FINAL REPORT

Evaluation of the Information Technology Professionals in Health Care ("Workforce") Program - Summative Report

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1. EXECUTIVE SUMMARY

To help address the increasing and evolving demands of the current health care and policy environments, the Office of the National Coordinator for Health Information Technology (ONC) developed the Information Technology (IT) Professionals in Health Care Program (referred to as the "Workforce Program"). The Workforce Program was authorized under Section 3016 of the Public Health Service Act (PHSA), as added by Title XIII in Division A of the American Recovery and Reinvestment Act (ARRA) of 2009.[1] The program's primary goal is to rapidly and sustainably train a new workforce of health IT professionals to help providers implement and optimize electronic health records (EHRs) to improve health care quality, safety, and cost-efficiency.

The Workforce Program is comprised of four constituent programs: the Community College Consortia to Educate Information Technology Professionals in Health Care program (CCC program), the Program of Assistance for University-Based Training (UBT program), the Curriculum Development Centers program (the Developers), and the Competency Examination for Individuals Completing Non-Degree Training program (also known as the HIT Pro Examination). In total, ONC awarded $116 million in funding across these four constituent programs. All four programs were funded in April 2010. ONC funded the CCCs, the Developers, and Competency Examination programs through two-year cooperative agreements, and the UBTs through grants of 39 months in duration. The four constituent programs are described below.

- *Program of Assistance for University-Based Training (UBT)*. This program provided grant funds totaling $32 million to nine colleges and universities to create or expand health IT training programs focused on health IT roles that were determined to require a high level of training. The training programs focused on the following six professional roles: clinician or public health leader; health information management and exchange specialist; health information privacy and security specialist; research and development scientist; programmers and software engineer; and health IT sub-specialist. Over the course of the grants, these programs awarded nearly 1,700 master's degrees or certificates of advanced study in health IT. (Period of performance: April 2010 – October 2013)
- *Community College Consortia (CCC) to Educate Information Technology Professionals in Health Care*. This program provided $68 million to five consortia, which supported approximately 81 community colleges covering all 50 states, to establish or improve non-degree health IT training programs designed to be completed within six months. The overarching goal of the CCC program was to enhance the capacity of the nation's community colleges to train 10,500 health IT specialists annually. The training programs were designed for professionals with an IT or health care background and focused on training students for the following six professional roles: practice workflow and

information management redesign specialists; clinician/practitioner consultants; implementation support specialists; implementation managers; technical/software support; and trainers. (Period of performance: April 2010 – October 2013)

- *Curriculum Development Centers Program (the Centers)*. ONC awarded a total of $10 million in cooperative agreements to five universities—four of which also received funding under the university-based training component of the program—to develop health IT educational materials for the CCC program. The materials were available to other schools outside of the Workforce Program for wider use across the country. Furthermore, ONC awarded one grantee additional funds to serve as the National Training and Dissemination Center (NTDC), who provided technical support to the grantee institutions and established a secure electronic site from which all materials were available for download through the end of 2012. (Period of performance: April 2010 – March 2013)
- *Competency Examination for Individuals Completing Non-Degree Training (HIT Pro Exam)*. ONC awarded one two-year, $6 million cooperative agreement to Northern Virginia Community College (NOVA) to fund the design and initial administration of competency exams in health IT for the six professional roles that are the focus of the CCC program. NOVA worked with Pearson VUE and the American Health Information Management Association (AHIMA) to develop and administer the competency exams. NOVA made vouchers available to cover the cost of the Exam for individuals who completed one of the CCC programs. Other health IT professionals were eligible to sit for the examination. (Period of performance: April 2010 – March 2013)

Evaluation Overview

In 2010, ONC funded NORC at the University of Chicago (NORC) to design and conduct a formative and summative evaluation of the Workforce Program to understand and capture the processes used by grantees to implement the program, assess program effectiveness, and uncover best practices and lessons learned. The NORC evaluation was charged with addressing the following three basic research questions:

1. What processes did the grantees use to implement the programs and meet program goals (e.g., barriers, lessons learned, successful strategies, coordination, program satisfaction)?
2. To what extent did the grantees meet the requirements of the Workforce Program (e.g., implementing new educational programs, matriculating and training the expected number of students, developing adequate curriculum materials, and developing and administering a competency exam)?
3. To what extent did participants in the program gain and maintain employment in health IT (e.g., job placement, job retention, salary, promotion, job readiness, employer needs)?

In the course of its data collection efforts, the evaluation team gathered information on these items as well as other characteristics and outcomes of interest with respect to the programs' success. This report presents the findings of the national program evaluation, which used a mixed-methods approach that relied on a range of data sources, including the following:

- *Student surveys.* NORC surveyed CCC and UBT students after they completed their training program. A follow-up survey gathered additional information capturing employment outcomes.
- *Survey of faculty.* Instructors at the community colleges were asked to complete a survey about their use and satisfaction of the materials developed by the curricula development centers.
- *Site visits.* NORC conducted site visits to 18 community colleges and all 9 of the universities that received UBT grant funding. During these visits, the evaluation team conducted classroom observations, discussions with stakeholders, and focus groups.
- *Focus groups.* The evaluation team conducted focus groups with students, faculty members, and competency exam takers.
- *Interviews with stakeholders*. During the site visits, we interviewed program directors, career counselors, faculty, and employers about their experiences with the Workforce Program, successful strategies, and common barriers to program implementation.
- *Interviews with grantee leads.* In order to document how the program evolved over time, NORC interviewed the grantee leads during each of the three years.
- *Administrative data.* In order to supplement these primary data collection efforts, ONC provided NORC with administrative data that were routinely gathered from grantees to provide information regarding the characteristics and key design elements of each school's program and enrolled population. The administrative data also included information on the curriculum and HIT Pro Exam such as the number of downloads, tests administered, among other measures.

This Executive Summary includes a brief overview of the findings gathered over the course of the evaluation on each component of the overall program.

Program of Assistance for University-Based Training (UBT)

The universities that received funding through the Program of Assistance for University-Based Training (UBT) used their grants in a variety of ways, including transitioning existing programs to an online format, providing financial support to students, creating new courses to expand existing programs, and hiring faculty and support personnel. Most UBT programs used some form of online learning. Of note,

some UBTs had to devote additional resources to the implementation of online learning platforms, as some faculty and students had difficulty adjusting to the new formats. To help with this challenge, programs set up specific trainings for faculty teaching online for the first time, and faculty members worked closely with students to ensure they were able to easily navigate the online tools needed to complete course work.

UBTs applied many of the same application and recruitment processes they used for their existing programs. At the outset, some UBTs faced difficulty in communicating the program's rigor to students, especially to those enrolled in certificate programs. To ensure that students were prepared, UBTs worked to communicate the expectations during the application processes and used student orientations to further convey information regarding workload and expectations.

In general, universities successfully trained students across all of the UBT Workforce Program's roles, at both the certificate and master's levels. As of December 2013, 1,704 individuals had completed the program and 86 individuals were still enrolled in the training. The attrition rate across the UBT programs was 12 percent (certificate: 11 percent; master's: 15 percent). The majority of students were satisfied with the program, with 56 percent of students indicating they were very satisfied and 33 percent were somewhat satisfied with the program during the follow-up survey.

Based on data from the follow-up surveys of all three UBT cohorts, 89 percent of students reported being employed after completing the program, a significant increase from the share employed at the time of the first survey (64 percent). Similarly, students were more likely to be employed in the field of health IT after completing the program than they had been previously, with 35 percent of students reporting that they were employed in health IT at baseline, and 64 percent reporting that they were employed in health IT at follow-up. Students found employment in a number of settings, with the greatest proportion of students reporting being employed in a hospital setting.

Variability in local job markets affected some students' ability to find employment. A number of students overcame this obstacle by relocating. While neither ONC nor the UBTs can control local job markets, increased coordination and communication with local employers could have mitigated this challenge. Further, a number of employers were not aware of the UBT programs. Several program leadership teams had recommendations for combating this issue, including having ONC assist with publicizing the programs to employers and encouraging them to post job opportunities on a centralized website, and collaborate with organizations such as the Health Information and Management Systems Society (HIMSS) and the American Medical Informatics Association (AMIA) to educate their members about the

programs. Overall, students, faculty members and employers felt the content of the courses provided students with a good baseline understanding of the field and poised them well to find employment.

Community College Consortia (CCC) to Educate Information Technology Professionals in Health Care

The community colleges participating in the CCC program approached implementation of the programs in a variety of ways. The flexibility afforded grantees in terms of the learning format and use of the Workforce Program's roles proved critical to the ability to launch the programs in a timely manner and to students' satisfaction. For instance, online learning was a popular learning format among many students, with two-thirds of students taking courses exclusively online. While students appreciated the flexibility that online learning provided, others desired face-to-face opportunities for in-person and hands-on training and networking.

For-credit programs generally appealed more to students than did those that did not offer credit, as did the opportunity to receive government funding to pay for the training. Colleges found success with informal word-of-mouth marketing to recruit students and found student orientations a valuable way to set student expectations regarding the workload. Nearly all faculty members were adjunct instructors who also worked in the field of health IT and whose real-world experience was of great value to students.

Students had diverse backgrounds in terms of their prior employment and educational backgrounds. In general, those with a health care background found some of the IT course material especially challenging, whereas those with an IT background had challenges breaking into the health care field upon graduation (and often had higher salary expectations as well). Schools that either proactively placed students in roles depending on their background or modified roles to meet employers' needs reported more success in terms of students completing the program and finding employment.

The CCC program was effective in enabling colleges to offer non-degree health IT training programs. Across all five consortia, 19,773 individuals had completed the program as of October 2013. The attrition rate across regions was 37.7%, but varied by region. In general, students expressed high rates of overall satisfaction with the CCC program, with 26 percent of students reporting they were very satisfied and 46 percent reporting they were somewhat satisfied with the program during the follow-up survey. More than six in ten students agreed strongly or somewhat that their instructors were knowledgeable in the subject matter (69 percent) and were effective teachers (63 percent). Similarly, majorities of students strongly or somewhat agreed that the courses met their general expectations of the program (68 percent), the required

courses fit together to form a cohesive training program (68 percent), and the courses had given them a clear understanding of the subject matter (70 percent).

CCC instructors had similarly positive feedback about the program. One issue that did affect student and faculty satisfaction, as well as attrition rates, was that many students were not sufficiently prepared for the level of difficulty of the courses and/or the workload. Indeed, many students, faculty members, program leadership teams, and employers alike found the requirement that students complete their training in six months to be a challenge. These stakeholders were also skeptical that a six-month, non-credit program without a certification would provide students sufficient health IT training to be able to find jobs in the field, especially ones that offer acceptable salaries.

As was the case with the UBT students, students from the community college programs were more likely to be employed, and in health IT in particular, after the program than they had been beforehand. At baseline, 77 percent of students reported having a job; at follow-up, a similar proportion of respondents were employed (80 percent). At follow-up, overall, 34 percent of students reported employment in health IT. The third cohort received a unique question at follow-up, asked only of those who responded that they were not working in health IT, which asked about health IT responsibilities. Among this group, 28% reported working in health IT and an additional 40% reported having health IT related responsibilities. Cohorts 1 and 2 may have had a similar proportion of students with health IT responsibilities had the question been asked of them as well.

Students who found a job with a different employer after completing the program believed that their program participation had a strong impact on obtaining their new job or job title. Students still seeking a job felt strongly that the skills they had learned in the program would help them obtain a job in health IT and perform well in it.

Employers and instructors highlighted the importance of both hands-on training and real-life experience as necessary to prepare individuals for the health IT workforce. In order to create hands-on experiences for students, some program administrators had reached out to providers and vendors in the community to set up internship programs for their students. Employers hiring program graduates were generally pleased with their performance, but many noted the graduates needed to work on their “soft skills” that are usually acquired through real-world experiences.

Curriculum Development Centers (the Developers)

All of the Developers funded to support the Workforce Program had significant prior experience in health IT training programs before the launch of this program. Developers worked with community colleges' advisory boards or committees composed of stakeholders to develop the materials. The five Developers worked together and with ONC to design a cohesive set of components using a consensus-based decision-making process. Although they collaborated with one another, with community colleges (some of which were CCC grantees), and with their advisory boards, many wished they had more chances to communicate with both the CCCs and the HIT Pro Exam grantee during the development process. They noted that stronger partnerships with the CCCs would have helped them target the materials to the correct audience, as many Developers struggled to create materials appropriate for the types of students who ended up enrolling in the CCC programs.

The elements created by the Developers included PowerPoint slides with voice-over narration and recordings; class activities and homework assignments; self-assessment questions; and links to supplemental readings and other resources. Over the course of the grant, the Developers created three versions of the materials, using feedback collected by the National Training and Dissemination Center (NTDC) from users to make improvements to each version. The NTDC surveyed CCC instructors to collect feedback, and users were able to submit ad-hoc feedback using a function on the NTDC website.

Across the board, the Developers felt the materials should have been developed prior to the start of the CCC program, as opposed to in parallel with the CCC program's implementation. Additionally, while the Developers felt the "buffet" approach to the curriculum was effective in allowing community colleges to select which materials to teach, some noted drawbacks of having five universities design separate components, including issues with consistency. The Developers also noted that the short development timeline limited collaboration among the Developers, as they did not have time to review one another's materials prior to distribution.

All in all, the Curriculum Development Program was successful in providing materials to the CCCs and members of the general public alike. In general, instructors felt the materials were comprehensive and would provide students with a foundation in health IT. The evaluation team also gathered information about CCC administrators', faculty members', and students' perceptions of the materials through site visit discussions and surveys of CCC students and faculty. From November 2011 to March 2013, the NTDC site received 113,982 visits and saw 187,683 downloads.

Stakeholders had some issues and concerns with the materials, but noted that many of these issues were corrected in later versions of the materials. The NTDC contracted with the American Medical Informatics Association (AMIA) to do a "gaps and overlaps" analysis of the existing materials across the set of 20 components. This analysis identified useful information that was missing from the materials as well as instances where multiple components covered the same content. The Developers used this information to revise the materials.

Many of the grantees (the Developers and CCCs alike) appreciated that it can be difficult to create materials for a rapidly evolving field and that the revision cycles helped ensure that new information could be incorporated into the materials; however, they also acknowledged the need for individual instructors to augment the materials with new information as the field evolves. Many instructors did modify the materials, and integrated information from other sources such as recent YouTube videos and publications into their courses. Even in a rapidly evolving field, the materials and programs were able to provide a foundation upon which students can continue to build upon throughout their careers. Despite these concerns, all of the CCCs were happy to have received the materials, and many noted they would not have been able to implement the programs in such a short timeframe without them.

Competency Examination for Individuals Completing Non-Degree Training

NOVA partnered with AHIMA to develop a competency exam for each of the six CCC-targeted roles. They in turn worked with Pearson VUE to secure test locations and widespread dissemination of the examinations. The exam developers established an advisory council of 22 industry stakeholders that included representatives from the Developers, the CCCs, RECs, the Department of Labor, and various employers and then convened teams to work on each role-specific exam. In consultation with industry leaders, these teams identified the knowledge, skills, and abilities necessary to fulfill the responsibilities associated with each role. The development team used this information to draft the six role-specific exams, which were then reviewed by subject matter experts, and cross-walked against a jobs analysis (previously performed by AHIMA) and the materials created by the Developers. These cross-walking exercises yielded largely consistent results, suggesting that their initial work aligned well with the learning objectives in the curriculum materials.

At the outset of the program, ONC set a goal of administering 10,000 exams. Initial progress toward this goal was slow. However, the grantees issued more than 9,500 vouchers and there were more than 10,400 exams scheduled as of March 31, 2013, marking a large increase from March of 2012. The exam's pass rate was 62%.When the evaluation team spoke to the exam developers in 2012, they reported that the

number of exams administered at the time was well below the numbers they had expected. They attributed this to several factors, including: community colleges not placing an emphasis on program graduates taking the exam; the fact that the exam was not a graduation requirement; lack of advertising about the exam; the fact that passing the exam would not confer any credential; and employers' lack of awareness of the exam or its value. Indeed, while many students elected to take the exam because they hoped it would help to make them more marketable, the employers the evaluation team interviewed over the course of the evaluation remained largely unaware of the exam and were not sure what it demonstrated in terms of an applicant's skill set.

The HIT Pro exam has since been transitioned to the AHIMA-Certified Healthcare Technology Specialist (CHTS) credential, which does confer a certification.[2] The team held a follow-up conversation with AHIMA in late 2013 about the large increase in the number of exams scheduled at the end of the funding period. Notably, during the final three months of grant funding, AHIMA changed the initial policy of allowing only one free exam per student. They then allowed anyone to take the exam and as many as they wanted, free of charge. Additionally, the grantees changed the messaging in their outreach efforts. During the final three months of the grant funding, email outreach emphasized the exam would no longer be free after March 2013 and that individuals should "act quickly" if they wanted to take the exam without a fee. Providing all exams free of charge and allowing exam takers to sit for more than one exam, in combination with promoting the fact that individuals would have to pay for exams in the future, led to a large increase in the number of exams delivered at the end of the period of grant funding. Employers' general lack of awareness of the exam remained a challenge, however.

Cross-Cutting Findings and Sustainability

Looking across the findings and information gathered from the full array of evaluation activities across all four components of the program, a number of common themes shed light on the program's success as a whole—and can be readily applied to other schools looking to launch or improve workforce training programs.

First, individuals associated with all four components of the program voiced the importance of communication with other grantees and clarity of purpose at the outset. Second, given the overarching purpose of the training program, all grantees and stakeholders noted the extreme importance of forging solid connections with the employer community. Third, the flexibility that ONC provided the grantees emerged as one of its greatest assets and this manifested in several ways, including allowing for different

learning formats and providing the CCCs the ability to adapt the curriculum materials to their needs and capacities.

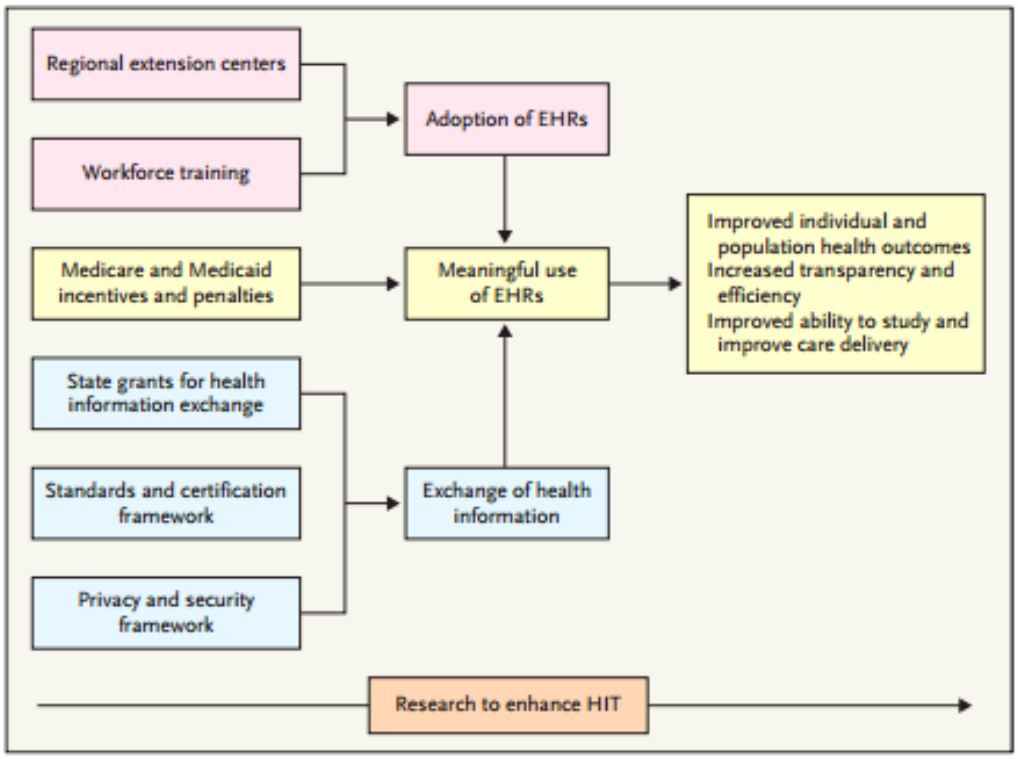
Although grantees are no longer receiving grant funding, at present, 63 of the original CCCs and all nine of the UBTs that received grant funding are continuing their health IT educational offerings. As noted above, the HIT Pro exam has been transitioned to the AHIMA Certified Healthcare Technology Specialist (CHTS) credential. The curriculum materials are now publicly available and are thus not limited to those affiliated with the Workforce Programs. Looking forward, colleges and universities have a variety of plans in place for their training programs, including creating longer training programs with more of a focus on hands-on learning, transitioning certificate programs to master's programs, and combining various training programs in strategic ways. Program leadership teams all noted that they look forward to continuing to adapt their programs to the rapidly evolving field of health IT.

2. WORKFORCE PROGRAM OVERVIEW AND POLICY CONTEXT

To help address the increasing and evolving demands of the current health care and policy environments, the Office of the National Coordinator for Health Information Technology (ONC) developed the Information Technology (IT) Professionals in Health Care Program (referred to as the "Workforce Program"). The Workforce Program was authorized under Section 3016 of the Public Health Service Act (PHSA), as added by Title XIII in Division A of the American Recovery and Reinvestment Act (ARRA) of 2009.[3] The Program's primary goal was to rapidly and sustainably train a new workforce of health IT professionals to help providers implement and optimize electronic health records (EHRs) to improve health care quality, safety, and cost-efficiency. To this end, ONC designed the program to train and graduate high-caliber health IT professionals interested in supporting the growing and evolving health IT industry.

The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which was part of ARRA, seeks to improve American health care delivery and patient care through an unprecedented investment in health IT. The HITECH Act focuses on health care providers attaining meaningful use of EHRs as a pathway toward improved health system performance. The attainment of meaningful use depends, in turn, on adoption and use of EHRs to achieve health and efficiency goals, and the development of security and privacy pathways for exchanging health information.[4] The provisions of the HITECH Act and their corresponding programs[5] (see Exhibit 1) were designed to work together to provide the necessary assistance and technical support to providers, many of whom otherwise lacked the financial resources, technical expertise, and infrastructure necessary to adopt and use EHRs in a meaningful way. The programs were also launched to enable coordination and alignment within and among states in order to realize the promise of using health IT.[6]

Exhibit 1: The HITECH Act's Framework for Meaningful Use of EHRs



Source: Blumenthal D. 2010. Launching HITECH. New England Journal of Medicine; 362(5): 382-385.

Among the critical tools in this investment were financial incentives for eligible professionals and hospitals to adopt and use certified EHR technology to improve patient care. Under the Centers for Medicare & Medicaid Services' EHR Incentive Programs, eligible professionals and hospitals demonstrating the meaningful use requirements by meeting thresholds on a number of objectives are eligible to collect incentive payments.[1] Conversely, eligible professionals and hospitals not adopting certified EHRs by 2015 will face payment adjustments from Medicare and Medicaid.[7] Under pressure to meet these regulatory requirements, obtain the EHR Incentive Programs payments, and avoid payment adjustments, there is a significant demand in the health care sector for a skilled health IT workforce in the face of a national shortage of qualified health IT professionals.

