition of Athens Area Physicians (CAAP), Health One Alliance (HOA)/NW GA Healthcare Partnership, Georgia Association for Primary Health Care (GAPHC), Community Health Works (CHW), Georgia Medical Care Foundation (GMCF), GA Institute of Technology, HyBrid Health IT, GA Board of Regents, American College of Physicians, East Georgia Health Cooperative, GA Academy of Family Physicians, GA State Medical Association, GA Partnership for Telehealth, Georgia Hospital Association, 712 Exchange, ACR2 Solutions, Ambit Consulting, Benita L. Bowers, Georgia Cancer System, HealthNovation, Jabo Industries LLC, Joel Duhl Inc., Latinos in Information Sciences and Technology Association (LISTA), Pristine Technology Solutions Inc., SouthCoast Medical Group, HealtheIT LLC, Georgia Rural Health Association, and HomeTown Health. Retrieved from: http://www.ga-hitec.org/ on July 17, 2012.

[76] Institute for Healthcare Improvement: IHI Triple Aim Initiative. Retrieved from: http://www.ihi.org/offerings/Initiatives/TripleAim/Pages/default.aspx on October 26, 2012.

[77] Agency for Healthcare Research and Quality. National Quality Strategy (NQS). Retrieved from http://www.ahrq.gov/workingforquality/nqs/principles.htm on May 5th 2013

[78] Agency for Healthcare Research and Quality (AHRQ). (2012). National Healthcare Disparities Report. AHRQ Publication No. 12-0006. Retrieved from http://www.ahrq.gov/research/findings/nhqrdr/nhdr11/nhdr11.pdf on May 5th 2013.

[79] NORC at the University of Chicago. (2010). Assessment of Health IT and Data Exchange in Safety Net Providers. Final Report to Assistant Secretary for Planning and Evaluation. Retrieved from: http://aspe.hhs.gov/sp/reports/2010/chcit2010/report.pdf.

[80] Garvin, J., Odom-Wesley, B., Rudman, W., and Stewart, R. (2009). Healthcare Disparities and the Role of Personal Health Records. Journal of AHIMA. Retrieved from: http://library.ahima.org/xpedio/groups/public/documents/ahima/bok1_043826.hcsp?dDocName=bok1_043826.

[81] Jimison, H., Gorman, P., Woods, S., Nygren, P., Walker, M., Norris, S., and Hersh, W. (2008). Barriers and Drivers of Health Information Technology Use for the Elderly, Chronically Ill, and Underserved. Evidence Report/Technology Assessment No. 175 (Prepared by the Oregon Evidence-based Practice Center under Contract No. 290-02-0024). AHRQ Publication No. 09-E004. Rockville, MD: Agency for Healthcare Research and Quality.

[82] Institute for Healthcare Improvement. (2009). Effective Interventions to Reduce Rehospitalizations: A Survey of the Published Evidence. Retrieved from: http://www.ihi.org/offerings/Initiatives/STAAR/Documents/STAAR_A_Survey_of_the_Published_Evidence.pdf on January 17, 2013.

[83] Custodio, R., Gard, A., and Graham, G. (2009). Health Information Technology: Addressing disparities by improving quality, increasing access, and developing workforce. Journal of Health Care for the Poor and Underserved 20(2):301-307.

[84] Ancker J.S., Barrón, Y., Rockoff, M.L., Hauser, D., Pichardo, M., Szerencsy, A., and Calman, N. (2011). Use of an electronic patient portal among disadvantaged populations. J Gen Intern Med 26(10):1117-23. Epub 2011 June 7.

[85] Adler, N. E., and Rehkopf, D. H. (2008). U.S. disparities in health: descriptions, causes, and mechanisms. Annual Review of Public Health 29:235-52.

[86] Custodio, R., Gard, A., and Graham, G. (2009). Health Information Technology: Addressing disparities by improving quality, increasing access, and developing workforce. Journal of Health Care for the Poor and Underserved 20(2):301-307.

[87] U.S. Department of Health and Human Services (HHS). (2011). Report to Congress: National Strategy for Quality Improvement in Healthcare. March 2011. Retrieved from:
http://www.healthcare.gov/law/resources/reports/quality03212011a.html

[88] Board on Health Care Services. (2011). Health IT and Patient Safety: Building Safer Systems for Better Care Institute of Medicine, National Academies of Science, November 10, 2011.