[1] Eligible health professionals can earn up to $44,000 in extra payments between 2011 and 2015 if they become meaningful users of EHRs (Medicaid providers can generally earn as much as $63,750 between 2011 and 2021). Hospitals that are meaningful users can collect an initial bonus and an extra payment per discharge of a Medicare patient. Medicaid has a separate formula for rewarding meaningful use by hospitals.

In 2010, ONC estimated a shortfall of 51,000 health IT workers over five years in terms of the number that would be needed to fully support health care providers and facilities in the adoption of EHRs.[8] This reinforced the findings of a September 2009 HIMSS survey of health care IT professionals, 79 percent of whom reported their organization would need to hire additional IT staff over the next two years in order to successfully transition to EHRs.[9] The Bureau of Labor Statistics has projected the need for an additional 37,700 health information management workers by 2020, and expects the rate of employment of medical records and health information technicians to increase by 21 percent from 2010 to 2020, faster than the average growth rate for all occupations (14 percent).[10]

National surveys indicate that EHR adoption by non-federal, office-based physicians more than doubled from 2008 to 2012, increasing from 16.9 percent to 39.6 percent.[11] In 2012, 44.0 percent of general, acute care hospitals had at least a basic EHR[2] system – an increase of 17 percentage points from 2011 and a near tripling of the proportion in 2010, the year prior to the availability of financial incentives.[12] The percentage of hospitals with a comprehensive EHR[3] system nearly doubled from 2011 to 2012, increasing from 8.7 percent to 16.7 percent.[13] Greater EHR adoption is projected to increase demand for skilled workers in order to implement, support, and use health IT.[14, 15] According to studies examining trends in health IT jobs using online job postings as a proxy for labor demand, the number of health IT-related postings has grown substantially over time, especially following passage of the HITECH Act in early 2009.[16, 17] According to one study, the number of health IT-related job postings tripled from 2007-2011, both as a share of all postings and as a share of all healthcare-related postings.[18] Beyond the sheer demand for health IT workers, HITECH created demand for a workforce with new competencies and skills in order to achieve the successful interface between IT and the world of health care delivery, such as an understanding of medical terminology and an ability to analyze clinical workflow in the current, highly fragmented health care system.

The Workforce Program's mission of creating a health IT workforce properly trained and equipped to facilitate the meaningful use of EHRs supplements the goals of other federal and state programs funded under HITECH, all of which address barriers to adoption and meaningful use of health IT, as well as the goals of the Affordable Care Act. Several initiatives funded under HITECH are designed to help

[2] A basic EHR includes the following electronic functionalities implemented in at least one major clinical unit in the hospital: recording patient demographic information; clinical notes; and patient problem lists; viewing laboratory and imaging results; and using computerized prescription ordering. **Source**: DesRoches CM, Painter M, Jha AK, eds. Health information technology in the United States: driving towards delivery system reform. Princeton (NJ): Robert Wood Johnson Foundation; 2012.

[3] A comprehensive EHR includes all of the basic functionalities and an additional 14 functions implemented in all major clinical units. **Source**: DesRoches CM, Painter M, Jha AK, eds. Health information technology in the United States: driving towards delivery system reform. Princeton (NJ): Robert Wood Johnson Foundation; 2012.

providers choose and implement EHRs, including the Health Information Technology Extension program, which created 62 Regional Extension Centers (RECs) that provide technical assistance, guidance, and information on best practices to support and accelerate health care providers' efforts to become meaningful users of EHRs.[19] To address the lack of infrastructure for the exchange of health information, the State Health Information Exchange Cooperative Agreement Program provided grants to state programs to support the development of health information exchange (HIE) capabilities within and across their jurisdictions.[20] Similarly, the Beacon Community Cooperative Agreement Program provided funding to 17 demonstration communities to show how the meaningful use of EHRs can achieve measurable improvements in the quality and efficiency of health services or public health outcomes.[21] Other HITECH initiatives, such as those in the Strategic Health IT Advanced Research Projects (SHARP) Program, promote innovation by funding research focused on achieving breakthrough advances to address well-documented problems that have impeded adoption.[22] Combined with the regulations created by the HITECH Act, these programs are designed to support the role of EHRs as part of a modernized, interconnected, and improved health care system.

The Workforce Program

The Workforce Program is comprised of four constituent programs: the Community College Consortia to Educate Information Technology Professionals in Health Care program (CCC program), the Program of Assistance for University-Based Training (UBT program), the Curriculum Development Centers program (the Developers), and the Competency Examination for Individuals Completing Non-Degree Training program (with the Competency Exam also known as the HIT Pro examination). In order to provide training in the areas most appropriate for the growing health IT workforce, ONC defined 12 professional roles for the various training programs to target. The CCC and UBT programs—and the six roles that each of them targeted—are described in more detailed below.

- *Program of Assistance for University-Based Training (UBT)*. This program provided grant funds totaling $32 million to nine colleges and universities to create or expand health IT training programs focused on health IT roles that were determined to require a high level of training. The training programs focused on the following six professional roles: clinician or public health leader; health information management and exchange specialist; health information privacy and security specialist; research and development scientist; programmers and software engineer; and health IT sub-specialist. Over the course of the grants, these programs awarded nearly 1,700 master's degrees or certificates of advanced study in health IT. (Period of performance: April 2010 – October 2013)

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uncover best practices and lessons learned. NORC's independent evaluation of the Workforce Program focused on addressing three key research questions:

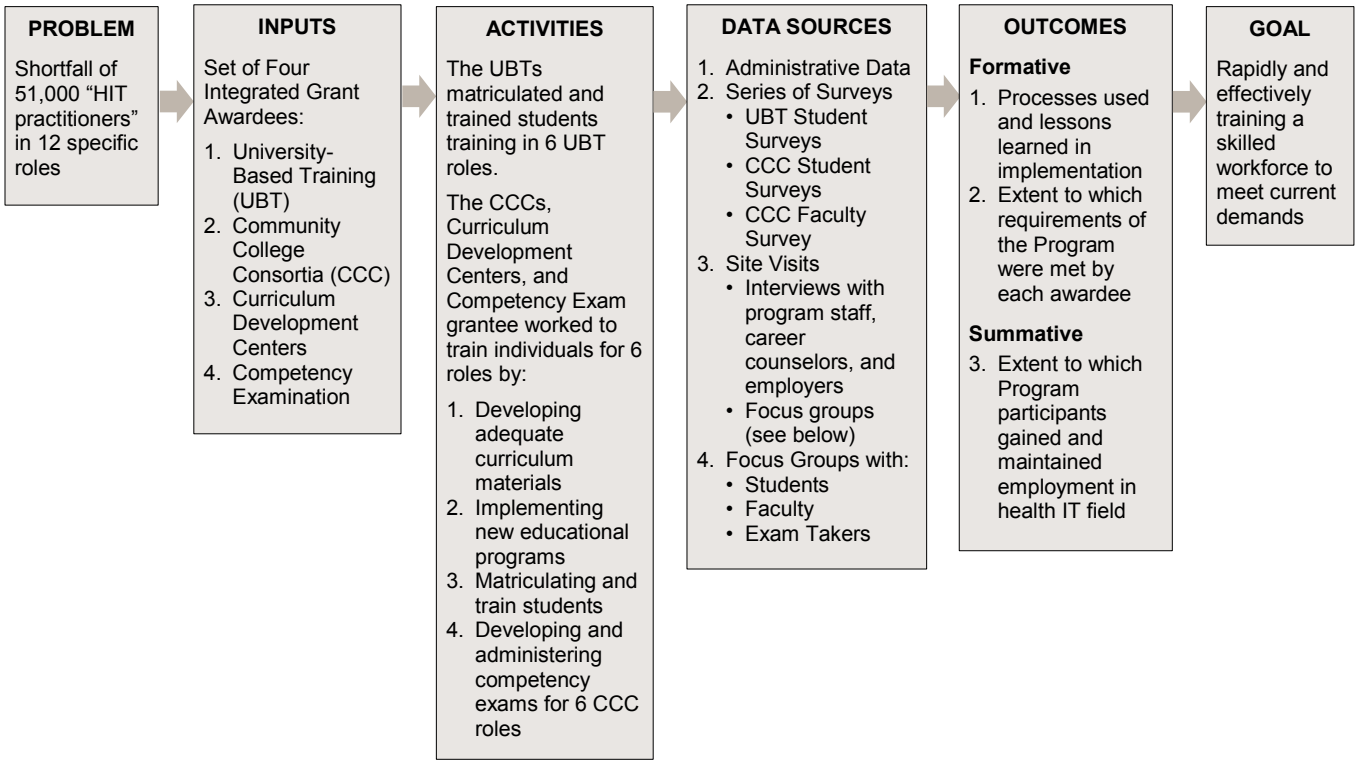
- What processes did the grantees use to implement the programs and meet program goals?
- To what extent did the grantees meet the requirements of the Workforce Program?
- To what extent did participants in the program gain and maintain employment in health?

Throughout the evaluation, NORC provided critical formative feedback to the grantee institutions on their activities and offered perspectives on the program's contributions in helping to build a skilled workforce equipped to meet employers' needs. This summative report focuses on these items as well as other characteristics and outcomes of interest with respect to the programs' success. This report describes and assesses the processes grantees used to implement the program, approaches to integrating evolving and newly developed curricula, recruiting and training faculty and prospective students, and coordinating among the four grant programs, as well as with prospective employers of students trained through the programs.

3. OVERVIEW OF EVALUATION METHODS

This section details the evaluation, including the research questions it addresses, the data sources used, the methods applied, and the timeline for each stage of the effort. The evaluation was designed in keeping with the context for and aims of the Program itself, as laid out in Exhibit 2 below.

Exhibit 2: Logic Model for the Workforce Program



Research Questions

The evaluation explored the following research questions:

1. What processes did the grantees use to implement the programs and meet program goals (e.g., barriers, lessons learned, successful strategies, coordination, program satisfaction)?
2. To what extent did the grantees meet the requirements of the Workforce Program (e.g., implementing new educational programs, matriculating and training the expected number of students, developing adequate curriculum materials, and developing and administering a competency exam)?

3. To what extent did participants in the program gain and maintain employment in health IT (e.g., job placement, job retention, salary, promotion, job readiness, employer needs)?

Appendix A provides additional detail about the research questions, including the sub-questions that correspond with each.

Data Sources

NORC based the evaluation of the Workforce Program on a number of data collection activities. NORC proposed a mixed-methods approach in order to gain a complete understanding of student and faculty experiences through surveys and add context and detail through qualitative research. The NORC team supplemented the data ONC gathered from grantees with primary data collection from all parties involved in the Workforce Program—the grantees, including staff from the community colleges, universities, Curriculum Development Centers (the Developers), and competency exam developers; the students who participated in the training programs; the individuals who took the competency exams; faculty members at participating academic institutions; and employers.

In order to document how the program evolved over time, NORC conducted interviews with the grantee leads during each of the three years of the evaluation and examined the administrative data reported quarterly by the programs as part of their grant requirements (i.e., the number of students enrolled in courses, number of individuals taking the exams, etc.). Other data sources included:

- *Student surveys*. NORC surveyed students after they were scheduled to complete their training program. A follow-up survey gathered additional information about their employment outcomes and other measures of interest.
- *Survey of faculty*. NORC asked instructors at the community colleges to complete a survey about their use and satisfaction of the materials developed by the Developers.
- *Focus groups*. The evaluation team conducted focus groups with students, faculty members, and competency exam takers.
- *Interviews with stakeholders*. During site visits, the team interviewed program directors, career counselors, faculty, and employers about their experiences with the Workforce Program, successful strategies, and common barriers to training implementation.

Prior to conducting this work, NORC worked with ONC to receive Paperwork Reduction Act (PRA) clearance from the Office of Management and Budget (OMB). We describe each activity in detail below and include a timeline of data collection activities at the end of this section.

Surveys

The NORC team conducted 13 web-based surveys as a part of this evaluation: three baseline and three follow-up surveys of CCC students, three baseline and three follow-up surveys of UBT students, and one survey of community college faculty.

For the six baseline student surveys, NORC contacted students when they were initially scheduled to complete the program to participate in a 20-minute web-based survey. NORC contacted students for the follow-up surveys six months after the mid-point of the baseline survey's field period.

In general, the surveys covered the following topics:

Domain	Survey Questions
Background	▪ Employment and educational background ▪ Students' motivation for entering the program and the health IT profession ▪ Demographics
Program Perceptions and Experiences	▪ Students' experiences in the program ▪ Perceptions about work/skill readiness (pre/post) ▪ Students' level of engagement with faculty ▪ Areas for program improvement ▪ Experiences with the competency exam
Satisfaction	▪ Students' attitudes and satisfaction with the learning environment (e.g., with faculty/courses/resources/curriculum materials/equipment) ▪ Satisfaction with support systems available within and outside of the college environment, including • Guidance, counseling, and mentoring (e.g., from faculty) • Career/job counseling and future employment
Employment Outcome	▪ Current employment status ▪ Employment post-program • New job versus same employer • Position or title change • Salary

NORC also completed a survey of CCC faculty, which collected information on instructors' opinions of the curriculum materials, the extent to which the instructor adhered to the curriculum, and their impressions of the implementation of the program at their institution. The survey results provided important feedback to the Developers so they could improve their curriculum materials and provide the NORC team with a robust set of data complementing the student surveys.

Site Visits

The NORC team completed two rounds of site visits to community colleges around the country, including individual member colleges and consortium leads. During the first round of site visits, the NORC team

visited 12 schools and conducted visits with an additional 8 during the second round. Similarly, the NORC team conducted site visits with universities that received UBT grant funding. Since there were only nine UBTs, NORC visited all of them over two rounds of site visits.

As part of these site visits, NORC held discussions with the programs' principal investigators and leadership teams, career counselors, and local employers. We also held small group discussions and/or focus groups with faculty members and students.

Structured Interviews with Leads

The NORC team conducted a series of structured interviews with leadership across the four Workforce constituent programs.

- Interviews with directors of the Curriculum Development Centers focused on their processes for identifying curriculum needs and revising materials, collaboration within and across the Workforce Program components, and efforts to make their contributions sustainable after program completion.
- Discussions with the administrators of the competency exam helped the NORC team gain a more complete understanding of the mechanics of that program and the methods for recruiting exam takers. These discussions revealed:
  - The processes for developing the exam (including working with community colleges, employers, ONC, and others);
  - Any changes that had been made to the format/content of the exam;
  - Strategies for making potential exam takers aware of the exam;
  - Challenges that had been encountered; and
  - Plans for sustainability after grant funding ends.
- Discussions with CCC consortium leads and UBT principal investigators supplemented site visit findings and provided NORC with information from individual schools at additional points in time. NORC asked about changes for the grantees since the previous discussion, plans for sustainability, and any formal or informal data collection they were conducting to track students after they left the program.

Focus Groups with Exam Takers

The NORC team also conducted focus groups via teleconference with individuals from around the country who had completed the HIT Pro exam, but who were not students or instructors in the ONC-funded community college program. In preparation for these focus groups, NORC held informal conversations with NOVA and AHIMA to learn more about the exam and experiences with exam-takers

to date. These conversations helped NORC develop discussion protocols and identify individuals to recruit for focus group discussions. The NORC team then developed protocols to guide the semi-structured focus group discussions.

Focus groups with exam takers took place during November of 2011 and April of 2012 and NORC spoke with participants about their:

- Background, the recruitment process, and their motivation for taking the exam;
- Thoughts about the exam's relevance and value;
- Recommendations on how to improve the exam or exam process; and
- Employment prospects.

Methods

The following section details the methodology for the survey portion of data collection and subsequently the qualitative research activities.

Surveys

Below, we describe the sampling methods applied for the CCC student, CCC faculty, and UBT student surveys, and the processes by which the survey instruments were developed.

Sampling

NORC employed different sampling strategies for the CCC student, UBT student, and CCC faculty surveys. Below, we describe these strategies including, as appropriate, the overall sampling approach, sampling of schools, sampling of students (or faculty), and selection criteria.

Community Colleges - Students

Overall Sampling Approach: For each web-based survey of community college students, the NORC team completed sampling in two stages. The team selected: 1) a sample of community colleges participating in the Workforce Program; and 2) a sample of students within each of the selected community colleges. The goal of this sampling plan (for the initial round of the survey and other baseline cohorts), was to select a sample that was as representative as possible of the population of students either currently or previously enrolled in the Workforce Program (based on the known characteristics of the total student population).

Sampling of Community Colleges: NORC selected the colleges from each consortium using probability proportional to size sampling. Therefore, NORC included colleges with the largest number of students enrolled in the Workforce Program at the time of selection for each cohort. Below is Exhibit 3 displaying the number of community colleges within each consortium.

Exhibit 3: Overview of Community College Consortia

Consortium	Lead School	Community Colleges with a Workforce Program
Northwestern	Bellevue	7
Western	Los Rios	13
Midwestern	Cuyahoga	17
Southern	Pitt	21
Northeastern	Tidewater	23
Total		**81**

Ultimately, this sampling approach resulted in 46 of the 81 member colleges being selected for at least one cohort. Of these, 10 colleges were selected for two cohorts and 2 schools for all three cohorts.

Sampling of Students: NORC based the distribution of the students sampled across the 46 community colleges for each of the three cohorts on the size of the community college program (i.e., the number of students enrolled) as well as the total enrollment within each consortium. This distribution occurred in two stages. First, the students were allocated proportional to the size of the program (PPS) within each consortium based on the total enrollment for the program across all of the consortia. The NORC team then allocated the consortium's sample needs across the community colleges chosen for the sample, based on Workforce Program enrollment size at the time of sample selection. The NORC team applied this sampling method during each cohort timeframe so that the colleges chosen and the allocation calculated for one cohort was not the same as for another. This allowed for accurate estimates based on current enrollment levels during each cohort.

Selection Criteria: NORC surveyed three cohorts of students. Students in each cohort received an invitation to participate in a baseline and follow-up survey. NORC asked all sample members to participate in the follow-up survey regardless of whether they were respondents or non-respondents to the baseline survey. NORC invited students to participate from 46 of the 81 member colleges in the five-region consortia as described above in the description of sampling of community colleges. NORC constructed the sample for each survey according to the following criteria described below and summarized in Exhibit 4.

- First, survey respondents had to have participated in the program for at least three complete months before receiving the invitation for the baseline. For example, those in Cohort 1 were enrolled as of November 30, 2010, and thus had at a minimum participated in the program for all of December, January, and February—and parts of March—before they took the survey.
- Second, NORC set cutoff dates for each cohort to capture all students enrolled during a traditional school semester. Again, using Cohort 1 as an example, it included students who enrolled in the program for the 2010 fall semester and thus the cutoff dates were 8/1/2010 – 11/30/2010.

Exhibit 4: Community College Selection Criteria

Cohort	Number of schools	Number of students sampled	Dates during which students were enrolled in the program
Cohort 1	20	623	8/1/2010 – 11/30/2010
Cohort 2	20	616	12/1/2010 – 3/31/2011
Cohort 3	20	684	4/1/2011 – 11/30/2011
Total	**46 (unique)**	**1,923**	**8/1/2010 – 11/30/2011**

Community Colleges - Faculty

Overall Sampling Approach: NORC surveyed the entire population (n=625) of faculty members from the Community Colleges and asked each faculty member to complete a short survey. ONC provided NORC with the sample file including faculty names, names of schools, phone numbers, and email addresses. NORC did not administer a follow-up survey to the faculty. Exhibit 5 below shows the distribution of faculty across the five regions.

Exhibit 5: Number of Faculty Sampled per Region

Regions	Faculty members per region
Northwestern (A)	104
Western (B)	153
Midwestern (C)	100
Southern (D)	117
Northeastern (E)	151
Total	**625**

University-Based Training (UBT)

Overall Sampling Approach: As with the CCC student survey, NORC surveyed three cohorts of UBT students as part of this evaluation. Students in each cohort received a baseline and follow-up survey.

Unlike the community college sampling approach, the NORC team contacted a census of all UBT students who graduated in 2011 and 2012, for a total of 1,038 individuals. NORC asked all UBT students to participate in the follow-up survey regardless of whether they were respondents or non-respondents to the baseline survey. Exhibit 6 shows the number of UBT students in each cohort.

Exhibit 6: UBT Sample per Cohort

Cohort	Number of students	Dates prior to which students were enrolled in the program
Cohort 1	477	9/2011
Cohort 2	124	1/2012
Cohort 3	437	9/2012
Total	**1,038**	

Development of survey instrument

Prior to launching the first survey (the CCC Cohort 1 Baseline survey), NORC conducted a pre-test in order to accurately determine the burden on respondents as well as to further test the clarity of the survey questions. Respondents provided generally positive feedback indicating that they could readily answer the questions and that the time to complete the survey was not onerous (average 20 minutes). Based on comments NORC received from the pre-testers, NORC recommended revisions to the baseline instrument including the addition of several questions.

Programming and testing the web survey instrument

Following ONC signoff on the questionnaire content, the NORC team programmed and tested the web surveys to ensure data capture and that the routing operated correctly. NORC technical questionnaire analysts used the Fusion platform to program the community college, university-based, and faculty surveys. Given the NORC team's experience with the Fusion platform, NORC understands respondent preferences, hardware and software configurations, and frequently asked questions, all of which enable NORC to deploy effective web-based data collection systems utilizing intuitive screen design, user-friendly interfaces, simple navigation, proactive use of prompt screens, backend intelligence, and data security.

NORC designers worked with the development team to ensure consistency across pages, color contrast, and navigation. NORC transmitted data using the Secure Sockets Layer protocol that uses a cryptographic system to encrypt data during transmission through the Internet. If a respondent wished to complete the web survey in multiple sessions, the questionnaire re-opened at the point of break-off during re-entry.

Also, if a respondent kept a survey open without any activity, the NORC web server closed it after a certain period, preserving the data up to the break-off point and securely closing the connection.

The system architecture of the web data collection process placed authentication information and response data in different physical servers. This strategy provided an extra layer of security to protect response data. NORC backed up production servers daily. NORC used an in-house data processing tool to export data for post-processing.

NORC project staff in both Bethesda and Chicago completed test cases for the various HITECH questionnaires subsequent to the completion of programming and the release of the instrument into a testing environment. Additionally, NORC provided ONC personnel with a link to the survey for review and evaluation. During the testing phase, the project team made minor edits to the web surveys in an iterative process between reviews and the technical questionnaire analysts. After the team completed revisions to the web survey, they released it into a production server environment and launched it with survey access information to cohort members.

Web surveys provided respondents with a link to a HITECH website with survey results and Frequently Asked Questions. Additionally, the survey contained a project email address for respondents to send inquiries about technical issues or incentive choices and questions regarding the survey.

Additional Pre-Survey Activities

NORC's call center prepared for each survey launch by building a contact file and preparing and training interviewers who would contact potential respondents who had not completed the survey.

Data File Pre-Loads: Call center staff formatted, verified, and tested the contact file including preloads (name, educational institution, date of birth, completion status) for each survey prior to its loading into the computer-assisted telephone interviewing (CATI) system before each web survey launch. In the case of follow-up surveys, call center staff consulted notes from locating efforts during the baseline survey and added the most promising phone number to the data set.

Interviewer Preparation and Training: Early on in the project, the NORC team determined that using a small group of interviewers (3 – 5) would be most effective and efficient for the Workforce Program evaluation surveys. The NORC team selected a group of interviewer candidates from top performers on other projects. Call center managers then listened to recordings representing the interviewers' previous work and selected three interviewers based on their ability to: (a) use their project knowledge effectively

to deviate from the script when necessary, (b) effectively listen to respondents and appropriately address their concerns, and (c) be personable and respectful with respondents.

Prior to the launch of the first survey, the interviewers attended NORC's general project training. There was minimal staff turnover between surveys and it was more effective to conduct "Skills Building" training instead of a full project training prior to each new survey launch. NORC call center management designed the "Skills Building" as a forum during which they presented interviewers with examples of challenging respondents/situations from previous rounds of the survey and gave them opportunities to creatively approach and respond to each situation.

"Skills Building" sessions lasted one hour and interviewers then participated in 45 minutes of "live dialing" during which interviewers used what they learned to prompt potential respondents while supervisors observed and provided immediate feedback and coaching. After the live dial, the group reassembled to discuss the experience and share any insights.

Survey Launch

When NORC launched each survey, potential respondents received an email including unique personal identification numbers and passwords, as well as the URL of the survey. Respondents who clicked on the URL and entered their identification number and password to proceed with the survey entered a page with informed consent information prior to starting the survey. To ensure that the NORC team gained each respondent's active consent, respondents needed to completely scroll through the text requesting consent and provide confirmation in order to continue to the survey. The informed consent text restated the survey sponsors; the survey administration time; and the facts that survey participation was completely voluntary, that respondents can skip any question, and that there would be no adverse consequences for failure to participate fully.

Prompting

Once each cohort was underway, the NORC team proceeded with email, telephone and mail prompting in order to encourage potential respondents to participate in the survey. Email and telephone prompting were continuous (with telephone starting after email), and the NORC team sent mailings periodically to spur response rates. The following section includes detail on the methodologies for each prompting activity.

Emails

NORC prompted potential study respondents via email every week for each cohort along with several targeted email prompts for specific cohorts. Prepared on Tuesdays, the NORC team sent a mass email to each potential respondent in the sample who had yet to start or complete the survey, each week of any

particular data collection field period. NORC drafted the text so that the study purpose, survey web link, personal identification number (PIN) and password of each respondent, and study contact information were included in each email. The NORC Data Services team sent these mass emails due to the large size of the production list.

NORC also sent targeted emails to various cohorts during data collection. The team sent these emails to specific subsets of each cohort based on a number of factors. In the baseline surveys, NORC sent targeted emails to respondents from low-responding schools and to respondents who withdrew from the program. Targeted emails contained language to explain the need for response from these specific groups and the NORC team sent them in tandem (e.g., one or two days later), with the regular mass email. In the follow-up surveys, the team sent targeted emails to the groups mentioned above, as well as a subset of the sample that previously completed the baseline survey. The team also sent targeted emails to recipients of $2 bill hard copy letter prompts (described below). For the faculty cohort, NORC sent a targeted prompt to respondents who started but did not fully complete the survey. NORC sent these target emails from a project survey specialist's desktop computer as they were smaller subsets of the larger production list and could be easily generated.

Telephone Prompts

The NORC call center began telephone prompting two to three weeks after the launch of each web survey. NORC interviewers prompted sample members on alternate weeks, allowing potential respondents adequate time to read their email and to complete the web survey before receiving another phone prompt. In order to increase the likelihood of reaching potential respondents, the team called them primarily in the evenings (after 4:00 PM Monday through Thursday and after 2:00 PM on Sunday).

Strategies: NORC's primary prompting strategy was for interviewers to avoid reading directly from a script and instead talk casually with potential respondents. To accomplish this, interviewers worked to improve their knowledge of the Workforce Program and health IT so they would be comfortable conversing about these topics.

Scripts: Along with familiarizing themselves with the subject area, the prompters used several variations of a script when speaking with the sample members. Initially, they used a general script that introduced the study and asked sample members whether they received an email prompt. If individuals had not received the email, prompters would describe the study in detail and send another email with the link, PIN and password for the survey. Additionally, whenever the prompters spoke with sample members, they would confirm contact information as well as encouraging sample members to complete the survey.

Messages: The NORC team frequently modified scripts for voicemail messages to keep them sounding fresh and compelling. Interviewers routinely suggested script changes based on their experience speaking with respondents and based on the most recent email prompt.

Hard Copy: During the last few weeks of each field period NORC discontinued prompting through the CATI system and put all outstanding cases onto hardcopy forms. The front of the form recorded prompting activities and the back recorded locating activities. Supervisors reviewed the history of each hard copy case and recommended strategies before giving them to prompters for a first hardcopy dial. The integration of prompting and locating activities on one form made it easy for supervisors and interviewers to review the entire history of a case and decide the most effective next step.

Survey Closedown: During each week the NORC team expected the survey to close, the NORC call center management met with interviewers to solicit their suggestions for script changes. Based on these suggestions, managers allowed interviewers to focus on different themes, including: (a) a HIMSS Membership or Amazon Gift Card incentive, when applicable; (b) a recent letter containing a $2 bill; and (c) the innovative "Guilt is Good" campaign during which interviewers conveyed to respondents that many of their peers had already completed the survey and the importance of their response.

Mail Prompts

In order to reach potential respondents who the team could not successfully reach to prompt via email or phone, NORC sent several mail prompts over the course of data collection field periods for most of the cohorts. These letters detailed the importance of the study as well as the information needed to access the survey. The NORC team drafted the language for these letters and received approval from ONC prior to mailings. NORC sent targeted letters during specific cohort field periods to sub-samples of low responding schools as well as sample members who had withdrawn from the program. For the UBT Cohort 2 follow- up survey, NORC mailed targeted letters to both respondents who completed the baseline and those who did not.

Several of the mailings (sent near the end of particular field periods), included a $2 bill as an incentive to complete the survey. These mailings were sent out in the following cohorts: CCC Cohort 2 Baseline, CCC Cohort 2 Follow-up, CCC Cohort 3 Baseline, CCC Cohort 3 Follow-up, and UBT Cohort 3 Follow-up.

Data cleaning and delivery

For each of the 12 student surveys, as well as the faculty survey, NORC cleaned and delivered a dataset. For the student and faculty surveys, the team constructed and delivered files in SAS and Excel, for both

numeric and character (verbatim) variables. The team also delivered SAS and text format files along with a SAS program to read the datasets.

NORC also included SAS output files with frequencies for both numeric and character variables, along with PDF format files containing the questions from each of the particular surveys. The questionnaire files include question text, variable names, skip and programming instructions. A PDF format file containing notes describing cleaning decisions and reserve (missing value) codes is also part of each delivery.

The analysis datasets did not include personal information such as first names, last names, and birthdates. Data cleaning notes cited questionnaire revisions along with information for variables associated with new or moved questions.

Additional Activities

In addition to the survey activities previously described, the NORC team performed a number of additional tasks in order to manage the survey data and increase respondent response rates.

Data File Management

The NORC team updated a file indicating the disposition of each case on a daily basis. Call center and research staff used this information to determine which cases to target for prompting and locating. NORC also used this file to monitor suspended cases (respondents who started but had not completed the web survey).

Locating

Interviewers began locating efforts several weeks into each field period and concentrated on locating phone numbers for potential respondents who had yet to complete the survey and who NORC could not reach by phone. Locating protocols differed during baseline and follow-up surveys.

Baseline

NORC began data collections for the baseline surveys by contacting the sample members using the original information provided by ONC. For UBT students, this information included mailing address, email address and phone number. For CCC students, ONC's contact information contained an email address and phone number but due to confidentiality agreement with the member colleges, ONC only provided a zip code (not the entire address).

Identifying Cases to Locate. Throughout data collection, the NORC team monitored the reliability of the original contact information carefully. Determining reliability depended on the type of contact

information. The team coded undelivered emails or those that "bounced" as needing a new email address. For telephone prompting, when the NORC call center flagged any number in which dialing resulted in a disconnected number, a wrong household, a fast busy, or a constant ring but no answer. The team flagged any letters mailed by the team and returned to NORC undelivered in order to locate a new street address. Once NORC identified an unreliable a piece of contact information, the team began locating.

Obtaining New Contact Information. For the cases that needed updated contact information, NORC relied on two sources, ONC and locating. The initial source of reliable contact information came from ONC. At the beginning of the study, ONC obtained the most up-to-date contact information from participating schools and forwarded the files to NORC. ONC provided updates to these files on a regular basis. The NORC team incorporated new contact information from these files into a database and used them for initial contact with potential respondents. Then, for cases that the team could not reach using ONC's information, NORC used the Internet to search for current information.

Locating. The NORC team executed online searching for sample members' contact information in three phases during data collection. The first phase included the use of free Internet search engine websites such as Whitepages.com, Spokeo.com, or Google.com, applying the most basic search techniques such as entering the respondents' first and last names and searching primarily for phone numbers. This method was conducted by the interviewers with their level of effort being minimal.

For phase two, the NORC team utilized a more robust search engine, Accurint® (a LexisNexis® database service contracted by NORC that provides direct online connection to public records and credit bureau information) to apply a greater variety of searches, such as first and last name, ZIP code, reverse phone number, birthdate to find new and/or more current contact information. Although there is a small cost of using Accurint®, the results were cost effective. Because many of the sample members were in the workforce, possess a credit history, and have an established career, NORC found up-to-date contacting information including addresses, phone numbers, cell phone numbers, and email addresses.

During locating, when the NORC team found new contact information, the team promptly mailed letters to cases that yielded a new street address, emailed prompts to cases with new email addresses, and called new phone numbers.

Finally, during the last few weeks of data collection, NORC conducted a careful review of the non-respondents to identify those grantee/member colleges that had a lower-than-average response rate. NORC targeted cases within these low-response rate colleges and implemented a more complex and intricate locating strategy for this third phase that involved a combination of Accurint® and the Internet to

conduct reverse email and address searches, relative, co-worker, and employer searches, as well as company searches. This third phase of locating typically resulted in additional completed surveys resulting in achieving desired response rates.

Follow-up

To determine the best method of contacting sample members during follow-up surveys, NORC ranked the contact information according to relevancy. For those respondents who completed the baseline survey, NORC ranked contact information number one and used it to make initial contact for the follow-up survey. For sample members who did not complete the baseline or did not provide updated contact information, the team used the most recent information available. If during the baseline, NORC obtained new information from ONC, the team used this. NORC then reviewed new email addresses, mailing addresses or phone numbers that were located during the baseline. If the respondent did not complete baseline and NORC did not obtain new information through locating or from ONC during the baseline, the team used the original contact information provided by ONC.

As with the baseline, NORC carefully monitored the contacting information and conducted locating on the contact data that was determined not reliable, i.e., bounced emails, returned mail, and disconnected phone numbers. NORC slightly modified the follow-up locating by prioritizing locating efforts according to the baseline completion status. Because those who completed the baseline were more likely to complete the follow-up, the team conducted locating on these cases first. Then, cases that did not complete the baseline - but that had been successfully contacted during the baseline (that is, spoke to the respondent on the phone, mail was not returned as undeliverable, emails did not bounce back), received locating. Finally, cases for which NORC never made contact during the baseline, or that refused to participate during the baseline, were located. NORC found that this locating strategy was the most efficient and cost effective. Conducting locating efforts first on the most-likely-to-complete cases, proved to be more likely to yield new and accurate contact information.

Suspended Cases

A suspended case is a survey in which the respondent logged in but did not complete the survey to the end. NORC identified suspended cases on a weekly basis and referred them to prompters who called the respondents, specified where the respondent broken off and offered to answer any questions or address any difficulties the respondent had with the survey, and encouraged them to complete the web survey.

800 Line

NORC setup a toll-free telephone line for the project to respond to incoming calls. The call center supervisors checked for voice-mail messages each day. On average, two calls came in each week. The majority of calls were in response to a voice-mail message left by one of the prompters.

Incentives – Amazon, HIMSS membership

NORC offered incentives to respondents in the CCC cohorts for their participation in the survey. For the baseline cohorts, the initial incentive included a free one-year membership to the Healthcare Information and Management Systems Society (HIMSS). With the membership to this professional association, respondents gained access to: continuing education and professional certification; weekly and monthly newsletters; discounts to HIMSS conferences and exhibitions as well as the HIMSS bookstore; a quarterly peer-reviewed journal; and network opportunities with the local chapter. Once respondents completed the survey, they received a link that allowed them to register for a one-year membership at no cost. If respondents were already members, the link allowed them to extend their membership for an additional year at the student member level.

In order to increase the response within the community college cohorts, NORC also offered a $25 Amazon.com gift code to the baseline cohorts approximately halfway through data collection for each survey. Through prompting, we let respondents know that if they preferred a $25 Amazon code in lieu of the HIMSS membership, they were to email the project at HITWorkforce@norc.org and ask for a code. The NORC team processed these requests on a daily basis and documented the codes in a secure project folder.

During data collection for the CCC follow-up cohorts, NORC offered respondents the $25 Amazon.com Gift Code and instructed them to email the project mailbox to redeem a code. The project team also processed these requests on a daily basis. If a respondent preferred a HIMSS membership, they were instructed to email the project to satisfy their preference. These respondents were then provided the link necessary to redeem the free membership.

NORC did not offer incentives to either university based cohorts (both baseline and follow-up) or the faculty cohort.

Qualitative Data Collection

As described previously, NORC engaged in a number of qualitative data collection activities during the evaluation of the Workforce Program. These activities include site visits with CCCs and UBTs, focus

groups with exam takers and interviews with grantee leadership. We describe methods for these activities below.

Site visit selection and recruitment of participants

To inform the site-selection process for both rounds of site visits with CCCs, the NORC team held conversations with the leads of each community college consortium. Next, NORC considered a range of selection criteria for the college. Criteria included: the areas in which colleges were located (to help ensure a geographically diverse collection of sites in terms of both location and whether they serve primarily rural or urban students); the particular Workforce Program roles for which training was offered; the number of students enrolled and early attrition rates; and state unemployment rates. The team also looked for schools that offered at least some in-person courses in order to make it easier to meet with a significant number of students and faculty members during the visits. For four schools that offered only online training, NORC conducted "virtual site visits." As part of the second round of site visits, NORC also re-visited two schools that were part of the first round as well. Based on these criteria and the qualitative information gathered from the consortium leads, NORC selected schools to visit from each region.

The NORC team completed site visits with all nine of the UBT grant recipients during two rounds of visits, eight of which were in-person visits. For the one school that did not generally offer in-person learning, the team conducted a "virtual site visit," during which we held all of the conversations via teleconference.

For both CCC and UBT site visits, the NORC team counted on program leadership to recruit administrative teams, career counselors, faculty members, students, and local employers to participate in discussions with NORC.

NORC worked with NOVA to recruit individuals to participate in focus group discussions about the competency examination. NORC scheduled some of these discussions shortly after the individuals had sat for the exam in order to capture their thoughts while the exam was still fresh in their minds. The NORC team conducted the remaining focus groups several months following the release of exam.

Preparation for Qualitative Data Collection

Prior to starting any of the qualitative data collection activities, NORC discussed with ONC the goals and objectives for the activity and the types of information the team hoped to learn during each discussion or focus group. The NORC team then drafted protocols for each category of discussion (e.g., focus group,

discussion, or interview), revised them to reflect any feedback collected, and received approval from ONC.

Obtaining Participants' Consent

Prior to beginning any discussion, focus group, or interview, the NORC team asked individuals for a verbal informed consent to participate. To do this, the NORC team described the evaluation purpose, its sponsors, and the role of NORC. The team then defined the amount of time it would take to participate, and informed individuals that participation was voluntary, any question could be skipped, that failure to fully or partially participate had no adverse consequences and that they could stop participating at any time. The NORC team assured participants that their comments would remain anonymous, and explained that the results would be reported only in the aggregate to ensure their willingness to participate in the discussion. As a part of the consent process, NORC also informed all discussion participants that team members would be both taking notes and audio-recording the discussions in order to accurately capture the feedback received. The team asked participants if they had any questions and asked each participant to confirm their consent to participate in the discussion.

Data Analysis

NORC completed data analyses in addition to calculating descriptive statistics of survey and administrative data in order to help identify factors associated with program completion rates and employment. The CCC survey data were weighted to ensure that the survey sample was representative of the entire population of CCC students with respect to their distribution among the five consortia and rates of program completion. The UBT survey data were not weighted as the survey was conducted among a census of students in that program.

Typology

After examining findings from both quantitate and qualitative data collection activities, the NORC team noted substantial variation in how the schools organized their programs. In order to describe key characteristics of the participating community colleges, the team decided to perform a typology analysis. The team designed the typology to explore the factors associated with low completion or graduation rates, as well as whether those colleges with significantly lower completion rates were disproportionately likely to be in a given region or regions. The team applied the following approach:

1. NORC working with ONC determined the most important variables (orientation, role sequencing, learning format, hands-on opportunities, internship opportunities, previous employment experience, for-credit classes, full/partial reimbursement for classes, total number of roles offered, and the size of the student population.
2. ONC facilitated the collection of data by contacting consortia directly.
3. The team tested ten college characteristics (mentioned in step one) for statistical significance based off program completion rates.
4. Four of those ten characteristics previous employment experience, for-credit classes, role sequencing, and learning format, were significant and then used to for clustering based off a common approach (across regions). In addition, the analyses assessed whether this variation was related to student completion rates as well as whether completion rate and profile membership differed by location, state unemployment rate, and meaningful use payments to eligible providers per county.
5. The team estimated models with an increasing number of profiles and compared them with respect to model fit.
6. Upon selecting the "best" fitting model, we explored whether the profiles differed with respect to student completion rates.
7. Based on the results from step six, we further explored whether the profiles differed with respect to location, state unemployment rate as well as meaningful use payments to eligible providers per county.

Regression Analysis

The NORC team estimated the association between predictor variables and multi-category employment variables using a multinomial logit model. This model creates a simultaneous estimation of binary logistic regression models for all possible comparisons among the outcome categories. Using the category "not working" as the reference variable, association coefficients are expressed as odds ratios. In this regression model, sampling weights were incorporated to reflect the complex sampling frame and robust standard errors were estimated to acknowledge the lack of independence due to students' nesting within community colleges.

Timeline

The NORC team started data collection for the Workforce Program evaluation with the CCC baseline survey in March of 2013. Exhibit 7 contains the matriculation dates as well as sample size, number of

respondents, response rate, and field period for each of the CCC surveys. Exhibit 8 contains the same information for the UBT surveys.

Exhibit 7: CCC Survey Characteristics

	Baseline			Follow-up		
	Cohort 1	Cohort 2	Cohort 3	Cohort 1	Cohort 2	Cohort 3
Matriculation Date(s)	8/2010-11/2010	12/2010-3/2011	4/2011-11/2011	8/2010-11/2010	12/2010-3/2011	4/2011-11/2011
Sample size	623	616	682	623	616	682
# of respondents	481	465	450	463	419	436
Response rate	77%	76%	66%	74%	68%	64%
Field period	3/2011-7/2011	8/2011-12/2011	4/2012-8/2012	11/2011-3/2012	3/2012-8/2012	1/2013-5/2013

Exhibit 8: UBT Survey Characteristics

	Baseline			Follow-up		
	Cohort 1	Cohort 2	Cohort 3	Cohort 1	Cohort 2	Cohort 3
Matriculation Date(s)	9/2011	1/2012	9/2012	9/2011	1/2012	9/2012
Sample size	477	124	440	477	124	440
# of respondents	360	96	325	340	94	311
Response rate	75%	77%	74%	71%	76%	71%
Field period	8/2011-11/2011	12/2011-2/2012	8/2012-11/2012	4/2012-8/2012	8/2012-11/2012	4/2013-8/2013

The CCC faculty survey was in the field from September through December 2011. NORC completed one round of focus groups regarding the competency exam in November of 2011 and the second round in April 2012.

The NORC team's first round of site visits to CCCs occurred in the summer and fall of 2011, with the second round following during the spring and summer of 2012. Exhibit 9, below, contains a list of the colleges NORC visited during each round of visits organized by region. Except where noted, each site visit included the full range of focus groups and interviews detailed above.

Exhibit 9: CCC Site Visits, by Region

Site Visit Round	College
	Region A: Northwestern Region
1	Bellevue Community College* (spoke with consortium director only)
1	Lake Region Community College
1	Lane Community College (spoke with faculty only)
1	Mt. Hood Community College (spoke with faculty and observed an in-person class)
1	Portland Community College
1	Umpqua Community College (spoke with faculty only)
	Region B: Western Region
1	East LA Community College
1	Los Rios Community College* (spoke with consortium leadership team only)
1	Maricopa-Gateway Community College
1	Orange Coast Community College
2	Pima College
	Region C: Midwestern Region
1	Cuyahoga Community College*
1	Macomb Community College
2	Milwaukee Area Technical College
	Region D: Southern Region
1	Midland Community College
1	Pitt Community College* (spoke with consortium director only)
1	All member schools (spoke with program directors only)
1 & 2	Atlanta Technical College
2	Dallas County Community College District
2	Houston Community College
	Region E: Northeastern Region
1	Community College of Baltimore County
1	Tidewater Community College*
1	Selected member schools (spoke with program directors only)
1 & 2	Community College of DC
2	Bronx Community College
2	Westchester Community College

NORC completed site visits to five of the nine UBT grantees from July 2011 through November 2011 and visited the remaining four UBTs during October and November of 2012. Exhibit 10, below, contains a list

of the universities NORC visited during each round of these visits. Additionally, NORC conducted progress calls with leads from each program component in January 2012, the summer of 2012, and the summer of 2013.

Exhibit 10: UBT Site Visits

Site Visit Round	University
1	Oregon Health and Sciences Johns Hopkins Indiana Columbia Duke
2	Colorado (virtual) Texas State George Washington Minnesota

4. PROGRAM OF ASSISTANCE FOR UNIVERSITY-BASED TRAINING (UBT)

Chapter Summary

In April 2010, ONC awarded one-time grants of 39 months in duration, totaling $32 million nationwide, to nine institutions of higher learning to assist in the creation and expansion of post-baccalaureate certificate and/or master's-level health IT training programs. Together, these colleges and universities formed the University-Based Training (UBT) Program, designed to rapidly and sustainably increase the availability of individuals qualified to serve in specific health IT professional roles requiring specialized training at the post-baccalaureate level.

Universities took a variety of approaches to designing and implementing their programs and utilizing the prescribed funding. In shaping their programs, several universities forged partnerships with one or more other institutions to form a consortium. In these instances, the collaborating institutions had an existing relationship based on previous collaborations and sought to leverage each participating school's programmatic strengths. Universities opted to use their grants in a number of ways, including to create new master's and certificate training programs, enhance previously existing capabilities and programs, transition programs to an online format, provide financial support and a limited number of stipends for qualified students, and to hire additional faculty and administrative personnel.

Universities trained students across six Workforce Program roles at both the certificate and master's levels, and offered the health IT training via part-time and full-time programs. Grantees housed their programs in a variety of schools within their institution, and reported that their various health IT training programs attracted students with different backgrounds and degrees of work experience, depending on which school housed the program. While all schools used funds to provide scholarships and tuition assistance to students, programs differed in the share of students' tuition covered. Universities also experienced varying degrees of success in recruiting students for their different programs and found that cost might be a factor.