[89] Cebul, R.D., Love, T.E., Jain, A.K., and Hebert, C.J. (2011). Electronic health records and quality of diabetes care. New England Journal of Medicine 365(9):825-33.

[90] Ibid.

[91] Gaylin, D., Goldman, S., Ketchel, A., and Moiduddin, A. (2005). Community Health Center Information Systems Assessment: Issues and Opportunities Final Report. National Opinion Research Center, University of Chicago for U.S. Department of Health & Human Services, Office of the Assistant Secretary for Planning and Evaluation. Retrieved from:
http://aspe.hhs.gov/sp/chc/chc.pdf on July 17, 2012.

[92] Amarasingham, R., Plantinga, L., Diener-West, M., Gaskin, D.J., and Powe, N.R. (2009). Clinical information technologies and inpatient outcomes: a multiple hospital study. Archives of Internal Medicine 169(2):108-14.

[93] Cheriff, A.D., Kapur, A.G., Qiu, M., and Cole, C.L. (2010). Physician productivity and the ambulatory EHR in a large academic multi-specialty physician group. Int J Med Inform 79(7):492-500. Epub 2010 May 15.

[94] Cebul, R.D., Love, T.E., Jain, A.K., and Hebert, C.J. (2011). Electronic health records and quality of diabetes care. *New England Journal of Medicine* 365(9):825-33.

[95] Institute of Medicine (IOM). Committee on Quality of Health Care in America. (1999). *To Err Is Human: Building a Safer Health System*. Washington, DC: National Academy Press.

[96] Agrawal, A., and W.Y. (2009). Reducing medication errors and improving systems reliability using an electronic medication reconciliation system. *Joint Commission Journal on Quality and Patient Safety* 35(2):106-14.

[97] Hensing, .J, Dahlen, D., Warden, M., Norman, J.V., Wilson, B.C., and Kisiel, S. (2008).Measuring the benefits of IT-enabled care transformation. *Healthcare Financial Management* 62(2):74-80.

[98] Agency for Healthcare Research and Quality (AHRQ). (2007). *National Healthcare Quality and Disparities Report, 2007,* 43.

[99] Buntin, M.B., Burke, M.F., Hoaglin, M.C., et al. (2011). The benefits of health information technology: a review of the recent literature shows predominantly positive results. *Health Affairs* 30(3):464-71.

[100] Weinfeld, J.M., Davidson, L.W., and Mohan, V. (2012). Electronic health records improve the quality of care in underserved populations: a literature review. *J Health Care Poor Underserved* 23(3 Suppl):136-53.

[101] Ibid.

[102] Millery, M., and Kukufka, R. (2010). Health information technology and quality of health care: Strategies for reducing disparities in underresourced settings. *Med Care Res Rev* 67(5 Suppl):268-98.

[103] Ibid.

[104] California Health Care Foundation. (2012). Retrieved from: http://www.chcf.org/publications/2010/04/consumers-and-health-information-technology-a-national-survey#ixzz20qFIN9BE on July 12, 2012.

[105] Agency for Healthcare Research and Quality (AHRQ). (2011). *National Healthcare Disparities Report, 2010.* AHRQ Publication No. 11-0005. Retrieved from: http://www.ahrq.gov/research/findings/nhqrdr/nhdr10/pdf/nhdr10.pdf on July 17, 2012.

[106] Rios-Ellis, B. (2005). *Critical Disparities in Latino Mental Health: Transforming Research into Action* for the Institute for Hispanic Health. Retrieved from:
http://www.nclr.org/index.php/publications/critical_disparities_in_latino_mental_health_transforming_research_into_action/ on July 17, 2012.

[107] Ibid.

[108] Health Resources and Services Administration (HRSA), Office of Rural Health Policy. *Telehealth*. Retrieved from: http://www.hrsa.gov/ruralhealth/about/telehealth/ on January 17, 2013.

[109] According to an evaluation conducted by Wake Forest University and East Carolina University, comparing baseline (six months prior to telehealth) to the intervention period (six months during telehealth) researchers observed a 50% reduction in hospital bed days and an 81% reduction in ED visits. These reductions continued after telehealth as subsequent analyses showed a 65% reduction in hospital bed days and a 15% reduction in ED visits when comparing baseline to post- intervention (six to thirty

months post telehealth). These significant reductions in hospital-related outcomes resulted in significant hospital cost reductions during telehealth (72% cost reduction) and post- telehealth intervention (64% cost reduction).