Schools reported varying degrees of preparedness among student entering the training programs, particularly among certificate program students who believed that a certificate program (as opposed to a master's) would neither require a large time commitment nor include rigorous coursework. Grantees found that communicating the rigor of the program during the application process and during student orientations an extremely valuable way to set student expectations regarding the workload. Most UBT

faculty members teaching in the programs were at the universities prior to the grant; however, many also had industry experience, which helped in providing students with real-world experience. Grantees also found success in helping students make industry connections by using guest lecturers to supplement faculty members' knowledge and perspectives.

Although most UBT programs used some form of online learning, universities employed a variety of platforms and structured their online learning in different ways. Some universities used self-paced online learning, while others used a more formal, structured format. Further, a number of UBTs used a hybrid approach, which included both in-person and online training either by requiring a mix of in-person and online courses, or by allowing students to choose whether to participate online or in-person. Students taking courses via the online platform appreciated the flexibility it offered, but also desired more opportunities for networking and hands-on training.

Most students were working professionals enrolled in the training program on a part-time basis and enrolled due to their motivation to find a new job or improve their skills and potential for promotion in their current job. UBT programs utilized group projects to provide students with opportunities to learn from one another. Approximately half of the UBT programs required internships or practica for their students, which offered an excellent way for students to gain the type of hands-on experience that proved critical in helping students secure employment following graduation.

As of December 2013, 1,704 individuals had completed the program and 86 individuals were enrolled in the training. Grantees reported that the UBT attrition rates were similar to the universities' other programs. Students expressed high rates of overall satisfaction with their UBT program as well as with the curricula and instructors. UBT faculty had similarly positive feedback about the program and felt the students were adequately prepared for the health IT workforce.

Students were more likely to be employed and in particular, employed in or with responsibilities in health IT, after completing the UBT training. At baseline, 64 percent of respondents reported having a job and 35 percent a job in health IT. At follow-up, 89 percent of respondents were employed and 64 percent were employed in health IT. Students employed in health IT were most likely to be working in a hospital setting, as well as in another provider setting or organization. Students who were seeking a job felt strongly that the skills they learned in the program would help them obtain a job in health IT and perform well in it. Similarly, students employed in the health field believed that the skills they learned would improve job performance and their potential for a promotion. Many students with the same employer as

prior to entering the program who had received a salary increase, new job title, or promotion believed this was attributable to their participation in the program.

Employers emphasized the importance of both hands-on training and real-life experience as essential to preparing individuals for the health IT workforce. Despite some indications of employer awareness of the program due to UBTs outreach, employers expressed concern that many are unaware of the program and are not sure how to gauge the market value of the training. In contrast, employers who had hired graduates of the programs felt the UBT graduates were well-equipped for the health IT workforce, and were very pleased with their performance and the knowledge they brought to their organizations.

The feedback collected through NORC's quantitative and qualitative research demonstrates that the UBT programs enabled universities to expand existing and/or develop new certificate and master's health IT training programs. Further, the UBT programs provided students with training that helped many find employment in health IT.

Introduction and Background

The Program of Assistance for University-Based Training (UBT Program) awarded $32 million in grants to nine universities with the goal of training 1,700 students over the course of the grants.[23] These universities aimed to rapidly increase the availability of individuals qualified to serve in specific health IT professional roles requiring university-level training. Funded in April 2010, the universities helped to train approximately 1,790 individuals as of December 2013. The UBT Program targeted students with no previous health IT experience and provided funds to universities located in geographically diverse areas of the country and in different health care markets with varying degrees of health IT penetration Exhibit 11 includes the universities and the amount of funding each received.

Exhibit 11: Universities and Funding Allotment

Institution	Funding Amount
Columbia University	$3,786,677
University of Colorado Denver, College of Nursing	$2,622,186
Duke University	$2,167,121
George Washington University	$4,612,313
Indiana University	$1,406,469
Johns Hopkins University	$3,752,512
University of Minnesota	$5,145,705
Oregon Health & Science University	$3,085,812
Texas State University	$5,421,205
Total	**$32,000,000**

Source: Based on information provided on the ONC UBT website: http://www.healthit.gov/buzz-blog/university-based-training/ubt-program-preparing-health-leaders-tomorrow-today/ and in the Funding Opportunity Announcement.

This chapter reports findings on three core research questions:

1. What processes did the grantees use to implement the programs and meet program goals? (e.g., barriers, lessons learned, successful strategies, coordination, program satisfaction)
2. To what extent did the grantees meet the requirements of the Workforce Program? (e.g., implementing new educational programs, matriculating and training the expected number of students, developing adequate curriculum materials, and developing and administering a competency exam)
3. To what extent did participants in the program gain and maintain employment in health IT? (e.g., job placement, job retention, salary, promotion, job readiness, employer needs)

To answer these research questions, the NORC team gathered information on program implementation, program design, program effectiveness, and student characteristics from site visits and in-depth interviews, surveys of UBT students, and program administrative data. The methodology portion of the Evaluation Overview section of this report details these data sources, and the operational aspects of those data collection and analysis activities.

Program Implementation and Organization

Site visits and discussions with UBT program administrators were instrumental in understanding how each grantee organized and implemented their training programs. The following section details how the universities designed their training and implemented their programs. The UBT administrative data supplement this information by providing demographic information on the students who enrolled.

Implementation

This section describes factors related to the grantees' implementation processes including their history of providing health IT training, start-up processes, and the formation of partnerships among multiple universities in some instances.

History of Providing Training

Prior to receiving funding, all of the grantees offered some type of graduate program in health IT, including two that previously had National Library of Medicine (NLM) programs in place. In two of the four instances where multiple schools formed a consortium to apply for funding, some of the schools in the consortia had not offered graduate programs in the field prior to receiving the grant. Most of the schools noted that they were planning to create new or expand their existing health IT training programs prior to the funding announcement, and that the Workforce Program grants helped them to realize these plans. Given the grantees' health IT backgrounds and plans for future activities, most believed the grant was a "natural fit."

Start-up Processes

In preparation for the funding, a number of grantees created advisory boards to prepare for and implement their health IT programs, as well as to help determine the particular UBT roles on which to focus. These advisory boards included representatives from academia, the health IT industry, the local Regional Extension Center (REC), and hospital and outpatient clinical settings. Principal investigators and program leadership teams reported that these groups were helpful in providing the necessary feedback and perspectives to make more informed decisions about the direction of their programs. Although none of the UBTs that reported convening advisory boards prior to the program mentioned utilizing them throughout the period of grant funding, they did indicate that some individuals on the advisory board stayed involved (e.g., faculty on the advisory board taught classes in the program and health IT industry representatives offered internships or practica for students). Further, a number of schools discussed convening similar advisory boards to ensure their programs and curricula remained timely and relevant. All grantees reported selecting the UBT roles for which they would provide training based on their existing capabilities and programs.

Overall, grantees encountered relatively few problems as they implemented their programs. Several program administrators reported planning programs under the assumption that most students would matriculate as full-time students, but then needed to modify programs as they realized that many students were also working full-time. Most programs continued to refine the curriculum and their programs from one cohort to the next. Grantees felt that student feedback was integral to this process, citing examples of

how student evaluations of early courses led to changes in the curricula and in how faculty communicated with students. Another grantee described how feedback from the first cohort of master's students persuaded them to change the learning format and the amount of time devoted to the practica and specific health IT topics.

Forming a Consortium

Four of the grantee universities forged partnerships with one or more other institutions in applying for the UBT grant. In these instances, the collaborating institutions had an existing relationship based on previous collaborations and sought to leverage each participating school's programmatic strengths. While such schools collaborated to implement their training, their programs were separate from one another. Grantees felt that cross-university application for and receipt of grant funding "forced" the collaborating universities to share strategies for success and lessons learned, and improved each of their individual programs in turn.

Use of UBT Grant Funding

Across the nine grant recipients, the UBT grantees received a total of $32 million in funding, ranging from approximately $1.4 million to $5.4 million per grantee. The grantees used the funds to expand their existing health IT programs or to create new programs, and all believed the money was integral to their programs' growth. All but one of the universities created additional certificate and master's programs; instead, this remaining grantee added additional requirements to existing programs. Several grantees used the money to adapt their existing in-person courses to online formats or to revise existing course materials. Some programs spent funds to train faculty who would be teaching online for the first time and thus needed to adjust their typical approach to teaching, interacting with students, and presenting course materials. A number of grantees used funds to hire staff for their UBT training programs, including project coordinators, career counselors, and new faculty. Some grantees also used the funds to pay for student recruitment efforts including online and print advertising via universities' newsletters and websites; social networking sites such as Facebook and LinkedIn; and at professional and trade conferences.

Program Design

Prior to launching their health IT training, each UBT designed and organized their respective training programs. This section details common themes and differences among schools in their organization and infrastructure, faculty, learning platforms, and career services.

Organization and Infrastructure

The training programs varied on a number of factors, including the integration of the Workforce Program's roles across the grantees' multiple health IT programs (Type I – certificate vs. Type II – master's), use of the Workforce Program's grant funds, student recruitment, and use of group projects and internships or practica.

Workforce Program Roles. The training funded universities to focus on six roles developed by ONC in order to meet the perceived health IT needs of employers. Although each program chose different roles on which to focus, UBTs looked to recruit similar types of students to receive training across roles. Most programs sought out—and the roles were specifically geared toward—individuals with either previous professional health or IT training and work experience. Descriptions of the roles on which the UBT programs focused are described in Exhibit 12 below.

Exhibit 12: University-Based Training Roles

Role	Vision	Background/General Requirements
Clinician/Public Health Leader	Lead the successful deployment and use of health IT to achieve transformational improvement in the quality, safety, outcomes, and thus the value, of health services.	Physicians or other clinical professionals (e.g., advanced-practice nurses, physician assistants) **or** hold (or be enrolled in) a master's or doctoral degree(s) in public health or related health field. Generally required at least one year of study leading to a university-issued certificate or master's degree in health informatics or health IT, as a complement to the individual's prior clinical or public health academic training.
Health Information Management and Exchange Specialist	Support the collection, management, retrieval, exchange, and/or analysis of information in electronic form, in health care and public health organizations. Not expected to enter directly into leadership or management roles.	Generally required specialization within baccalaureate-level studies **or** a certificate of advanced studies **or** post-baccalaureate-level training in health information management, health informatics, or related fields, leading to a university-issued certificate or master's degree.
Health Information Privacy and Security Specialist	Serve as institutional/ organizational information privacy or security officers.	Generally required specialization within baccalaureate-level studies **or** a certificate of advanced studies **or** post-baccalaureate-level training in health information management, health informatics, or related fields, leading to a university-issued certificate or master's degree.

Role	Vision	Background/General Requirements
Research and Development Scientist	Support efforts to create innovative models and solutions that advance the capabilities of health IT, and conduct studies on the effectiveness of health IT and its effect on health care quality. Individuals trained for these positions could also accept positions as teachers in institutions of higher education including community colleges, building health IT training capacity across the nation.	Generally required a doctoral degree in informatics or related fields for individuals not holding an advanced degree in one of the health professions, **or** a master's degree for physicians or other individuals holding a doctoral degree in any health professions for which a doctoral degree is the minimum degree required to enter professional practice.
Programmers and Software Engineer	Serve as architects and developers of advanced health IT solutions. Would be cross-trained in IT and health domains, thereby possessing a high level of familiarity with health domains to complement their technical skills in computer and information science.	Generally required specialization within baccalaureate-level studies **or** a certificate of advanced studies **or** post-baccalaureate-level training in health informatics or related field, but a university-issued certificate of advanced training in a health-related topic area was also appropriate for individuals with IT backgrounds.
Health IT Sub-Specialist	Complement the work of the Research and Development Scientists described above, and possess a deep understanding of an external discipline, as it applies to health IT. Expected to find employment in research and development settings, and could serve important roles as teachers.	Generally required successful completion of at least a master's degree in an appropriate discipline other than health informatics, but with a course of study that closely aligns with health IT. Such individuals' original research (e.g., a master's thesis) would be on a topic directly related to health IT.

Notably, some of the universities slightly modified the ONC roles to fit their existing programs. As a result, some students received training in medical informatics or as a health services generalist.

Integration of Health IT Programs. While grantees administered multiple training programs, including certificate (Type I) and master's (Type II) programs, the universities took different approaches to integrating these programs. One grantee formed certificate programs in their Schools of Medicine, Nursing, and Public Health, and created a core set of courses that students across all programs were required to take. The grantee commented that their various programs provided different types of training and attracted students with different backgrounds, depending on which school housed the program. Another school described their certificate program as being more applied than their master's program, covering only the "essentials" of health IT. Students could complete this certificate program on a part-time basis whereas the master's program required full-time enrollment. One university with a master's

program housed in its School of Business noted that, although the program attracted students more interested in business, the students were very pleased with a separate degree that allowed them to concentrate on informatics.

Integrating Health IT Programs Across the University
One school reported establishing a Center for Health Informatics to connect the health IT programs across the different university components and departments. The Center served as a tool for collaboration as well as ensured that programs were aligned and that classes originating in different areas of the university were complementary and not overlapping in content.

Course Content. Faculty members at many universities reported using existing materials for courses newly created under the UBT program. For programs that added new courses or modified existing coursework, faculty looked to the literature, best practices, and informatics professional guidelines for material.

UBT faculty used a variety of materials as vehicles for course content. These included didactic lectures with slides, reading assignments (e.g., from textbooks, the health IT literature, media, federal laws and regulations), and case studies. Faculty members at several universities also reported using commercial and open-source software in their classes. While some programs persuaded EHR and health IT software vendors to donate their products to be used as part of hands-on learning opportunities, other universities used a free, web-based EHR product called Practice Fusion that allowed them to practice manipulating an EHR and complete projects using de-identified patient data. Faculty also used a number of methods to assess students' understanding of course content including quizzes and exams, writing assignments, and group projects. Most of the UBTs incorporated group work in their programs' courses and reported using a team-based learning approach in which programs placed students with diverse backgrounds into small groups for more "real world" experience.

Student Recruitment and Application Process. UBT administrators reported advertising their programs in a variety of ways, including in the universities' newsletters and websites; social networking sites such as Facebook and LinkedIn; at professional and trade conferences; through email and print advertisements; and via word-of-mouth. One leadership team experienced varying degrees of success in recruiting students for their different programs and noted that cost might be a factor. For instance, the program leadership surmised that their certificate in the School of Nursing was very popular because nurses can typically receive funding for educational programs through the hospitals where they work.

The UBT programs' application processes were similar to those used for the universities' other graduate programs. Applicants were typically required to submit an application form, essay, transcripts, and letters

of recommendation. Further, one certificate program also required applicants to interview in-person. Administrators from this certificate program reported looking for applicants who exceled in "soft skill" areas including communication because they believed a major role for their graduates in the health IT workplace is serving as the translator between clinical and IT staff.

Financial Support for Students. All grantees used funds to provide scholarships and tuition assistance to students. Programs differed in the share of students' tuition covered (ranging from partial to full coverage) and whether they provide students with a stipend. Although all grantees used some of their funding to supplement student tuition, not all health IT students received funding. For instance, since prior health IT experience disqualified applicants from receiving UBT funds, admitted students with such a background in the field were not eligible for this assistance, but could receive training.

NORC baseline surveys asked UBT students if they used any of the following sources of financial support to enroll in the program: a UBT program grant, fellowship or scholarship, government grant, other grant, internship/traineeship, student loan, private loan, personal earnings and/or savings, employer reimbursement or assistance, and other sources of financial support. If a student selected more than one source of financial support, NORC asked which source provided the most support. Across the three cohorts at baseline, 51 percent of students received a government grant, the most frequent answer. The second most-frequent source of financial support was the UBT grant (43 percent). Additionally, 32 percent of students used personal earnings or savings, 13 percent received employer reimbursement or assistance. Eleven percent either used a fellowship or scholarship or took out a student loan. Two percent of students took out a private loan and one percent of students either received another form of grant or reported other sources of financial support. Less than 1 percent of students received a fellowship or scholarship. Among students who selected more than one form of financial support, 19 percent identified government grants and 18 percent identified the UBT grant as the source of most support.

There was little variation across cohorts in the percentage of students who used the different types of financial support. Across cohorts, the UBT program grant and government grants were the most common forms of financial support. In Cohort 1, the UBT program grant was the primary source of financial support (19 percent). In Cohorts 2 and 3, the primary source of financial support was government grants (18 percent and 20 percent, respectively). Fellowship or scholarship and student loans tied as the overall third-most frequent source of financial support.

Faculty

As stated, while some grantees hired new faculty members, most faculty were already teaching at the universities prior to the UBT funding. While most of the instructors had previous teaching experience, some also had industry experience, as opposed to a strictly academic background. As previously noted, several universities reported needing to hire administrative staff at the grant's outset. A number of UBTs hired grant coordinators specifically for the purposes of the training program. Grantees also reported regularly using industry experts as guest lecturers to augment faculty members' knowledge and perspectives. They felt this exposure increased students' understanding of the material and allowed them to establish valuable industry connections.

Learning Platforms

Universities implemented a spectrum of learning platforms, offering a combination of online and in-person training. According to ONC administrative data, 71 percent of all students were distance learners. Additionally, many of the grantees offered hybrid learning platforms that include both in-person and online training either by requiring a mix of in-person and online courses, or by allowing students to choose whether to participate online or in-person. Some UBTs offered online courses asynchronously (self-paced), whereas others designed their online programs in a more-structured manner. A number of UBTs offered programs exclusively online.

Combining Online and In-Person Learning
Students and faculty at one university praised a learning platform that offered online learning with in-person experiences. Program administrators described offering the program mostly online via recorded lectures, two textbooks, audio files, quizzes, and projects. The program provides a specified time each week for students to call in and speak with a faculty members and ask questions. Once a month, students meet in person for a day. This combination platform offered much of the flexibility of online learning with face-to-face opportunities to form relationships and participate in real-time.

UBTs that used an online learning platform (or online components of hybrid programs) utilized a number of different software programs and technologies (e.g., BlackBoard and TRACS) to create websites with course materials including audio or video recordings of lectures, syllabi, course readings, discussion boards, and links to live class sessions. A number of UBTs used additional techniques to stimulate greater interaction among students such as SecondLife, with students creating avatars and meeting in virtual classrooms or study groups.

NORC's baseline survey asked students about the primary manner in which they participated in the program's courses. Across the three cohorts, 33 percent of students reported participating in a self-paced online course. Twenty-six percent of students reported their primary manner of participation was via

online discussion boards and 17 percent of reported they participated primarily in person. Further, eight percent of students participated primarily via webinars, five percent via video conference, and an additional three percent via another mechanism. The share of students reporting that they were taught via each mode were similar across the three cohorts, with the exception of Cohort 2 in which the percentage of students who participated via online discussion boards increased to 43 percent from 25 percent in Cohort 1 and 23 percent in Cohort 3. Accordingly, the share of students participating primarily in-person decreased in Cohort 2 from 18 percent to 6 percent in Cohorts 1 and 2.

Career Services

Most programs employed career counselors and/or offer services to assist students with their job hunts. The extent of these services differed significantly across UBTs as well as across individual institutions offering programs as part of a partnership with one grantee university. Some programs hired a career counselor dedicated to the students enrolled in a specific training program, while others utilized the counselor to serve all students at the institution (or in the department). Whereas the role of career counselors at some programs was to serve as a resource for students who seek them out, at other programs, the role involved more direct student engagement. At one program, the career counselor reviewed every student's resume and helped place each student in an internship. Another program's career counselor tailored his assistance to specific students to ensure that each student's job search focused on their personal interests and career goals.

UBT programs (or the host universities more broadly) offered employment-related services including career fairs, resume writing and job search seminars, networking advice, listservs, job coaching, LinkedIn and Facebook groups, and one-on-one assistance. Universities also brought in potential employers to give seminars and talks. Online programs made efforts to provide virtual versions of some of these services (e.g., notifying students of a HIMSS virtual career fair), although programs had varying degrees of success in this effort. Additionally, universities often tried to connect students with alumni and encourage them to be active on LinkedIn and Facebook groups. During site visits, UBT administrators reported that many alumni also hired program graduates from subsequent cohorts.

Internships and Practica

Approximately half of the UBT programs required internships or practica for their students. At the universities that did not require them, faculty members and students alike suggested they should be incorporated into the program to ensure that students receive the hands-on training and "real-world" experience that potential employers are seeking. Students participated in internships and practica with a variety of different types of employers including: EHR and other health IT vendors, health IT consulting

companies, hospitals, and other clinical health care settings. During internships and practica, students participated in activities that ranged from shadowing health IT staff to participating in more hands-on health IT implementation. Program administrators at several programs, particularly online programs attracting students from around the country, cited the difficulty of placing students in internships and career counselors noted the amount of time and effort necessary to help find internships for students.

The universities that did have practicum requirements handled them in different ways. The requirements for practicum length and intensity ranged from 10 days full-time to 9-16 weeks part-time. Practicum completion requirements ranged from submitting a paper at the end of the practicum, electronically recording journal entries during the practicum, or simply reporting to work during the length of the practicum. Program administrators also reported differences in the assistance they offer students in finding a practicum or internship placement. At some universities, it was students' responsibility to find an internship/practicum host; at others, faculty members and career counselors were actively involved in placing students.

UBTs offered a number of ways to address early challenges with placing students in internship and practicum experiences. In general, in order to give students as much time as possible to prepare and find an opportunity, the universities introduced the internship/practicum requirement early in their programs. At one university, students completed a goals analysis sheet to help identify their interests and goals to achieve as part of their practicum. Another program paid internship hosts a $2,000 incentive to take on student interns and at least one other program employed a career counselor to find an internship for each student. While the degree of support in finding and securing an internship varied across schools, all programs reported offering some form of assistance (e.g., informal suggestions from faculty of organizations/companies with potential internship opportunities) to students who requested input or guidance.

Students' Characteristics

Students enrolled in the UBT programs came from varying backgrounds, ranged in their degree of work experience, and had different motivations for enrolling. According to the UBT administrative data, the average age of students at the time of enrollment across the program as a whole was 41 years old. Students also ranged in their degree of work or professional experience with some students entering the UBT project straight from undergraduate programs with little to no work experience, and others late-career professionals hoping to transition into health IT. Grantees reported that students' backgrounds tended to vary by the type of program in which they enrolled (i.e., certificate or master's); however, this was not consistent across schools. Program administrators and faculty reported during site visit

discussions that most students had some work experience and that many were working professionals enrolled in the programs on a part-time basis. Exhibit 13, below, provides an overview of student characteristics.