[110] Britton, B. (2010). Telehealth and Chronic Care Management: Reducing Hypertension. Retrieved from: http://www.encsn.org/quarterly_11.htm on July 17, 2012.

[111] NORC at the University of Chicago. (2010). *Assessment of Health IT and Data Exchange in Safety Net Providers. Final Report to Assistant Secretary for Planning and Evaluation*. Retrieved from: http://aspe.hhs.gov/sp/reports/2010/chcit2010/report.pdf

[112] Jean-Jacques, M., Persell, S.D., Thompson, J.A., Hasnain-Wynia, R., and Baker, D.W. (2012). Changes in disparities following the implementation of a health information technology-supported quality improvement initiative. *Journal of General Internal Medicine* 27(1):71-7. Epub 2011 Sept. 3.

[113] Kaplan, S.A., Calman, N.S., Golub, M., Davis, J.H., Ruddock, C., and Billings, J. (2006). Racial and ethnic disparities in health: a view from the South Bronx. *J Health Care Poor Underserved.* 2006 Feb;17(1):116-27.

[114] Agency for Healthcare Research and Quality. National Resource Center for Health IT. Retrieved from: http://healthit.ahrq.gov/portal/server.pt?open=512&objID=562&PageID=5531&mode=2&in_hi_userid=3882&cached=true

[115] U.S. Department of Health and Human Services. Health Resources and Services Administration. Office of Rural Health Policy 2009 Annual Report. Retrieved from http://www.hrsa.gov/ruralhealth/pdf/annualreport2009.pdf on May 5, 2013

[116] Retrieved from: http://capsules.kaiserhealthnews.org/index.php/2012/02/health-it-coordinator-release-of-stage-2-guidelines-a-push-ahead/ on July 17, 2012.

[117] HealthIT.gov. Office of the National Coordinator for Health Information Technology (ONC). Federal Health Information Technology Strategic Plan 2011-2015 . Retrieved from http://www.healthit.gov/sites/default/files/utility/final-federal-health-it-strategic-plan-0911.pdf on January 20, 2013

[118] Minorityhealth.hhs.gov, Retrieved from: http://minorityhealth.hhs.gov/npa/files/Plans/HHS/HHS_Plan_complete.pdf.

[119] Health IT.gov Rural Health IT is a Priority for HHS. Retrieved from: http://www.healthit.gov/buzz-blog/local-implementation-support/rural-health-it-is-a-priority-for-hhs/ on November 3, 2012.

[120] Ibid.

[121] Office of the National Coordinator for Health Information Technology (ONC). HITECH Programs: State Health Information Exchange Cooperative Agreement Program. Retrieved from: http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__state_health_information_exchange_program/1488%3E on July 17, 2012.

[122] The Direct Project. Retrieved from: http://wiki.directproject.org/home on July 17, 2012.

[123] Office of the National Coordinator for Health Information Technology (ONC). (2013). State Health Information Exchange Program. Retrieved from: http://statehieresources.org/program-measures-dashboard/hie-implementation-status/ on March 25, 2013.

[124] Ibid.

[125] Williams, C., Mostashari, F., Mertz, K., Hogin, E., and Atwal, P. (2012). From the Office of the National Coordinator: The Strategy for Advancing the Exchange of Health Information. *Health Affairs* 31(3):527-536.

[126] Moiduddin, A., and Gaylin, D.S. (2007). *Health Information Technology Adoption Among Health Centers: A Digital Divide in the Making?* National Health Policy Forum. Retrieved from: http://www.nhpf.org/library/background-papers/BP_HealthCenterIT_07-23-07.pdf on July 17, 2012.

[127] Office of the National Coordinator for Health Information Technology (ONC). (2012). Figures retrieved from ONC's Regional Extension Center Dashboard, April 2013. Retrieved from http://dashboard.healthit.gov/rec/ on May 5, 2013.

[128] Office of the National Coordinator for Health Information Technology (ONC). (2011). Rural Health IT Initiatives: USDA and HHS Sign Agreement to Help Expand Health IT Infrastructure in Rural America. Retrieved from: http://healthit.hhs.gov/portal/server.pt?open=512&mode=2&objID=3769 on July 17, 2012.