Exhibit 13: UBT Students' Characteristics

	Total Students	% Distance Learners	% Targeted for Public Health	Sex (M:F)	Average Student Age	
					Certificate	Master's
Columbia University	227	95%	12%	.63	43	37
University of Colorado Denver, College of Nursing	156	100%	13%	.24	44	40
Duke University	119	21%	27%	.83	40	41
George Washington University	306	100%	33%	.73	41	N/A
Indiana University	102	15%	3%	.26	43	43
Johns Hopkins University	215	95%	34%	.42	40	30
University of Minnesota	299	57%	18%	.52	40	36
Oregon Health & Science University	176	93%	22%	.59	45	40
Texas State University	430	45%	2%	.84	36	46
Total	**2030**	**71%**	**18%**	**.58**	**41**	**41**

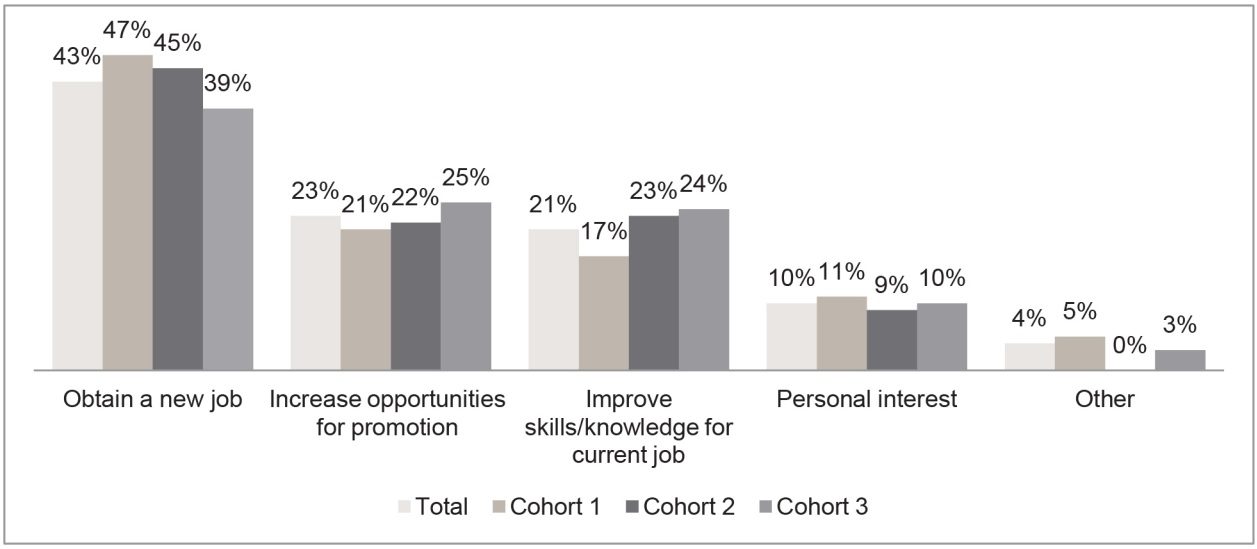
Source: ONC administrative Data, as of December 2013

As part of the baseline surveys, NORC collected information on students' motivation for enrolling in the program. Across student survey cohorts, the greatest proportion of students (64 percent) responded that their motivation for enrolling in the health IT training program was to help them find a new job. Substantial proportions of students also cited the following reasons for enrolling: personal interest (50 percent), improving skills or knowledge for their current job (49 percent), and increasing opportunities for promotion or advancement in their current job (48 percent). Eight percent of students indicated they were motivated to enroll by some other reason. Overall, students responded similarly across the three cohorts.

Of the students who indicated their primary motivation for pursuing an educational program in health IT, 43 percent cited the primary reason was to obtain a new job. As seen in Exhibit 14 below, 23 percent of students indicated their primary motivation for enrolling was to increase their opportunity for promotion or advancement in their current job and 21 percent of students were motivated to enroll in order to improve their skills/knowledge for their current job. As the cohorts progressed, the share of students who identified obtaining a new job as their primary motivation for pursing a health IT educational program

decreased slightly (Cohort 1: 47 percent; Cohort 2: 45 percent; Cohort 3: 39 percent). Conversely, the percentage of students who indicated their primary motivation was to increase their opportunities for promotion or advancement in their current job or to improve their skills and knowledge for their current job increased slightly. These differences across cohorts may be due in part to health IT jobs becoming available and filled as the cohorts progressed due to the industry need created by federal programs such as the Medicare and Medicaid EHR Incentive Programs. Exhibit 14 displays students' primary motivation for enrolling, by cohort.

Exhibit 14: Students' Primary Motivation for Enrolling in the Program, by Cohort



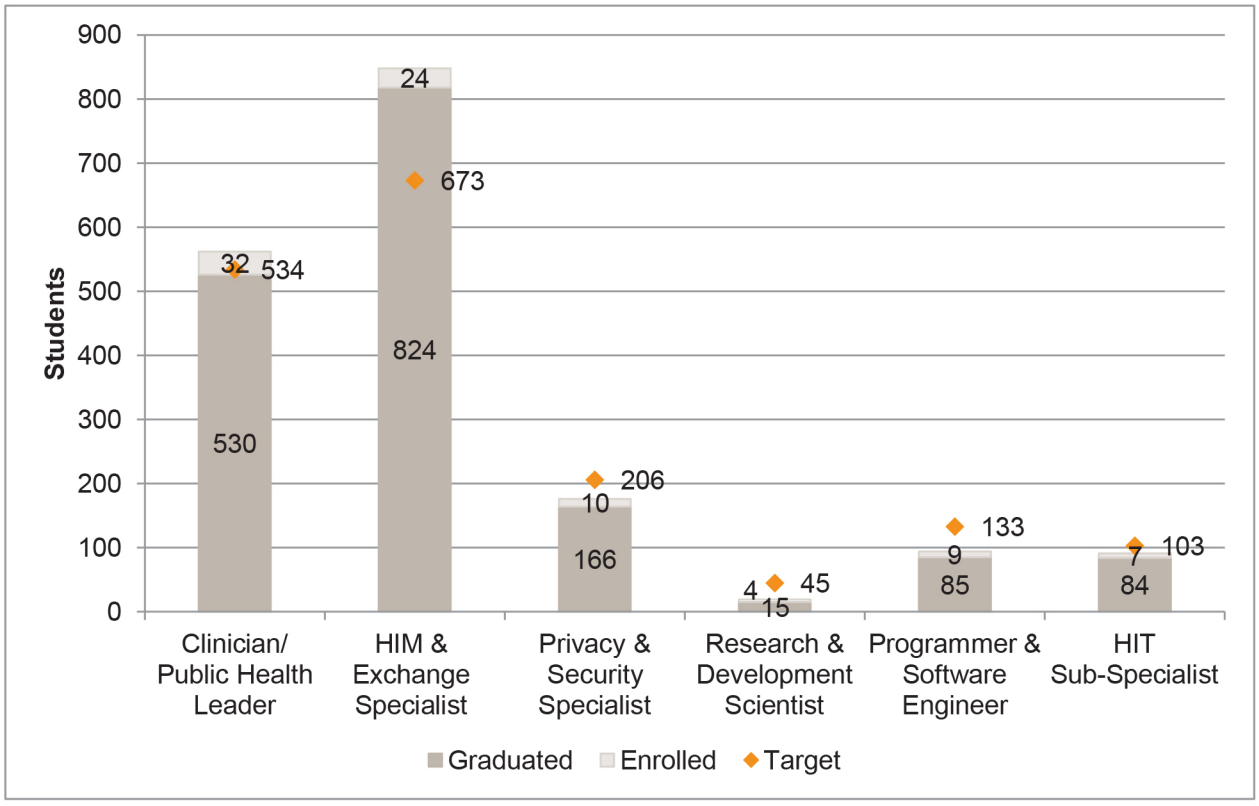
Source: NORC UBT Baseline Survey

Site visit findings supported these survey findings. During focus groups, employed students provided a variety of reasons for enrolling, including a desire to transition to a new career, to gain additional training for jobs they currently held, and to improve their opportunities for promotion or advancement. Several students who were working in the health care field noted they enrolled in the program to advance their knowledge of how health IT can enhance the quality of patient care, to better understand the health care industry overall, and to become more qualified for work related to the meaningful use of health IT. Students coming directly from undergraduate programs mentioned possessing few job prospects with solely a bachelor's degree and looking for a field with job growth.

ONC administrative data provided the number of students trained in each role. The most popular role in terms of numbers of students enrolling in and graduating was the Health Information Management (HIM) and Exchange Specialist role. The Clinician Leader, Public Health Leader, and Privacy and Security Specialist roles followed in popularity. Far fewer students enrolled in and graduated from programs

focusing on the Programmer and Software Engineer, HIT Sub-Specialist, and Research and Development Scientist roles. Exhibit 15 below details the numbers of students graduated from and enrolled, by role (as of December 2013).

Exhibit 15: Number of Students Graduated and Enrolled, by Role



Source: ONC administrative Data, as of December 2013

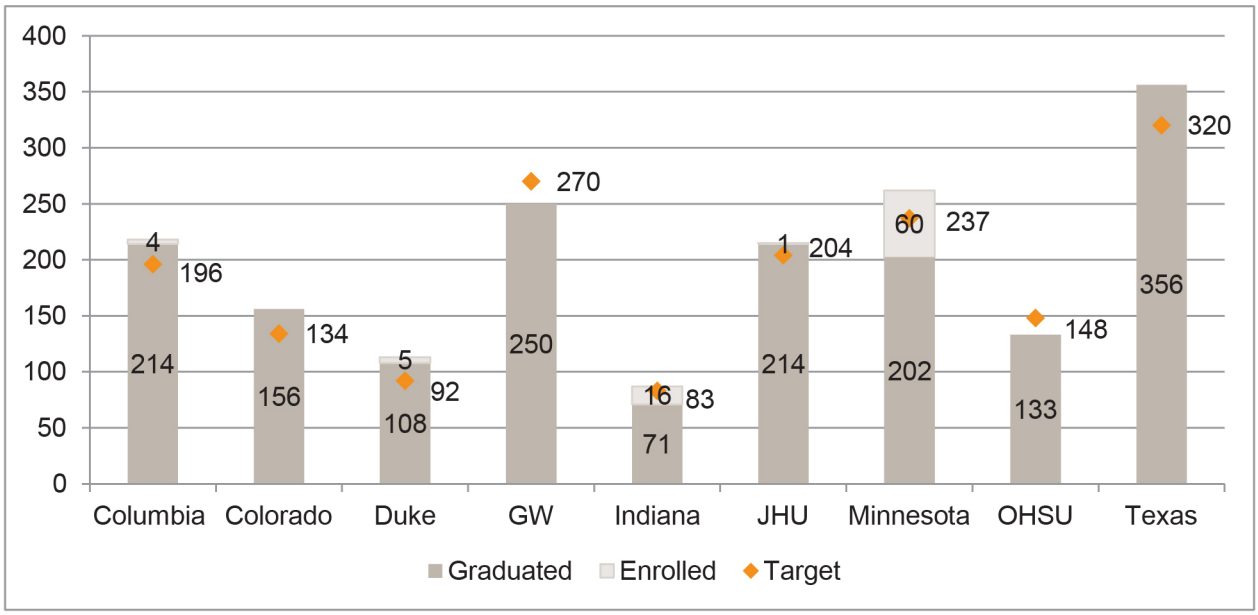
Program Effectiveness

This section reviews the program's overall effectiveness with respect to rates of student enrollment, graduation and attrition, student satisfaction and perspectives, student employment rates, and employer perspectives on the UBT training.

Student Enrollment and Graduation

Counts and rates of student enrollment and graduation (i.e., successful completion) from the health IT training programs serve as important measures of program effectiveness. Across all UBTs, 1,790 individuals either completed the program (1,704 individuals) or were still enrolled (68 individuals) as of December 2013. Exhibit 16, below, depicts program completion, enrollment and withdrawal by UBT.

Exhibit 16: Program Completion Status, by UBT



Source: ONC administrative Data, as of December 2013
Table Note: University acronyms are as follows – George Washington University (GW), Johns Hopkins University (JHU), Oregon Health & Science University (OHSU), and Texas State (Texas).

While the attrition rates varied somewhat by UBT (as shown above in Exhibit 16), in general, grantees reported seeing attrition rates that were similar to the universities' other programs. As of December 2013, the attrition rate across the UBT programs was 12 percent (certificate: 11 percent; master's: 15 percent). Administrators noted that the majority of students who dropped out cited the rigor of the program, and/or the time commitment required. Some program staff and faculty members suggested that students who enrolled in the certificate programs were often not prepared for the rigor that the universities required because they were working toward a certificate, not a more-formal advanced degree. To reduce attrition, universities focused on preparing students for the workload and time commitments at the outset. Several universities also had processes in place to intervene early with students who were struggling.

In general, faculty members found that students with a clinical background tended to do better in the more clinical roles, while students with an IT background excelled in the more technical roles. However, this was not the case at all schools. Faculty members observed that sometimes even the students with IT backgrounds needed retraining on the technical material because informatics differs in many ways from the field of health IT. Grantees reported that students with an IT background often struggled to learn the health care vocabulary necessary for working in health IT. To address this issue, one university required students without a health care background to take health-focused prerequisite courses. Similarly, students without knowledge of IT were required to take IT-focused prerequisites.

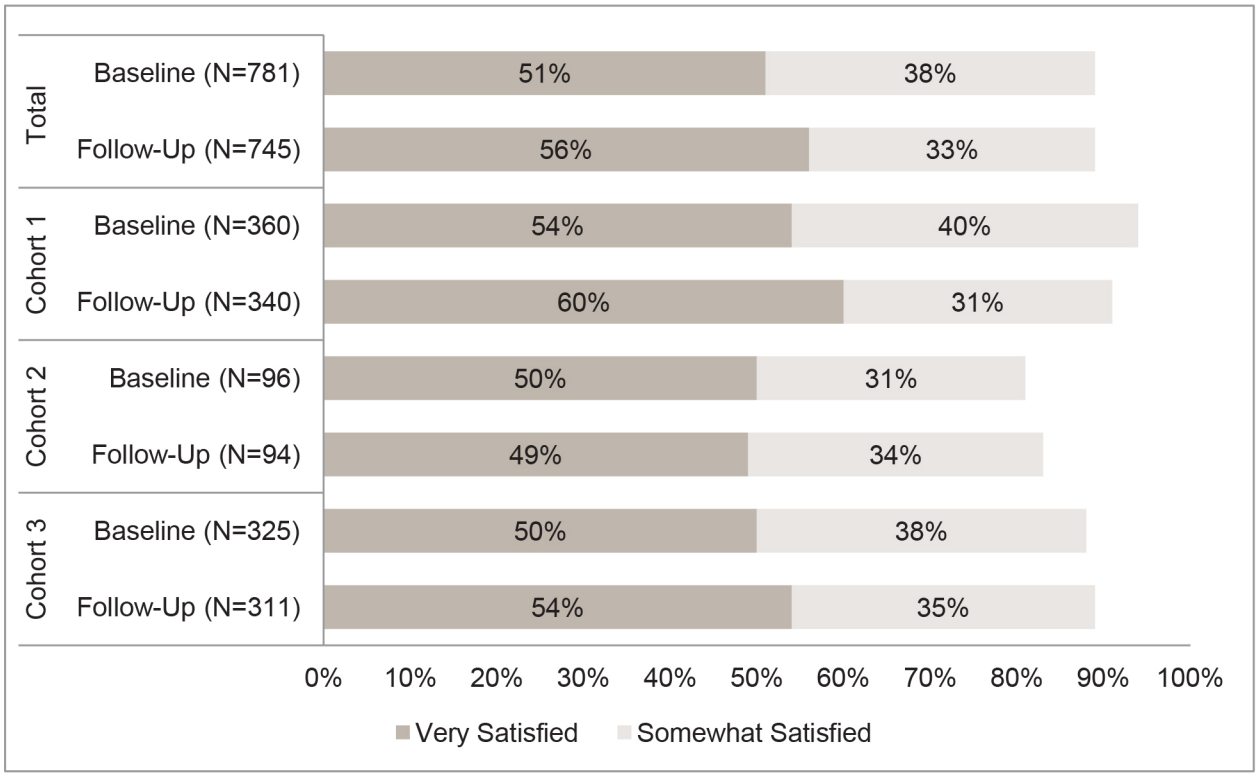
Students' Satisfaction

NORC collected data about student satisfaction from surveys and also gathered qualitative data from discussions with students during site visits.

Overall Students' Satisfaction

In both the baseline and follow-up survey, NORC asked UBT students to rate their overall program satisfaction. At both baseline and follow-up, 89 percent of students indicated they were very or somewhat satisfied, indicating that perceptions of the program remained consistent and positive six months after the initial assessment. Program satisfaction rates at baseline and follow-up varied slightly across cohorts, as seen in Exhibit 17.

Exhibit 17: Program Satisfaction at Baseline and Follow-up, by Cohort



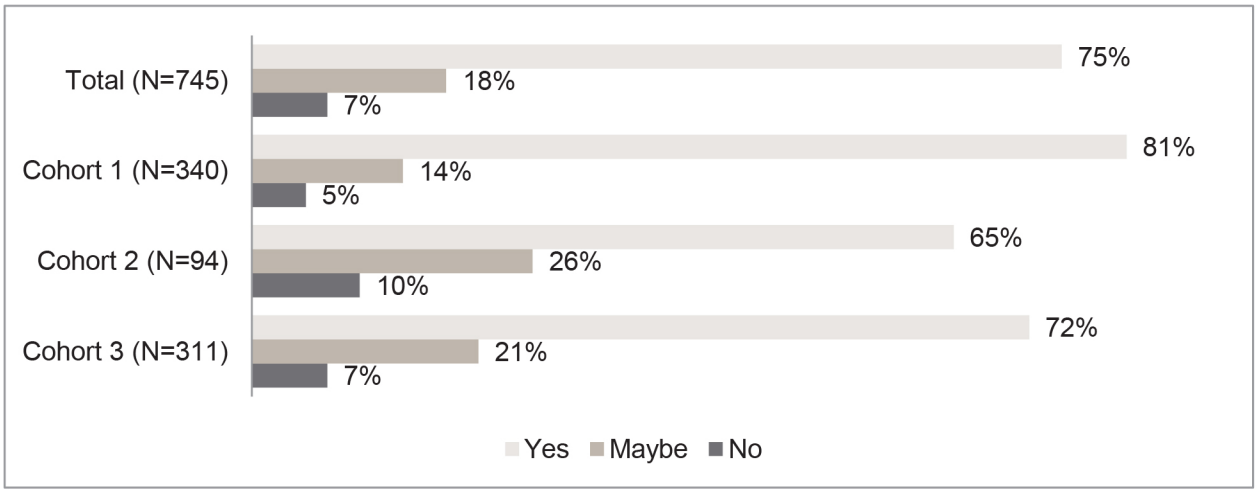
Source: NORC UBT Baseline and Follow-Up Surveys

Changes in student satisfaction rates from baseline to follow-up varied little across cohorts. The share of students very or somewhat satisfied with the program declined by three percentage points in Cohort 1. In contrast, the share of students very or somewhat satisfied increased by three percentage points in Cohort 2 and by one point in Cohort 3. Interestingly, despite having the highest student satisfaction rate across

cohorts at baseline and follow-up, Cohort 1 was the only cohort that saw a decrease in satisfaction over time.

At follow-up, NORC asked students if they would recommend the program to others interested in entering the health IT field. Across cohorts, 75 percent of students indicated they would recommend the program to others interested in health IT, 18 percent indicated they might recommend it, and seven percent said they would be unwilling to recommend the program. Exhibit 18, below, depicts students' willingness to recommend the program to others at follow-up, by cohort.

Exhibit 18: Students' Willingness to Recommend Program at Follow-up



Source: NORC UBT Follow-Up Survey

Satisfaction with Course Content and Instructors

NORC's baseline surveys asked students about their satisfaction with the courses offered by their program and the majority of students responded positively. Eighty-six percent of students strongly or somewhat agreed that they were satisfied with the courses offered by their program. In contrast, nine percent of students indicated that they somewhat or strongly disagreed; five percent responded they neither agreed nor disagreed.

During focus groups, most students indicated they were pleased with their courses and that the curriculum provided a clear understanding of the subject matter. Most students felt the courses provided a broad understanding of health informatics and created a base of knowledge that would help them pursue and understand more-specific, informatics-related interests.

While generally pleased with the curriculum, some students identified weaknesses in the course content during the focus groups, most of which were specific to particular programs. Across universities and

programs, students cited some programmatic flaws, suggesting that programs standardize the quality and amount of work; update the course content more frequently; offer foundational courses earlier in the program; incorporate more applied learning opportunities; ensure better coordination between the universities' programs; and offer a greater variety of courses. Additionally, several students voiced concern about the short length of the program, explaining that it prohibited them from learning about the field in the level of detail that they would have preferred—or that they felt necessary in order to obtain the type of position they were seeking.

Students' opinions of the workload varied across universities and across different programs within individual universities, however. Students at several universities believed they received the amount of knowledge and work they were expecting. At other institutions, students' expectations regarding the amount of work were inconsistent with program expectations. This was especially true for certificate program students who believed that a certificate program (as opposed to a master's) would neither require much time nor include rigorous coursework.

During student focus groups, NORC heard generally positive feedback on the quality of the UBT instructors. Overall, students felt the faculty members were knowledgeable in their content areas, motivated, and interested in helping students succeed. Students also felt that the instructors' relevant professional experience in their respective fields enhanced the quality of their teaching. Some students commented that they would have appreciated more timely feedback on projects and grades, citing this lack of feedback and occasional lapses in communication as a source of frustration.

Satisfaction with Internships and Practica

Students reported being extremely appreciative of their internships and practicum opportunities, as they provided them with valuable real-world experience. Students who participated in an internship or practicum experience often cited this as the most valuable part of their training. Students experienced mixed success in securing practica, with some describing it as very time-consuming and stressful, and suggesting that programs should try to streamline and improve the process for the future. Students at universities that employed a career counselor whose role it was to help in internship placement or assign students a practicum advisor believed these individuals were essential in identifying opportunities and providing personalized advice.

Students' experiences while participating in internships and practica also varied. At one university, students felt their practicum preceptors were not sufficiently engaged. Students at another program, however, were extremely pleased that they were able to complete "real work" during their internships and

believed they learned a lot in the process. For students at universities that did not offer a practicum or formal internship opportunity, the lack thereof was their largest source of frustration with the program.

Satisfaction with Learning Format

Regarding the learning format, students noted during focus groups that in-person courses provided them with opportunities for additional discussions with classmates and instructors, and fostered opportunities for students to network and form study groups. At the same time, students viewed online classes as more convenient, particularly for those working full- or part-time and/or with competing personal or family responsibilities. Many students enrolled in web-based programs noted that the nature of the online classes was the reason they applied because, without the flexibility of online learning, attending classes would not have been possible.

Online UBT courses used a variety of different software programs and technologies (e.g., BlackBoard, TRACS, SecondLife) to facilitate learning. Students generally liked these technologies, but reported that it often took time to become comfortable with them. Students who participated in online learning believed the most effective instructors maximized the capabilities of the learning platform (e.g., through interactive features including discussion boards and "live chat" sessions) instead of simply transferring in-person lectures to an online format. Some of these students also indicated a desire for more direct and timely communication with faculty.