[129] Federal Communication Commission (FCC). (2012). The Department of Health and Human Services Recommendations for the Federal Communication Commission's Rural Health Care Support Mechanism. Retrieved from: http://apps.fcc.gov/ecfs/document/view?id=7021025160 on July 17, 2012.

[130] Letter from Kathleen Sebelius to Chairman Julius Genachowski, Federal Communications Commission regarding "Broadband access to rural health care providers." April 18, 2011. Retrieved from: http://apps.fcc.gov/ecfs/comment/view?z=hccdf&id=6016377665 on July 17, 2012.

[131] Federal Communications Commission (FCC). (2010). The Department of Health and Human Services' comments for the Federal Communications Commission's Rural Health Care Support Mechanism. Retrieved from: http://apps.fcc.gov/ecfs/document/view?id=7021025160 on July 17 2012.

[132] Centers for Medicare & Medicaid Services (CMS). Overview of EHR Incentive Programs. Retrieved from: https://www.cms.gov/EHRIncentivePrograms/ on July 17, 2012.

[133] Health Resources and Services Administration (HRSA). 2012. Network Guide. Retrieved from: http://www.hrsa.gov/healthit/networkguide/ on March 22, 2013.

[134] Federal Communications Commission. Rural Health Care Program. July 2012. Retrieved from: http://transition.fcc.gov/wcb/tapd/ruralhealth/welcome.html on July 16, 2012.

[135] Hincapie, A, Warholak T.L., and Armstrong E.P. (2011). Social impact of mandated health coverage for telemedicine in the state of Arizona. The University of Arizona College Pharmacy. Retrieved from: http://crh.arizona.edu/sites/crh.arizona.edu/files/Telemedicine%20Report%20V12Ana-1.pdf on August 30, 2012.

[136] "Eligible Professionals" (EPs) for the Medicare incentive program include doctors of medicine or osteopathy, doctors of dental surgery or dental medicine, doctors of podiatry, doctors of optometry, or chiropractors; EPs for the Medicaid incentive program include Medicaid Eligible Professionals as follows: physicians, nurse practitioners, certified nurse-midwives, dentists, physicians assistants working in an FQHC or RHC that is led by a physicians' assistant. EPs may not be hospital-based.

[137] An Introduction to the Medicare EHR Incentive Program for Eligible Professionals. U.S. Department of Health and Human Services, CMS. Retrieved from: http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/Beginners_Guide.pdf on November 3, 2012.

[138] CMS.gov, (2010). Medicare & Medicaid, EHR Incentive Program, Specifics of the Program for Eligible Professionals. August 10, 2010. Retrieved from: http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/downloads/EHR_Incentive_Program_Agency_Training_081010.pdf on November 5, 2012.

[139] Centers for Medicare & Medicaid Services (CMS). Retrieved from: http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Meaningful_Use.html on November 5, 2012.

[140] Centers for Medicare & Medicaid Services (CMS). (2011). Medicare program; payment policies under the physician fee schedule, five-year review of work relative value units, clinical laboratory fee schedule: signature on requisition, and other revisions to Part B for CY 2012. Final rule with comment period. Federal Register 76, no. 228 (November 28): 73025 -73474. Retrieved from: https://federalregister.gov/a/2011-28597 on August 30, 2012.

[141] Centers for Medicare & Medicaid Services (CMS). Telemedicine. http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Delivery-Systems/Telemedicine.html. Retrieved from: on August 30, 2012.

[142] Department of Health Policy School of Public Health and Health Services, The George Washington University. (2012). Quality Incentives for Federally Qualified Health Centers, Rural Health Clinics and Free Clinics: A Report to Congress. Submitted to the Office of the Secretary, January 23, 2012. Under Contract No. HHSP23320095635WC. Retrieved from http://www.healthit.gov/sites/default/files/pdf/quality-incentives-final-report-1-23-12.pdf on November 1, 2012.

[143] The Office of the National Coordinator for Health Information Technology. HITECH Programs: Regional Extension Centers. Retrieved from: http://healthit.hhs.gov/portal/server.pt/community/hit_extension_program/1495/home/17174 on July 17, 2012.