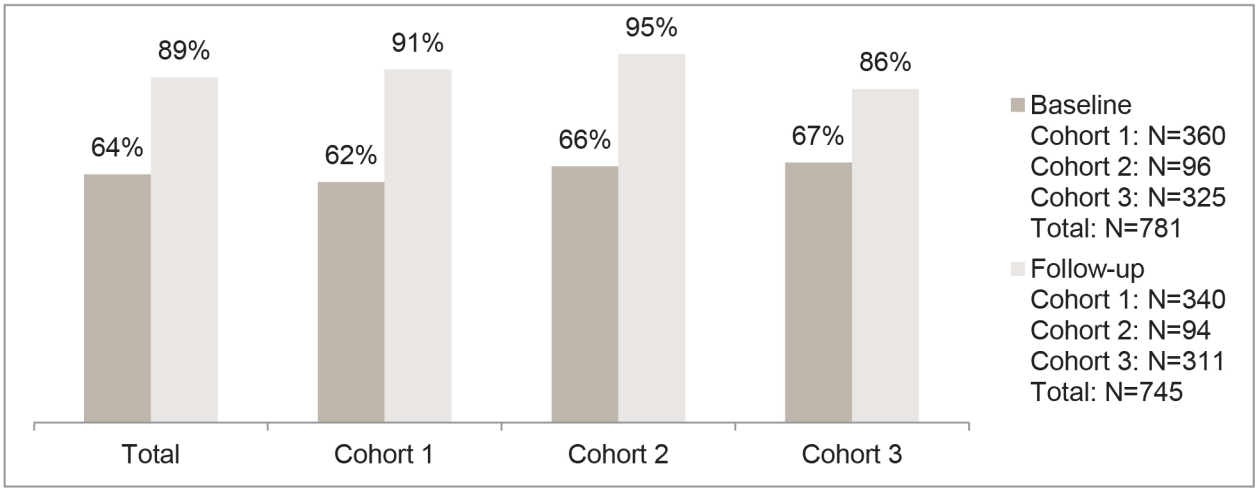
Additional Training for Distance Learning and Teaching
One UBT offered students a free one-credit class aimed at preparing them to be effective e-learners, which instructors reported led to students being more engaged and better communicators. Students found this course beneficial as well. Similarly, some programs required all instructors to train in distance learning, and many provided faculty with feedback on how to improve their online teaching techniques over time. Students and faculty alike were appreciative of this support.

Students who participated in online learning across programs reported some level of frustration with the technology regardless of the software. Issues with the online learning platform included: the inability to load course software onto mobile devices, a lack of training on how to best utilize course software, and the technology serving as more of a distraction than a learning aid (e.g., SecondLife avatars). Some students also reported connectivity issues although this was sometimes due to a lack of access to high-speed internet in rural areas and was thus outside the program's control. One of the specific drawbacks to online learning that students reported was the lack of opportunity for networking and forming close connections to classmates and instructors. Despite these various issues, in general, students were happy with online learning, but many acknowledged it is a personal preference and that some individuals will simply always prefer in-person learning.

Students' Employment

To better understand the extent to which participants in the program were able to gain and maintain employment in health IT, the NORC surveys asked UBT students about their employment status and history at both baseline and follow-up. More students reported having a job at follow-up across all three cohorts. See Exhibit 19 below for details on differences between baseline and follow-up.

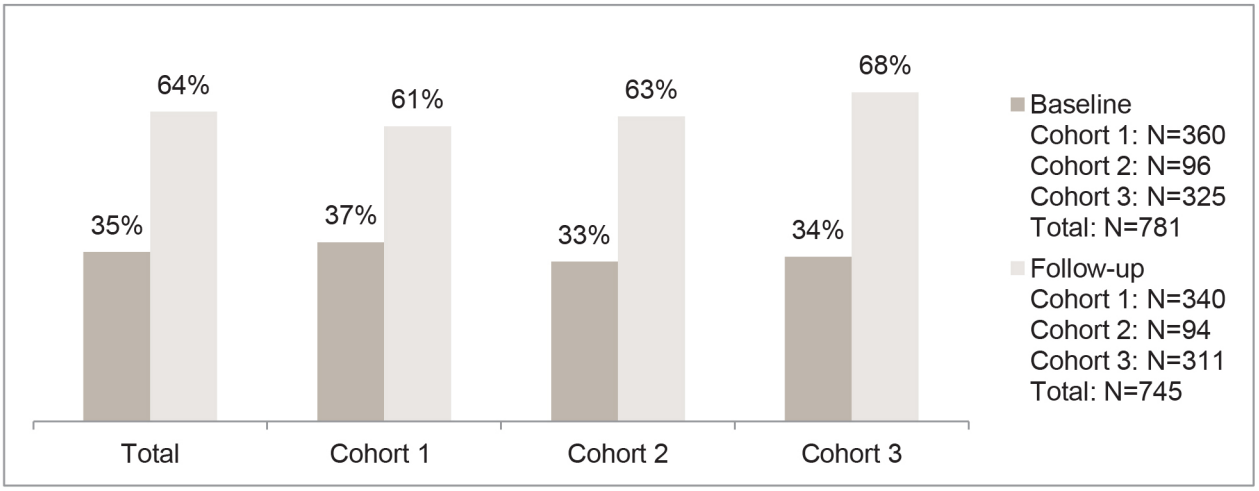
Exhibit 19: Students Employed at Baseline and Follow-up, by Cohort



Source: NORC UBT Follow-Up Surveys

Among the respondents to this question at baseline, 64 percent reported were employed and 35 percent were employed in health IT. (Those described as employed were either currently working or had a job lined up but had not yet started.) Of those respondents who were seeking a job, 93 percent were looking for jobs in health IT. At follow-up, a substantially higher proportion of respondents were currently employed (89 percent) or currently employed in health IT jobs (64 percent). However, it is important to note that, for Cohort 3, this analysis considers students employed in a position with responsibilities in health IT at follow-up as 'employed in health IT.' At follow-up, the percentage of students currently employed in health IT across the three cohorts increased somewhat over time. In Cohort 1, 61 percent of students indicated they were employed in health IT at follow-up compared to 63 percent in Cohort 2 and 68 percent in Cohort 3. See Exhibit 20 below for details on differences between students' employment in health IT at baseline and follow-up.

Exhibit 20: Students Employed in Health IT at Baseline and Follow-up, by Cohort



Source: NORC UBT Follow-Up Surveys
Exhibit Note: At follow-up, students in Cohorts 1 and 2 were considered employed in health IT if they reported that they had responsibilities involving health IT in their current position. In Cohort 3, students were considered employed in health IT if they reported that they were employed in health IT or if they reported that they had responsibilities involving health IT in their current position.

The NORC survey asked additional questions to students who had the same employer at both baseline and follow-up. Across the three cohorts, 54 percent of those employed in health IT at follow-up were working for the same employer as at baseline. In this group, 38 percent of students had received a salary increase, 35 percent had received a new job title, and 24 percent had received a promotion. In Cohort 3, NORC additionally asked students who reported receiving a salary increase, new job title, or promotion about the extent to which they thought this was attributable to their participation in the program. Fifty-five percent of Cohort 3 students who received a salary increase from the same health IT employer they were working for at baseline either strongly or somewhat attributed this to their participation in the program. Sixty-eight percent attributed their new job title either strongly or somewhat to their participation in the program. Sixty percent attributed their promotion either strongly or somewhat to their participation in the program. Across both cohorts, 63 percent of students employed in health IT at follow-up reported that they have managerial responsibilities and 53 percent reported that they are responsible for training other employees in health IT-related skills, suggesting that the program will have an additional, albeit indirect impact on the numbers of newly trained health IT workers.

Students who successfully found employment worked with a wide range of employers, including vendors, hospitals, public-health agencies, and consulting firms. While some students were able to turn internships into full-time jobs, others were not as successful in this regard. At follow-up, approximately 32 percent of students responded that their current job in health IT was with the same employer where they had interned

or had their practicum. A number of students from one of the universities launched an independent consulting firm themselves and hired other students to work for their company.

Job Setting

In the baseline survey, students who were employed or had a job lined up in health IT were asked which of eight settings (hospital, physician's office, another provider setting or organization, Regional Extension Center (REC), other organization that provides IT consulting/training, health department or governmental agency, IT Vendor, or other) best described their current health IT job. Students were asked the same question in the follow-up survey, which included an additional job setting option not originally included in the baseline survey: State Health Information Exchange (HIE) or Health Information Organization. At both baseline and follow-up, the greatest proportion of students reported being employed in a hospital setting, followed by "other" and "another provider setting or organization." Exhibit 21 displays the percentage of students across cohorts employed in a health IT job setting at baseline and follow-up.

Exhibit 21: Health IT Job Setting Across Baseline and Follow-Up

Job Setting	Baseline (N=488)	Follow-up (N=534)
Hospital	26%	30%
Physician's office	5%	6%
Another provider setting or organization	8%	7%
Regional Extension Center	1%	2%
Other organization that provides IT consulting/training	7%	6%
Health department or government agency	8%	6%
EHR vendor	3%	3%
IT vendor	4%	3%
State Health Information Exchange or Health Information Organization	-	1%
Other	12%	18%

Source: NORC UBT Baseline and Follow-Up Surveys

During focus group discussions, students reported mixed experiences regarding their job searches. Faculty members and students alike believed that success in the job search depended in large part on geographic location and the needs of local markets. A number of students described relocating in order to secure the kind of job that they were looking for. Further, although having no previous health IT experience was a requirement for admission to the program, some students believed that it was a major factor in their difficulties securing employment. These students reported hearing from employers that their training qualified them only for entry-level positions. One employer noted that hospitals are often willing to leave

positions vacant for six to eight months in order to find someone with the precise experience necessary to fill the position rather than train a less-qualified individual on their specific EHR or in other areas.

Results from the College of Health Information Management Executives (CHIME) 2012 survey and 2013 Healthcare Information and Management Systems Society (HIMSS) Workforce survey confirm the NORC team's findings. CHIME survey results suggest that CIOs currently are looking to fill IT positions with workers who have specialized knowledge of health IT and/or how it can be applied in clinical settings.[24] Most 2012 survey respondents indicated they primarily were interested in applicants with backgrounds in health IT, with some reporting that they were looking for applicants with backgrounds in clinical informatics or having some clinical experience. Applicants with only education but no experience ranked at the bottom of respondent preferences.[25] Similarly, with respect to the recruitment and retention of IT workers, HIMSS survey respondents overwhelmingly indicated that they look for seasoned professionals with industry experience for their open positions.[26] This sentiment was repeated by other employers, as well as by students, who highlighted the need to acquire hands-on experience in a clinical setting with EHRs in general, but specifically with the EHR system or systems commonly used in their geographic area, in part due to variation in regional labor markets. Another challenge students reported is that they typically come into the program with high salary expectations that may not be realistic. Many students explained that, as they learned more about the field, they reduced their expectations.

Perceived Program Benefits

Respondents to both the baseline and follow-up surveys reported on their belief in the program's ability to prepare students for the health IT workforce. Among students already working or with a job lined up in health IT, roughly two-thirds of respondents (61 percent) strongly agreed or somewhat agreed that the skills they were learning in the program helped them obtain their health IT job. A greater share of such students (83 percent) strongly or somewhat agreed that the skills they were learning would help them perform well in their health IT job. Among those students who were seeking a job in health IT at baseline, approximately three-quarters strongly or somewhat agreed that the skills they were learning would adequately prepare them for the type of health IT job they were seeking (74 percent) and strongly or somewhat agreed that the skills they were learning would help them obtain the type of position in health IT they were seeking (79 percent).

Exhibit 22: Employment Status and Preparation, at Baseline

	The skills I am learning/learned will….	Cohorts 1 & 2	Cohort 3	Overall
Respondents who were employed in health IT	… help me to obtain my health IT job	54%	71%	61%
	… help me perform well in my health IT job	79%	88%	83%
Respondents who were seeking a job in health IT	… help me obtain the type of position in health IT I am seeking	80%	77%	79%
	… adequately prepare me for the type of health IT job I am seeking	74%	75%	74%

Source: NORC UBT Baseline Survey

At follow-up, fewer respondents who were seeking a job in health IT responded positively. Fifty-seven percent of these respondents strongly or somewhat agreed that the skills they were learning would help them obtain the type of position in health IT they were seeking and 69 percent strongly or somewhat agreed those skills would help them perform well in the type of health IT job they were seeking. For respondents employed in health IT at follow-up, 80 percent reported that the skills they learned would improve their potential for a promotion or better position. Differences between baseline and follow-up for students without a job in health IT may reflect respondents' optimism for finding a job at baseline and disappointment regarding not having a job in health IT at follow-up.

Overall, students felt the programs provided them with the necessary skills to be successful in future jobs. Career counselors reported that graduates sometimes entered the program uncertain about its utility and their future in health IT, but that they left the program believing that enrolling was the right choice. As previously noted, students believed that programs' inclusion of more opportunities for real-world experience would improve their ability to secure jobs. Program administrators, faculty, and employers reported similar sentiments. Career counselors commented that the students who were successful in their job searches tended to be those who displayed the most professional maturity as well as those who possessed the "soft skills" that employers noted as important. Career counselors also noted that the students who gained employment tended to have used their school's job placement assistance programs.

Employer Perspectives

Site visits provided rich opportunities to gather employers' feedback on the extent to which the program was well-suited for their current workforce needs. While these qualitative data were valuable for understanding the perspectives of some health IT employers, the relatively small sample size upon which

they are based must be kept in mind. Further, many of the employers recruited to participate in site visit discussions had existing relationships with the UBTs.

Workforce Needs

Employers described the characteristics of a successful applicant as having: a diverse array of skills in both medical areas and IT; strong communication skills including the ability to speak to and understand the needs of clinical staff and to provide input to technical staff and help create applied solutions; effective decision-making and problem-solving skills; some clinical background or at least some familiarity with medical terminology; an understanding of clinical workflow; and some experience with EHRs. A number of employers noted a large demand for skilled professionals to assist with EHR implementation given the push for providers to adopt EHRs and the prospect of meaningful use incentive payments.

Employers generally agreed that the UBT roles matched current workforce needs. Some employers noted they were looking for employees who could cover multiple roles as opposed to just one, particularly in smaller offices. Other employers suggested adding roles or modifying existing roles to include design of EHR systems (i.e., presenting data and coordinating decision support), interoperability (e.g., HL7 transactions, Direct protocols), the impact of payment reform on customers and software development, and telehealth.

Familiarity with the Programs

In addition to offering services geared toward their students, most universities engaged in outreach activities to increase employers' awareness of the program. They noted the importance of working through local chapters of the American Health Information Management Association (AHIMA) or Healthcare Information and Management Systems Society (HIMSS). One career counselor explained that, in addition to working with the students, he worked to "brand" the program to employers in order to help them better understand the types of students graduating from the program and available for employment. Most universities created LinkedIn groups and used local health and technology networking groups to help students network, find employment, and educate employers about the programs. Results of the 2012 CHIME survey indicate that this outreach may have been successful as 68 percent of respondents indicated were aware of the university-based training (and community college) programs.[27] The universities also noted that alumni were a key resource in educating employers about the UBT programs and graduates. Several program leadership teams recommended that ONC assist in publicizing the programs to employers and potentially bringing employers together to post job opportunities on an ONC or other centralized website. This may be especially true given the current federal policy emphasis of

EHR diffusion[28] and subsequent proliferation of health IT job opportunities since 2009 (job postings tripled between 2009 and 2012), which may make the number of sources overwhelming for job seekers and employers alike.[29]

Although most of the employers we spoke with were familiar with the UBT programs, several noted that other employers in the field were less familiar or unaware of the programs. They suggested that even those employers who are aware of the programs do not fully understand the range of skills acquired by program graduates. The 2012 CHIME survey results indicating that only 12 percent of responding CIOs who know of the programs reported hiring its graduates support these findings.[30] Further, employers agreed that the UBT programs' connection to ONC was an important point and worth publicizing. Several employers suggested that the RECs take a more proactive role in increasing awareness of the UBT programs in the areas in which they serve. Some schools reported having close relationships with RECs, included REC representatives on their advisory boards, or reported that graduates of their programs found employment with the local REC. Other programs indicated having little contact or difficult interactions with the REC. Employers emphasized the importance of social networking tools, such as LinkedIn, and the important role that professional organizations (e.g., HIMSS, American Medical Informatics Association (AMIA), and medical societies) could play in increasing awareness of the programs among employers.

Perceptions of Internships and Practica

Generally, universities heard positive feedback from internship and practicum host organizations and discussions with employers yielded similar results. Employers had learned about the UBT programs from industry networking (e.g., HIMSS and AMIA), via direct contact from program administrators, hiring graduates, or knowing a colleague who had participated in a UBT program. Employers believed that internships or practica were of utmost importance to UBT students, especially those without previous health IT experience. This feedback is supportive of findings from the CHIME 2012 survey, in which respondents most frequently named actual experience in a health IT shop and education in IT theory and practice in a real-world setting as the most important attributes and competencies needed by health IT professionals.[31] Several employers who regularly hosted interns from one program discussed having hired a number of program graduates. Additionally, several employers agreed on the importance of strengthening relationships between academic and employer communities to ensure more real-time feedback on industry needs. In some markets, employers were unaware of any official outreach to other employers from the UBTs or ONC.

Experiences with Program Graduates

Employers who reported hiring graduates of UBT programs were very pleased with their performance and the knowledge they brought to their organizations. Overall, employers reported that graduates were enthusiastic, displayed a strong work ethic, and made important contributions to projects. One employer commented that, compared to graduates of other programs, the graduates of UBT programs were better prepared and understood many of the nuances of health IT. Faculty members, employers, and students alike all commented that employers might give the program more weight when considering job applicants if it provided students with a certification.

Perceived Job Readiness

Employers generally felt the programs would prepare the students for the workforce. However, they offered UBTs several suggestions for improvement, including: adding more hands-on learning, training students in different care settings (e.g., hospitals or private practices), and more frequently and methodically reaching out to employers for insights into current workforce needs in order to tailor programs to meet them. Many employers suggested that programs reach out to HIMSS and AMIA for input and support noting this would not only bolster the program's visibility, but also give the programs more credibility and improve students' employment prospects. Many students echoed the employers' feedback and believed that, while employers were aware of the program, they were not sure how to gauge the market value of the training.

Employers emphasized the need for candidates with hands-on experience in health IT, specifically with an EHR system commonly used in their geographic area. They also stressed the importance of training in "soft skills," noting they are looking for candidates with strong people and customer services skills, who are problem-solvers, and who are energetic and eager to learn. These findings echo those from the 2012 CHIME survey, in which CIOs were asked what competencies or areas of knowledge are generally lacking in candidates being considered for IT staff positions; respondents most frequently mentioned that candidates lacked knowledge of healthcare and related IT applications. Also rated high as a concern in hiring decisions was a lack of practical experience; lack of experience with an organization's system; and an inability to interact successfully with front-line users.[32]

Challenges and Lessons Learned

The UBT programs had a number of successes, but also faced some challenges that helped generate important lessons learned for the future.

Program Implementation and Organization

One challenge that a number of the UBTs faced during implementation was difficulty in communicating the program's rigor to students at the outset, especially to those enrolled in certificate programs. Program leadership and faculty members noted that the programs could be very intensive, and they wanted to be sure that students were aware of the expectations upon enrollment. To ensure students were prepared, UBTs worked to communicate the expectations during the application processes and used student orientations to further convey information regarding workload and expectations.

Another challenge UBTs faced was implementing online learning platforms. Universities without previous experience with online learning had some difficulty deciding upon the best approach to online learning (offering self-paced or structured courses) and some faculty and students had difficulty adjusting to the new platforms. To help with this challenge, programs set up specific trainings for faculty who would be teaching online for the first time and thus needed to change their typical approach to teaching, interacting with students, and presenting course materials. Faculty members also worked closely with students to ensure they were able to easily navigate the online tools needed to complete course work.

Students, faculty, and employers alike all believed that internships and practica were very important and necessary aspects of health IT training programs. Employers especially commented that the hands-on learning experiences these opportunities afforded made students more attractive job candidates. As noted, approximately half of the UBT programs did require internships or practica, but because of the importance of these aspects of the programs, many individuals strongly suggested that UBT programs without such a requirement add one. Students enrolled in programs that did not require internships or practica could look for these opportunities on their own; however, it was more difficult for them to find internships and practica without the assistance of the university. Further, students would be less likely to realize the importance of these opportunities if they were not a program requirement.

Program Design

Though employers and faculty members felt the ONC Workforce Program roles fit well with current workforce needs, some found the details of the roles a challenge and offered additional recommendations for how to make the roles better meet workforce needs. Many employers noted that a data analyst role could be very helpful, and that students trained in it would likely be marketable. They suggested ONC consider adding this role, or that universities begin to include some courses that provide training on data analytics.

Variability in local job markets posed another challenge to students, affecting their ability to find jobs. A number of students were willing to overcome this obstacle by relocating to find employment in the particular area of health IT in which they trained. While neither ONC nor universities can control local job markets, increased coordination and communication with local employers could have mitigated this challenge. Further, a number of employers were not aware of the UBT programs. Many were only aware of the programs because they had employees who were directly involved in some way with one of the universities by serving as adjunct faculty, providing assistance in planning, or in some other role. Several program leadership teams recommended that ONC assist in publicizing the programs to employers and potentially bring employers together to post job opportunities on an ONC or other centralized website. Another recommendation for increasing awareness of the program was working with organizations such as HIMSS and AMIA to educate their members.

Lastly, students and faculty members noted the challenge of ensuring that the programs communicated up-to-date information as the field of health IT continued to evolve rapidly. In order to do this, faculty members needed to work to update course content as often as possible as new information became available; however, some students felt that schools or instructors did not update materials frequently enough. This issue notwithstanding, students did feel that the content of the courses gave them a good baseline understanding of the field.

Conclusions

In April 2010, ONC awarded grants totaling $32 million to nine colleges and universities with the goal of rapidly increasing the availability of individuals qualified to serve in specific health IT professional roles requiring university-level training. Ultimately, the UBT program was effective in enabling universities to offer both certificate and master's programs.

Universities took a variety of approaches to designing and implementing their programs. Several universities forged partnerships with one or more other institutions in applying for the UBT grant. In these instances, the collaborating institutions had an existing relationship based on previous collaborations and sought to leverage each participating school's programmatic strengths. Some schools also formed advisory boards to prepare for and implement their health IT programs, as well as to assist in determining the specific UBT roles on which to focus. Universities opted to use their grants in a number of ways, including to create new master's and certificate training programs, enhance previously existing capabilities and programs, transition programs to an online format, provide financial support to students, and to hire additional faculty and administrative personnel.

Grantees trained students across all of the Workforce Program's roles, and at both the certificate and master's levels. The HIM and Exchange Specialist role was the most popular, followed by Clinician Leader and Public Health Leader. Some universities slightly modified the six ONC roles to fit their existing programs. As a result, some students received training in medical informatics or as a health services generalist. Grantees housed their programs in a variety of schools within their institution, including the School of Medicine, the School of Nursing, the School of Public Health, and the Business School, and took different approaches to integrating their multiple training programs.

Grantees reported that their various programs attracted students with different backgrounds, depending on which school housed the program. While all schools used funds to provide scholarships and tuition assistance to students, programs differed in the share of students' tuition covered. Universities also experienced varying degrees of success in recruiting students for their different programs and found that cost might be a factor. Most faculty members teaching in the programs were at the universities prior to the UBT funding; however, many also had industry experience, which helped in providing students with real-world experience. Grantees found success in helping students make industry connections by using guest lecturers to supplement faculty members' knowledge and perspectives.

Although most UBT programs used some form of online learning, universities employed a variety of platforms and structured their online learning in different ways. Some universities used self-paced online learning, while others used a more formal, structured format. Further, a number of UBTs also used a hybrid approach, which included both in-person and online training either by requiring a mix of in-person and online courses, or by allowing students to choose whether to participate online or in-person. Students taking courses via the online platform appreciated the flexibility it offered, but also desired more opportunities for networking and hands-on training.

Students enrolled in the UBT program came from varying backgrounds and ranged in their degree of work experience; however, most were working professionals enrolled in the programs on a part-time basis and enrolled due to their motivation to find a new job or improve their skills and promotion potential in their current job. UBT programs utilized group projects to provide students with opportunities to learn from one another. Approximately half of the UBT programs required internships or practica for their students, which offered an excellent way for students to gain the type of hands-on experience that proved critical in helping students secure employment following graduation.

As of December 2013, 1,704 individuals had completed the program and 86 were still enrolled in the UBT training. Grantees reported that the UBT attrition rates were similar to the universities' other

programs. Students expressed high rates of overall satisfaction with their UBT program as well as with the curricula and instructors. UBT faculty had similarly positive feedback about the program and felt the students were adequately prepared for the health IT workforce.

Students were more likely to be employed and in particular, employed in or with responsibilities in health IT, after completing the UBT training. Based on data from the follow-up surveys of all three UBT cohorts, 89 percent of students reported being employed after completing the program, a significant increase from those employed before program completion (64 percent). Similarly, students were more likely to be employed in the field of health IT after completing the program than they had been previously, with 35 percent of students reporting that they were employed in health IT at baseline and 64 percent reporting that they were employed in health IT at follow-up. Students employed in health IT were most likely to be working in a hospital setting, as well as in another provider setting or organization. Students who were seeking a job felt strongly that the skills they learned in the program would help them obtain a job in health IT and perform well in it. Similarly, students employed in the health field believed that the skills they learned would improve job performance and their potential for a promotion. Many students with the same employer as prior to entering the program who received a salary increase, new job title, or promotion believed this was attributable to their participation in the program.

Employers emphasized the importance of both hands-on training and real-life experience as necessary to prepare individuals for the health IT workforce. Despite some indications of employer awareness of the program due to UBTs outreach, employers expressed concern that many are unaware of the program and are not sure how to gauge the market value of the training. In contrast, employers who had hired graduates of the programs felt they were well-equipped for the health IT workforce, and were very pleased with their performance and the knowledge they brought to their organizations.

The feedback collected through NORC's quantitative and qualitative research demonstrates that the UBT programs enabled universities to expand existing and/or develop new certificate and master's health IT training programs. Further, the UBT programs provided students with training that helped many find employment in health IT.

5. COMMUNITY COLLEGE CONSORTIA (CCC) TO EDUCATE INFORMATION TECHNOLOGY PROFESSIONALS IN HEALTH CARE

Chapter Summary

In April of 2010, ONC awarded $68 million to five consortia, which ultimately supported 81 community colleges for two years. These consortia covered all 50 states, to establish or improve non-degree health IT training programs students would be able to complete within six months. The program consisted of five regional consortia, with ONC awarding funding to the consortium lead for each region.

Colleges took a variety of approaches to implementing their programs and utilizing the prescribed Workforce Program roles. Schools that either proactively placed students in roles depending on their background or modified roles to meet employers' needs reported more success in terms of students completing the program and finding employment. Additionally, for-credit programs appealed more to students than did those that did not offer credit, as did the opportunity to receive government funding to pay for the training. Colleges found success with informal word-of-mouth marketing to recruit students and found student orientations an extremely valuable way to set student expectations regarding the workload. Nearly all faculty members teaching in the programs were adjunct instructors who also worked in the field of health IT and whose real-world experience was of great value to students.

More than half of schools taught using a hybrid approach combining online and in-person training. An additional forty percent of programs offered exclusively online training, which was a popular format due to the flexibility it offered. Many students, however, desired some face-to-face opportunities for in-person and especially hands-on training and networking. In general, students in the CCC program were older than typical community college students, had at least a bachelor's degree, and enrolled due to their motivation to find a new job or improve their skills and promotion potential in their current job.

As of December 2013, 19,733 individuals had completed their health IT training at one of the community colleges funded under this program. Schools reported that attrition rates were similar to other community college programs. Students expressed high rates of overall satisfaction with their CCC programs as well as with instructors and the curricula. CCC instructors similarly had positive feedback about the program. Colleges found that the most successful students were those with adequate backgrounds in health or IT, who chose an appropriate training role based on this background, and who were prepared for the hard work and intensity of the training.

Students were more likely to obtain employment, and, in particular, become employed in the field of health IT after completing CCC training. Among the total number of baseline respondents to this question, 70 percent reported having a part- or full-time job and 24 percent a job in health IT. At follow-up, a similar proportion of respondents to baseline were employed (74 percent), although more reported health IT jobs (36 percent). The third cohort received a unique question at follow-up, asked only of those who responded that they were not working in health IT, which asked about health IT responsibilities. Among this group, 28% reported working in health IT and an additional 40% reported having health IT related responsibilities. Cohorts 1 and 2 may have had a similar proportion of students with health IT responsibilities had the question been asked of them as well.

Students employed in health IT were most likely to be working in the role of technical software support and in a hospital setting. Students whose job in health IT was with a different employer prior to entering the program believed that their program participation had a strong impact on obtaining their job and their position or job title. Students who were seeking a job felt strongly that the skills they learned in the program would help them obtain a job in health IT and perform well in it. Similarly, students employed in the health field believed that the skills they learned would improve job performance and their potential for a promotion.

Employers highlighted the importance of both hands-on training and real-life experience as necessary to prepare individuals for the health IT workforce. Despite CCCs' outreach efforts to employers, some remained unaware of the CCC program and were unclear about what program graduates could offer, and many had not hired graduates. Employers who believed that graduates would enter the workforce prepared as highly skilled health IT experts were forced to temper their expectations. On the other hand, employers who experienced first-hand program graduates' abilities were overall very pleased with their work.

By and large, the feedback collected throughout NORC's quantitative and qualitative research demonstrated that CCC programs provided opportunities for community colleges to expand or further develop their health IT training programs and provided students with satisfactory training that helped many find employment in the field of health IT.

Introduction and Background

The CCC to Educate Information Technology Professionals in Health Care Program awarded $68 million to five consortia. These consortia supported 81 community colleges covering all 50 states, to establish or

improve non-degree health IT training programs that students would be able to complete within six months. Funded from April 2010 through October 2013, the community colleges collectively trained 19,773 new health IT professionals. ONC designed the training programs for professionals with an IT or health care background.

The program consisted of five regional consortia, with ONC awarding funding to the consortium lead for each region. Exhibit 23 displays the leads for each region and the funds awarded in each year.

Exhibit 23: Funding, by Region

Region	Consortium Lead	Year 1 Funding Amount	Year 2 Funding Amount	Total
Northwestern (Region A)	Bellevue College	$3,364,798	$2,798,463	$6,163,261
Western (Region B)	Los Rios Community College	$5,435,587	$5,182,328	$10,617,915
Midwestern (Region C)	Cuyahoga Community College District	$7,531,403	$7,116,493	$14,647,896
Southern (Region D)	Pitt Community College	$10,901,009	$9,669,892	$20,570,901
Northeastern (Region E)	Tidewater Community College	$8,492,793	$7,524,815	$16,017,608
	Total	**$35,725,590**	**$32,291,991**	**$68,017,581**

Source: ONC administrative data.

The CCC program targeted students with backgrounds in either health care or IT and was developed to meet the demand for a health IT workforce that can assist with electronic health record (EHR) implementation, health information exchange and other health IT functions nationwide.

NORC's independent evaluation of the Workforce Program focused on addressing three key research questions:

- What processes did the grantees use to implement the programs and meet program goals?
- To what extent did the grantees meet the requirements of the Workforce Program?
- To what extent did participants in the program gain and maintain employment in health?

To answer these research questions, the NORC team gathered and analyzed information on program implementation, program design, and student characteristics from student and faculty surveys, site visits, in-depth interviews, and administrative program data. The methodology portion of the Evaluation Overview section of this report details the operational aspects of those data collection and analysis activities.

Program Implementation and Organization

The following section details how community colleges implemented their programs, designed their training, and the characteristics of the students who enrolled. Findings in this section rely on a mix of qualitative and quantitative data. Exhibit 24 summarizes key college program implementation and design characteristics that the NORC team measured using quantitative data collected from the consortium leads; these findings are described in detail below along with quantitative survey findings and findings from qualitative research activities.

Exhibit 24: Characteristics of Community Colleges

Domain	Characteristic	%
Pre-HITECH Programs	Health IT/Health Information Management	73
	None	27
Credits offered	Non-credit	61
	Credit or both	39
Student orientation to program	Mandatory or optional	66
	None	34
Role sequencing	Some/all multiple roles	47
	Sequential	37
	Only one role to complete	17
Student responsibility for tuition	Program for fee	52
	Full/partial reimbursement	29
	No reimbursement	20
Learning format	Hybrid (combination of online and in-person)	53
	Online	39
	Entirely in-person	8
Hands-on opportunities	Not offered	68
	Offered	32
Internships/Practica	Required or supported	67
	None	33
Number of Workforce Program roles implemented	More than four roles	52
	Fewer than four roles	48
Student population	Below the median (23,052)	51
	At or above the median (23,052)	49

Source: ONC administrative data

Implementation

This section describes whether schools had a history of providing health IT training, how they started their programs, and how they collaborated with other grantees. These characteristics revealed how

prepared schools were to begin training and how much support they received while developing their programs. The NORC team gathered the information in this section from site visits and progress calls with leads.

Although the NORC team explored a number of characteristics of individual community college programs, further analyses (described below in the typology section of this chapter) demonstrate that the existence of previous health IT training, whether courses were offered on a for-credit or not-for-credit basis, the number and sequence of the roles offered, and learning format (e.g., online or in-person) were all correlated with individual schools' completion rates.

History of Providing Training in Health IT

During site visits and calls with program leads, the NORC team learned that many of the schools had pre-existing health IT programs, including associate's degree and certificate programs. ONC administrative data supported these findings by revealing that three-quarters of colleges had existing programs (see Exhibit 24 above). The schools without health IT programs, but with related health information management (HIM) programs,[4] viewed the grant program as an opportunity to add to their curricula. While those schools had advantages—for example, they were more likely to have computer labs available with health IT software for student use—many were still essentially starting new programs, rather than tweaking existing ones to meet the objectives of this grant, as some of the existing programs were very different than the CCC program.

The lead institutions cited a range of reasons for applying for the consortium lead role. For example, one consortium director noted it was an easy decision to apply for the lead position because they are one of the region's largest community colleges and possess a robust infrastructure. Another consortium director commented that, although they did not have a health IT program in place previously, they did have experience leading large federal grants and felt they were in a good position to provide leadership to the region.

Start-Up Processes

The five consortia each came together in different ways. During site visits, program leads reported that at least two of the regions included several schools that were already working as a group on other efforts, both related to and not related to health IT. In other regions, the consortium formed for the purposes of

[4] The American Health Information Management Association (AHIMA) defines **HIM** as the practice of acquiring, analyzing, and protecting digital and traditional medical information vital to providing quality patient care. This differs from health IT, which AHIMA defines as the framework used to manage health information and the exchange of health information in a digital format.

the grant. In many instances, member schools approached the lead about applying for funds; however, at least one lead institution noted they leveraged pre-existing relationships with schools in the region to recruit member colleges.

Collaboration with Consortium Lead and Other Consortium Members

Many of the colleges also shared valuable information about the nature and extent of their collaboration with the consortium leads and other consortium members throughout the program. Program administrators reported these findings during site visits and progress calls.

In general, member colleges were pleased with the consortium model for the program. The five consortia operated differently and took different approaches to collaboration. Although consortium leads had different levels of involvement with their members, all held regular conference calls and regional meetings to bring their member colleges together to share challenges, lessons learned, and best practices.

Consortium leads provided various types of assistance to their member colleges. In general, member schools were pleased with the support they received from their consortium lead. For example, most leads served as the primary point of contact with ONC and thus helped relay information to the member colleges and provide feedback to ONC in turn. While some schools appreciated that this reduced their administrative burden, others preferred a flatter organizational structure, as it often took a long time for the members to receive the information (for example, grant requirements) they needed. The leads provided other types of assistance including helping members implement their programs; bringing members together to share best practices; and providing templates and instructions for developing the budget. Several leads also collected information, including demographic, employment, and background information, from their member colleges and planned to use this information as an input to inform future improvements to their programs and their sustainability over time.

Discussions with CCC administrators demonstrated variation by region in levels of collaboration between consortium members. In a number of regions, administrative teams and faculty members regularly shared best practices and edited materials in conjunction with other schools; in other regions, CCC administrators reported that the member schools had little interaction with each other. In regions with more active collaboration, many member colleges communicated with each other informally through phone calls and e-mail in addition to regular consortium conference calls. Although there was intra-consortium collaboration, many faculty and administrators noted they would have benefited from a mechanism for sharing best practices among all of the schools in the CCC Program, not only those within their consortium.

Program Design

ONC provided CCCs considerable leeway in the way they designed their health IT training programs. This section details common themes and differences among schools in their organization and infrastructure, faculty, learning platforms, career services, and colleges' approach to the competency exam.

Organization and Infrastructure

CCCs' organization of their training programs varied along a number of dimensions including their use of the Workforce Program roles, cohorts, whether they offered credit for their program, how they offered financial support to and recruited students, and their use of orientation programs.

Workforce Program Roles. The training focused on the following six roles developed by ONC in order to meet employers' health IT needs. CCC awardees selected the specific roles on which their programs would focus. These roles are described in Exhibit 25, below.

Exhibit 25: Workforce Program Roles

Role	Description	Background	Responsibilities
Practice workflow and information management redesign specialist	Assist in reorganizing the workflow within provider settings to improve health and care delivery	Health care (for example, as practice administrators) or in information technology	▪ Conduct user requirements analysis to facilitate workflow design ▪ Integrate information technology functions into workflow ▪ Document health information exchange needs ▪ Design processes/information flows that accommodate QI and reporting ▪ Work with provider personnel to implement revised workflows ▪ Evaluate process workflows to validate or improve practices' systems
Clinician/ practitioner consultants	Similar to the "redesign specialist" role listed above but draws on the background of licensed clinical or public health professionals	Same as above	▪ Suggest solutions for health IT implementation problems in clinical/public health settings ▪ Address workflow and data collection issues from a clinical perspective, including quality measurement and improvement ▪ Assist in the selection of vendors and software ▪ Advocate for users' needs. Act as a liaison between users, IT staff, vendors

Role	Description	Background	Responsibilities
Implementation support specialists	Provide on-site user support for the period of time before and during implementation of health IT systems in clinical and public health settings	IT or information management	▪ Execute implementation project plans, by installing hardware (as needed) and configuring software to meet practice needs ▪ Incorporate usability principles into design and implementation ▪ Test software against performance specifications ▪ Interact with vendors to rectify problems occurring during deployment
Implementation Manager	Provide on-site management of mobile adoption support teams for the period before and during health IT systems implementation in clinical/public health settings	Health and/or IT environments as well as administrative and managerial	▪ Apply project management and change management principles to create implementation project plans to achieve project goals ▪ Interact with clinical personnel to ensure open communication with support team ▪ Lead implementation teams consisting of workers in roles described above ▪ Manage vendor relations, providing feedback for product improvement
Technical/ software support staff	Maintain systems in clinical/public health settings, including patching and upgrading of software	Information technology or information management	▪ Interact with end users to diagnose IT problems and implement solutions ▪ Document IT problems and evaluate effectiveness of problem resolution ▪ Support systems security and standards
Trainers	Workers in this role design and deliver training programs using adult learning principles to employees in clinical and public health settings	Health prof. or HIM specialists, with some experience as trainers in the classroom	▪ Be able to use a range of health IT applications, preferably at an expert level ▪ Communicate both health and IT concepts as appropriate ▪ Assess training needs and competencies of learners ▪ Design lesson plans, structuring active learning experiences for users ▪ Track training records of the users and develop learning plans

Many schools took a proactive approach to placing students in the various Workforce Program roles by considering student preferences, but ultimately selecting roles for the students based on their backgrounds. One college employed staff to evaluate students' background and determine if their studies would focus on health care or IT courses, and then allowed the students to select the appropriate role within the given category. Less often, schools allowed more autonomy to students in selecting their roles. Several schools provided counseling to students upon acceptance to the program with respect to which roles might be most appropriate, and then the students ultimately selected a role for themselves. In

addition to helping students select the training role/s, a number of schools also permitted students to place out of courses based on their background, allowing students to take the classes best tailored to their particular needs.

Modifications to Workforce Program Roles to Better Meet Employers' Needs
One consortium lead developed a two-track model through which students with an IT background could enroll in an engineering track (which merged the Technical/Software Support Staff and Implementation Support Specialist roles) and students with a health care background could enroll in a consulting track (which merges the remaining four roles). While students in both tracks took several courses that focused on the same curriculum components, the courses' content did differ (for example, more technical content for the engineering track). The program leaders believed that students who trained for more than one role would be more desirable to employers than students trained in one role alone. The consortium lead received feedback from industry representatives in formulating this approach.

Student cohorts. During site visits and calls with program leads, the majority of schools reported organizing "cohorts" of students who moved through the six-month training program as a group, on the same schedule and taking the same classes; however, a minority took a different approach. A few CCC administrators reported that students training in the same role started the program together and attended classes at a set time each week, with the course topics and instructors changing every few weeks. Several other schools took a different approach, with each cohort constituting a "class" of graduates, with students matriculating at the same time and having the same targeted end date, but deciding upon their own schedule of courses. Lastly, several schools did not have cohorts at all, and the training took place asynchronously.

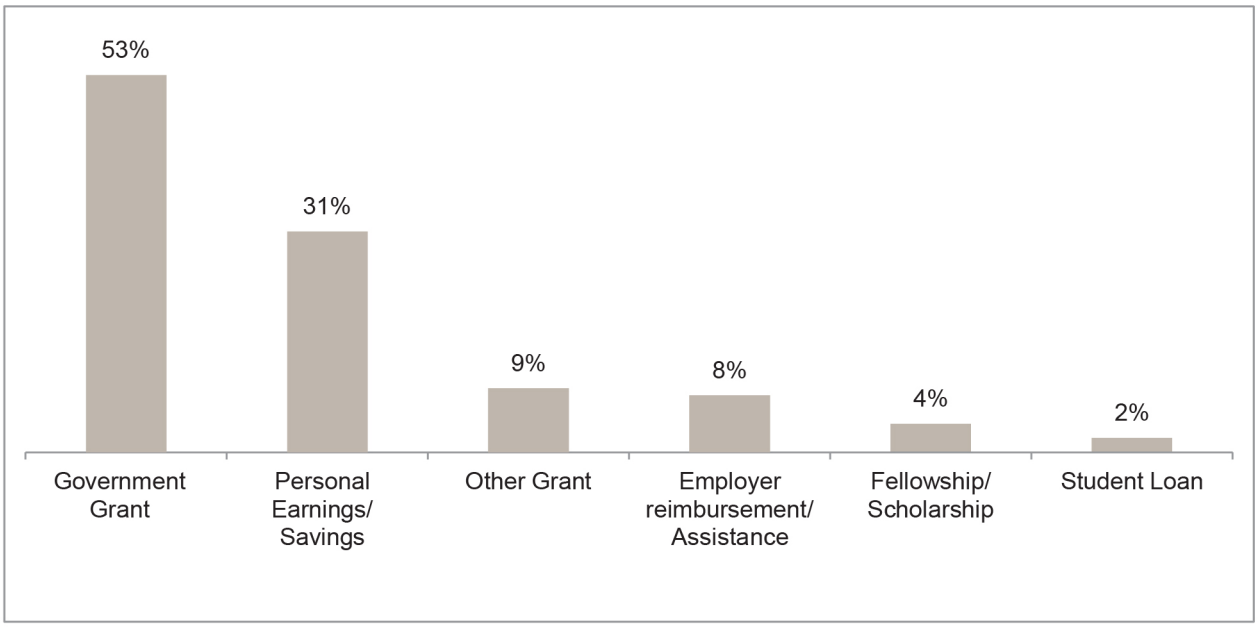
Credit versus non-credit offerings. The grants provided schools with the option of delivering training programs on a for-credit or not-for-credit basis. According to ONC administrative data, forty percent of schools offered credit. Site visits and calls with program leads confirmed this as the NORC team saw a variation both across and within the consortia in terms of whether schools offered credit for their programs (see Exhibit 24 above). Consortium and program directors reported this was a subject of much debate in the early phase of the program. School leads taking the for-credit approach thought this approach would be more appealing to students, and thus help with the programs' sustainability after the end of ONC funding. Administrators of schools that did not take this approach believed that, due to the compressed timeframe, the program was administratively more conducive to a non-credit structure.

Fees and financial support. The terms of the grants afforded the schools flexibility in whether or not to charge students tuition. Though the majority of CCC administrators we spoke with during site visits and telephone conversations reported that their colleges did not charge students full tuition for the program, ONC administrative data revealed that half of schools (52 percent) did charge tuition. During site visits,

several schools reported charging tuition because they believed students would take the training program more seriously and be less likely to drop out. Another thirty percent of schools required students to pay in advance and then provided a full or partial refund to students who completed the program within six months (see Exhibit 24 above).

NORC baseline surveys of CCC students also collected information on students' use of financial support. The survey asked if students used any of the following sources of financial support to enroll in the program: a fellowship or scholarship, government grant, other grant, internship/traineeship, student loan, private loan, personal earnings or savings, and employer reimbursement or assistance. If a student selected more than one source of financial support, NORC further asked which source provided the most support. At baseline across the three cohorts, 53 percent of students received a government grant, the most frequent answer. Among students who selected more than one form of financial support, 50 percent identified government grants as their primary source of support. Exhibit 26 below displays students' responses regarding financial support across all three Cohorts.

Exhibit 26: Sources of Financial Support



Source: NORC baseline CCC student surveys

Student recruitment and application processes. CCC administrators reported great success with word-of-mouth marketing strategies; for instance, as the grant progressed, many program completers went on to recruit their friends and co-workers. As reported during site visits and progress calls, several schools also targeted students currently enrolled in other health care or IT programs at the college. These more-

informal strategies were so successful that many program leads decided not to engage in formal marketing and recruitment campaigns. Schools that engaged in marketing campaigns used a number of mechanisms for doing so, including placing ads in local newspapers; running articles in the college newspaper; advertising on the school's website; using radio or classified ads; connecting with various networking groups; and participating in job fairs and relevant conferences. Administrators of schools that engaged in extensive marketing campaigns reported difficulties in finding the staff and resources to do so effectively.

Schools used a variety of approaches in their application and acceptance processes. Several consortia agreed on baseline admissions criteria for all member colleges, while the others left this entirely up to each school. CCC administrators noted that it was very important to ensure students had adequate backgrounds in order to be successful in the program. In order to do this, schools used strategies including requiring applicants to take a pre-assessment test; implementing a vetting component to the application process, with applicants having to check boxes to indicate their experience and education; carefully reviewing resumes and transcripts; holding in-person interviews; and speaking with references.

Orientation. According to administrative data, two-thirds of schools reported holding either optional or mandatory orientations to introduce students to the program (See Exhibit 24 above). The orientations offered a chance for schools to provide students with an understanding of the demands of the program, as well as local employment needs in order to keep students' expectations realistic.

One College's Intensive Orientation
As opposed to the more traditional orientation sessions, one school held a one-week, intensive "boot camp" to introduce students to concepts that the program would cover and impart a sense of the program's intensity. This orientation was successful in preparing students for the program, and the school planned to expand the boot camp to two weeks to help students with health care backgrounds acclimate to the IT field and vice versa.