[144] HTRC Learning Center. Retrieved from: https://www.hitrc-learn.org/learncenter.asp?id=178409 on November 5, 2012

[145] Heisey-Grove, D,, M. Hufstader , and I. Hollin I, et al. (2012). *Progress towards the meaningful use of electronic health records among critical access hospitals and small rural hospitals working with Regional Extension Centers*. ONC Data Brief, no. 5. Washington, DC: Office of the National Coordinator for Health Information Technology, November 2012. Retrieved from http://www.healthit.gov/sites/default/files/databrief05_cahandsmallrural.pdf on January 20, 2013.

[146] Samuel CA, King J, Adetosoye F, Samy L, Furukawa MF. (2013). "Engaging Providers in Underserved Areas to Adopt Electronic Health Records." *American Journal of Managed Care*, 19(3):229-34

[147] Retrieved from https://www.nterlearning.org/web/guest/course-details?cid=502 on January 20, 2013.

[148] Office of the National Coordinator for Health Information Technology (ONC). (2012). Figures retrieved from ONC's Community College Consortia Dashboard, April 2012. Retrieved from: http://dashboard.healthit.gov/college/ on July 17, 2012.

[149] Whitehouse.gov, (2012). White House Rural Council's Health IT Initiative Helps Community Colleges Tailor Programs to Workforce Needs. June 28th 2012. Retrieved from http://www.whitehouse.gov/blog/2012/06/28/white-house-rural-council-s-health-it-initiative-helps-community-colleges-tailor-pro on March 29, 2013.

[150] Memorandum of Understanding between the U.S. Department of Labor (Employment and Training Administration) and the U.S. Department of Health and Human Services (Office of the National Coordinator for Health Information Technology and Health Resources and Services Administration). February 21, 2012.

[151] Graham-Jones P, Jain SH, Friedman CP, Marcotte L, Blumenthal D. The need to incorporate health information technology into physicians' education and professional development. Health Aff (Millwood). 2012 Mar;31(3):481-7. doi: 10.1377/hlthaff.2011.0423.

[152] Standards and Interoperability Framework Data Sheet. Retrieved from: http://www.healthit.gov/sites/default/files/hie-interoperability/standards-and-interoperability-framework-data-sheet.pdf on November 5, 2012

[153] NIST. NIST Partners with ONC and AHRQ to Deliver Guidance on Electronic Health Record Usability. December 8, 2010. Retrieved from: http://www.nist.gov/healthcare/hit/hit_120810.cfm on November 5, 2012

[154] Columbia University. (2012). Retrieved from: http://www.columbia.edu/cu/text4health/ on July 8, 2012.

[155] Stockwell, M.S., Kharbanda, E.O., et al. (2012). "Effect of a Text Messaging Intervention on Influenza Vaccination in an Urban, Low-Income Pediatric and Adolescent Population. A Randomized Controlled Trial." *JAMA* (16):1702-1708.

[156] Shields, A.E., Shin P., Leu, M., Levy, D.E., Betancourt, R.M., Hawkins, D., and Proser, M. (2007). Adoption of health information technology in community health centers: results of a national survey. *Health Affairs* 26(5):1373-83.

[157] Jha, A.K., DesRoches, C.M., Shield, A.E., et al. (2009). Evidence of an emerging digital divide among hospitals that care for the poor. *Health Affairs* 28(6): w1160-70.

[158] Heisey-Grove, D,, M. Hufstader , and I. Hollin I, et al. (2012). *Progress towards the meaningful use of electronic health records among critical access hospitals and small rural hospitals working with Regional Extension Centers*. ONC Data Brief, no. 5. Washington, DC: Office of the National Coordinator for Health Information Technology, November 2012. Retrieved from http://www.healthit.gov/sites/default/files/databrief05_cahandsmallrural.pdf on January 20, 2013.

[159] Samuel CA, King J, Adetosoye F, Samy L, Furukawa MF. (2013). "Engaging Providers in Underserved Areas to Adopt Electronic Health Records." *American Journal of Managed Care*, 19(3):229-34

[160] Smith, A. (2010). Home Broadband 2010. Pew Internet & American Life Project. Retrieved from: http://pewinternet.org/Reports/2010/Home-Broadband-2010.aspx on July 17, 2012.

[161] Federal Communications Commission (FCC). Universal Service Monitoring Report. CC Docket No. 98-202. 2011