Faculty and Staff

The survey of CCC faculty demonstrated that three-quarters (78 percent) of faculty were teaching part time. Additionally, nearly all faculty members who the NORC team spoke with during site visits noted that they were adjunct instructors who also worked in the field of health IT. However, the survey of faculty also revealed a range of teaching and health IT experience among instructors, as shown in Exhibit 27 below.

Exhibit 27: Faculty Experience with Teaching and Health IT

	Teaching Experience %	Health IT Experience %
None	21^	29
Less than two years	16	18
Two to five years	19	14
More than five years	44	39

^Previous to taking on the CCC instructor role
Source: NORC survey of CCC faculty members

While a number of the instructors had previous teaching experience, most had an industry background as opposed to an academic background. Often, instructors who were already teaching health care or IT courses at the college taught in this program as well. In addition to hiring faculty, many schools needed to hire administrative staff at the grant's outset. A number of program administrators reported hiring grant coordinators and managers specifically for the purposes of this program; however, other program directors commented that it was difficult to figure out what types of staff to hire. One school hired an administrative assistant who took on extensive marketing responsibilities after it was clear that the program coordinator needed assistance with this task.

Learning Platform

Schools implemented a spectrum of learning platforms, from fully online to mostly in-person. According to ONC administrative data, nine percent of CCC students received face-to-face training, 53 percent hybrid, and 39 percent fully online. Site visits shed light on how schools structured their training programs using different learning platforms. The schools using a hybrid approach (part online and part in-person learning) implemented their programs in a number of ways. One school structured the program so that students spent six hours on the weekends in in-person classes, with the remaining courses delivered online. Other schools offered students more flexibility in deciding on the balance between online and in-person classes that they took. At yet another school, all courses were online, but the students participated in regular "face to face" networking sessions, in which they heard from local employers, experts in the field, and faculty members. Several schools reported changing their learning platforms as the grant progressed, due in part to student feedback requesting more in-person training. NORC's typology analysis, (described in more detail below) demonstrated that learning platform and in particular opportunities for face-to-face training was associated with higher program completion rates

Career Services

The schools engaged in a variety of approaches to help students find positions. All schools reported posting job openings either on their websites, in classrooms, or in their career services offices. Others offered seminars or other resources—available either exclusively to health IT students or as part of the college's general career services department—with tips on conducting a job search, refining a résumé, or preparing for a job interview. During site visits, program administrators noted that many students had not looked for a job in many years and were therefore unfamiliar with how to make the most of web-based resources and networking opportunities—a particularly important skill in the close-knit health IT industry. In response, schools helped set up networking opportunities including career fairs for students and provided tips for capitalizing on these opportunities.

To address the perceived need for hands-on experience, some colleges actively engaged in trying to place students in internships. To do this, program administrators reached out to providers and vendors in the community to set up internship programs for their students, while others provided advice on actively reaching out to providers and vendors to inquire about employment. Schools had varying degrees of success in their own outreach efforts. Many attributed their success, or lack thereof, to the needs of the local workforce and simply whether employers were looking to take on interns.

An Innovative Approach to Hands-On Experience
Students at one community college could enroll in the school's "Intern Academy," through which they could earn classroom hours through paid or unpaid internships. Students identified goals in conjunction with their employers upon which they would be assessed at the program's end. Another school encouraged students to approach providers in the community and ask if they would be interested in receiving assistance with EHR implementation. Through this program, students engaged in activities such as presenting trainings on privacy, helping offices with vendor selection, and digitizing paper records.

Competency Exam

Although Section 7 of this report describes the HIT Pro competency exam in detail, this chapter includes findings on the CCCs' different approaches to the exam. The CCCs could request vouchers that allowed individuals—including students who enrolled in the community college programs and others with relevant experience, training, or education in health care or IT—to take the exam free of charge. Although these vouchers were readily available, students' familiarity with the HIT Pro exam varied widely.

During student focus groups, the NORC team learned that one community college made the exam a mandatory part of the program; however, students were still able to graduate even if they did not pass the exam. Additionally, as shown in Exhibit 29, below, a quarter of students (27%) reported their reason for enrolling in the CCC program was to prepare for the exam. In contrast, during discussions with students

at other institutions, many students had not yet determined whether they would sit for the exam, and some were unfamiliar with it.

CCCs also differed in whether and how they offered students help with preparation for the exam. One college offered two four-hour review sessions at the program's conclusion. During those sessions, students reviewed the questions from the assessments that were included in the curriculum materials. Over the course of the grant, several college administrators reported making a greater effort to help students prepare for the HIT Pro exam. While several schools initiated more formal "prep courses," at other schools, students worked in less-formal study groups.

Students' Characteristics

In general, students enrolled in the CCC programs tended to be older than typical community college students, but the age distribution varied from school to school. According to the administrative data, the average age of a CCC student at the time of enrollment was just over 44 years and community college administrators reported that most other programs attracted younger students. Students also possessed a wide range of educational backgrounds; however, most students had bachelor's degrees and, in some cases, master's degrees and PhDs. A notable exception was one school that catered to younger students. The highest level of education for most students at this school was either a GED or high school diploma. All schools required some previous experience in IT or health care for enrollment, and the majority of students had several years of work experience. Exhibit 28 below provides an overview of student characteristics broken out by region and overall.

Exhibit 28: CCC Students' Characteristics

	Total Enrolled Students	Minority Status	Average Student Age	Prior Experience			Average Months to Complete
Consortium				Health IT	HC (Not IT)	IT (Not HC)	
Northwestern	4,728	15.5%	44.0	39.8%	37.7%	5.4%	2.3
Western	4,602	44.7%	46.1	16.1%	40.4%	34.1%	4.8
Midwestern	6,705	33.7%	46.9	19.8%	35.5%	31.6%	5.7
Southern	10,148	46.8%	46.3	18.3%	50.4%	25.7%	5.7
Northeastern	6,415	35.8%	47.0	13.6%	36.3%	26.7%	5.4
National	**32,598**	**35.0%**	**46.1**	**21.6%**	**40.2%**	**24.4%**	**4.8**

Source: ONC administrative data, October 2013

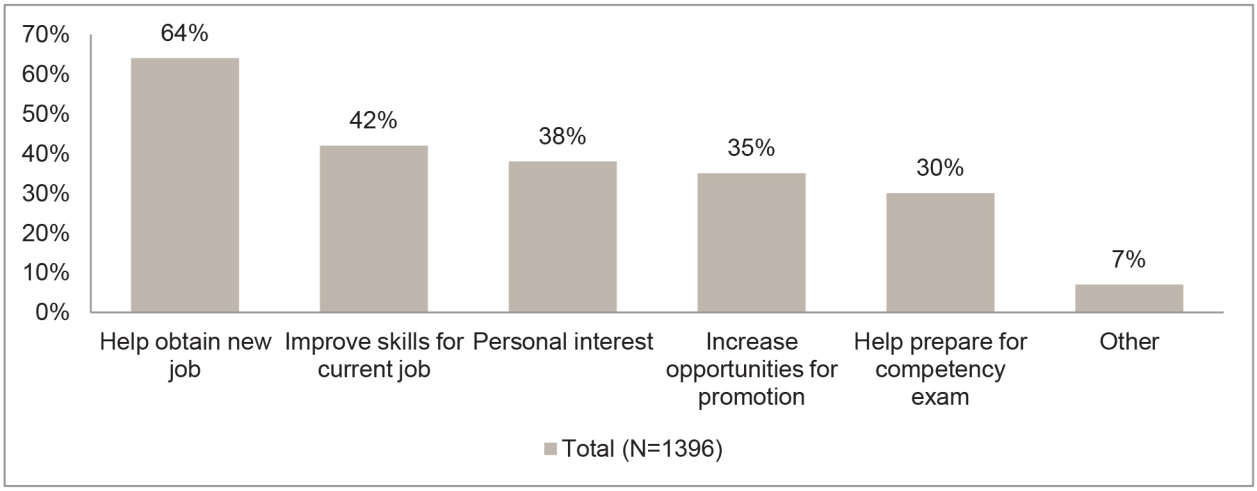
Of particular interest is the Northwestern region's measure of the average number of months for students to complete their training, which, at 2.3 months, was less than half of the other four regions. Bellevue

College, the region's consortium lead, used a portion of their program funding to customize a tailored health IT training program for the U.S. Department of Veterans Affairs. Bellevue based the training off of the curriculum developed by the Centers and used by the CCCs. The aim of this training program was to increase Veterans Affairs workforce capacity for the design, configuration, use, and maintenance of informatics interventions that improve health care for veterans. The training program consisted of 40 hours, distributed over approximately eight weeks. Over 1,000 of the Northwestern region's students participated in this customized training for the Department of Veterans Affairs, which explains the lower-than-average time it took students to complete their training.

In addition to the student characteristics reported by CCCs to ONC, NORC collected information on students' motivation for enrolling in the program through student surveys. Across the student survey cohorts, the greatest proportion of students (64 percent) responded that their motivation for enrolling in the health IT training program was to help them find a new job. Substantial proportions of students also cited the following reasons for enrolling: improving skills or knowledge for their current job (42 percent), personal interest (36 percent), increasing opportunities for promotion or advancement in their current job (38 percent), and helping them prepare for the HIT Pro Competency exam (30 percent). Regarding motivations for enrollment, students responded similarly across cohorts with two exceptions. In Cohort 3, fewer students responded that their motivation was to prepare for the HIT Pro competency exam (24 percent in Cohort 3 versus 34 percent in Cohort 1 and 29 percent in Cohort 2) or to help them obtain a new job (48 percent in Cohort 3 versus 67 percent in Cohort 1 and 68 percent in Cohort 2). Conversely, more students in Cohort 3 responded that their motivation was to improve their skills or knowledge for their current job (53 percent) than in Cohorts 1 and 2 (37 and 41 percent respectively).

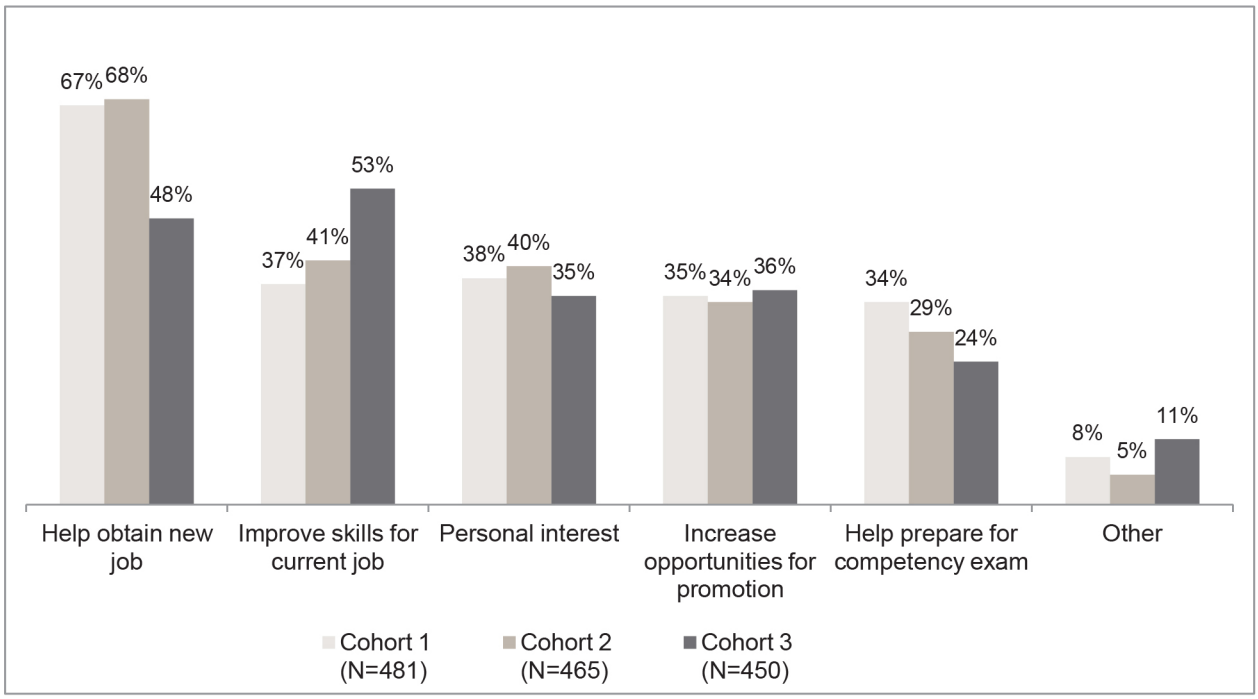
These cross-Cohort differences may be due, in part, to many health IT jobs becoming available and filled prior to Cohort 3 students' matriculation due to the need created by programs such as meaningful use. Qualitative findings also demonstrated that over the period of grant funding, CCCs recruiting processes evolved to focus on workers filling some of these positions. These students may not have had the background or training necessary to thrive in these positions and thus entered the program to improve their job performance. Exhibit 29 contains survey data from across the Cohorts and Exhibit 30 contains Cohort-specific findings.

Exhibit 29: Students' Motivations for Enrolling, All Cohorts Combined



Source: NORC baseline CCC student surveys

Exhibit 30: Students' Motivations for Enrolling, by Cohort



Source: NORC baseline CCC student surveys

Site visit findings supported these survey findings. During student groups, employed students stated reasons for enrolling included gaining additional training for jobs they currently held, improving their opportunities for promotion, and helping them secure a new or better job. On the other hand, unemployed students hoped the program would give them additional credentials to help secure a job. Additionally,

some unemployed students previously lost high-paying jobs in IT and were finding it difficult to accept lower-paying opportunities. They enrolled in the program in order to "break in" to the health care sector in hopes of landing a job with higher compensation and one more commensurate with their years of experience.

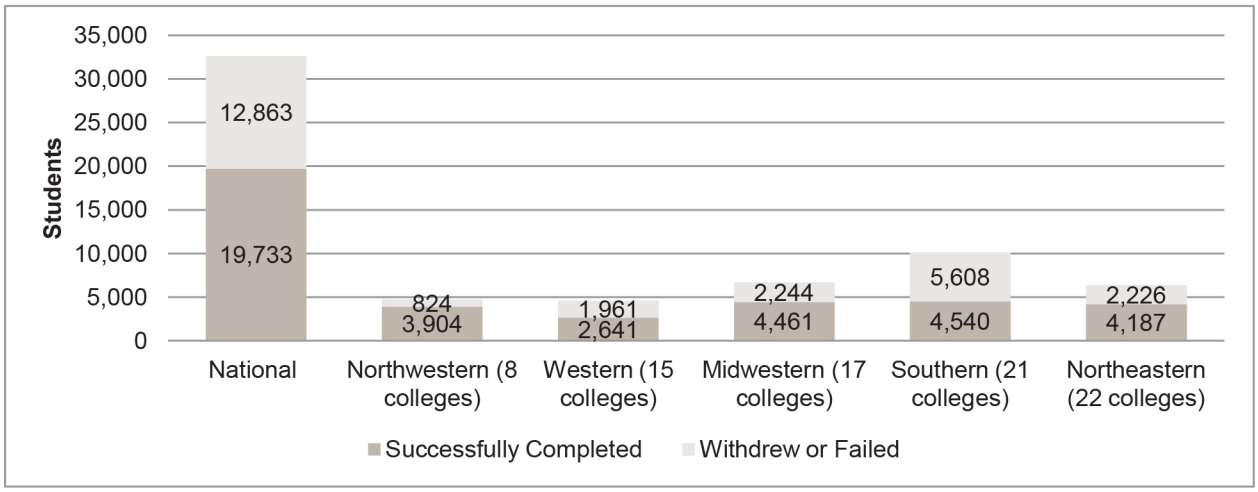
Program Effectiveness

The second and third research questions asked about the effectiveness of programs. This section details the outcomes of CCCs including rates of student enrollment and graduation, student and faculty satisfaction, student employment rates, and employer perspectives on CCC training.

Student Enrollment and Graduation

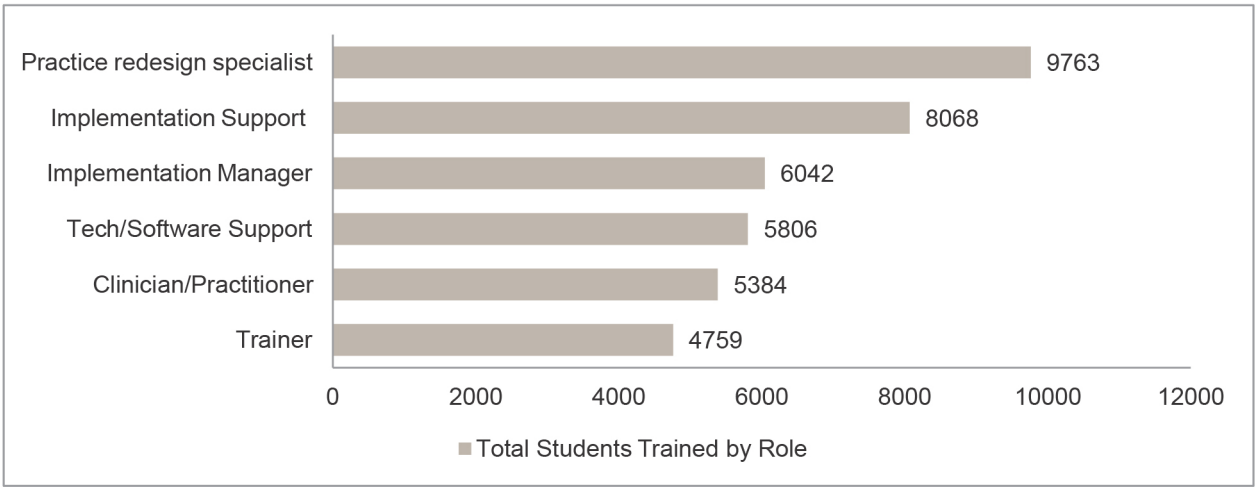
Counts and rates of student enrollment in and graduation from (or successful completion of) health IT training serve as important measures of program effectiveness. Across all regions, 19,733 individuals completed the program at program completion in October 2013. Exhibit 31 below depicts program completion, enrollment, and withdrawal by CCC region.

Exhibit 31: Program Completion, by CCC Region



Source: ONC administrative data, October 2013.

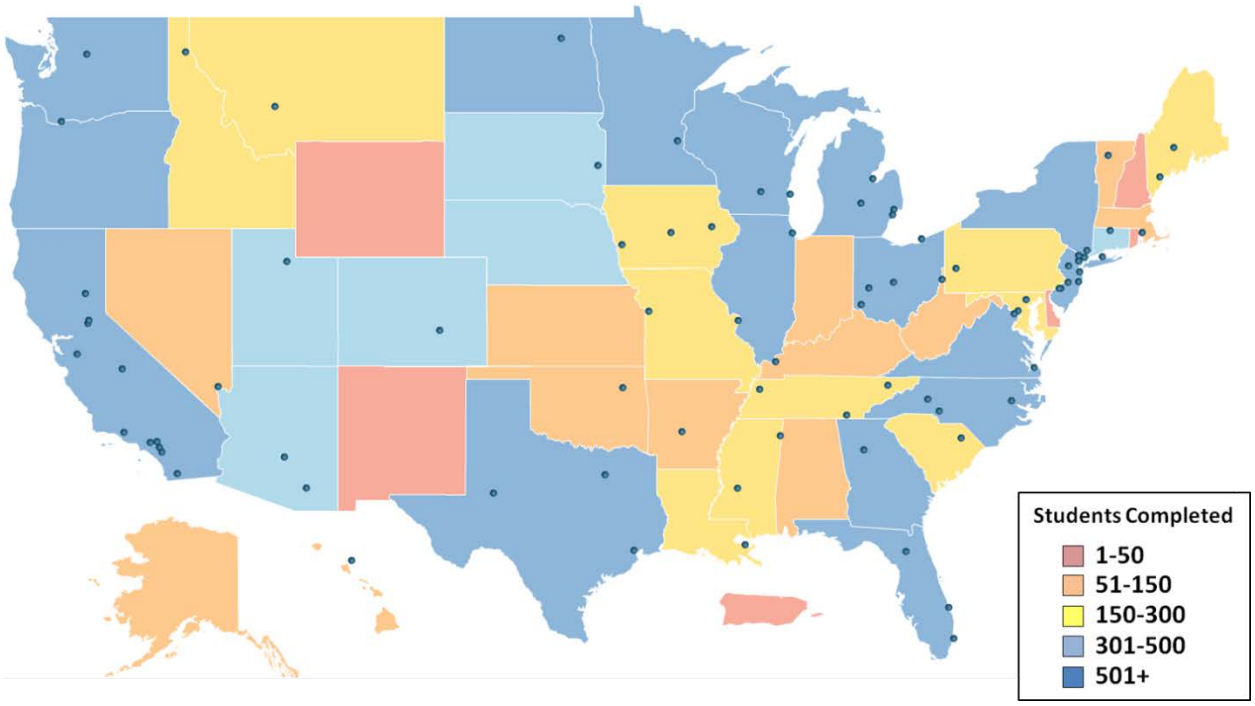
Exhibit 32: Number of Students Trained, by Role



Source: ONC administrative data, October 2013.

As previously noted, the 81 community colleges trained students in all 50 states. Exhibit 33 below shows that 16 states trained more than 500 students.

Exhibit 33: Number of Students Who Successfully Completed the Community College Consortium Program, by State



Source: ONC administrative data

The attrition rate across regions was 37.7%, but varied by region (as shown in Exhibit 33 above). In general, program administrators reported that attrition rates from the Workforce Program were about the same as those from other programs at the schools. Administrators noted some students dropped out of the program once they had a better sense of the workload and the time commitment. CCC administrators suggested that, in general, students with health care backgrounds were more likely to struggle with the materials than were those with IT backgrounds, and many of the students echoed this sentiment. Students mentioned some of their classmates opted not to complete the program because of their frustration with the quality of course materials or the lack of attention or feedback they received from instructors. To reduce attrition, schools focused on preparing students for the workload at the outset (for example, through the aforementioned orientation sessions) and counseling students who were struggling.

Generally, faculty members reported that students came into their health IT training with adequate background knowledge and skills. Results of the survey of CCC instructors indicated that 14 percent of respondents believed students were extremely well-prepared for their training and 68 percent believed that students' preparation was adequate. Discussions with faculty members during site visits added context to these survey findings. Faculty members revealed that, in general, students with an IT background had an easier time learning the health care material, while students with health care backgrounds had a more difficult time picking up the technical IT skills. When probed on possible reasons for this observation, faculty members suggested that the health care materials might be more "intuitive," while the IT topics required more practice and experience for proficiency.

Typology of Community Colleges

After examining findings from both quantitative and qualitative data collection activities, the NORC team noted substantial variation in how the schools organized their programs. In order to describe key characteristics of the participating community colleges, the team conducted a typology analysis. The team designed the typology to explore the factors associated with low completion or graduation rates, as well as whether those colleges with significantly lower completion rates were disproportionately likely to be in a given region or regions. The team applied the following approach:

1. NORC working with ONC determined the most important variables. They were orientation, role sequencing, learning format, hands-on opportunities, internship opportunities, previous employment experience, for-credit classes, full/partial reimbursement for classes, total number of roles offered, and the size of the student population.
2. ONC facilitated the collection of data by contacting consortia directly.

3. The team tested ten college characteristics (mentioned in step one) for statistical significance based off program completion rates.
4. Four of those ten characteristics previous employment experience, for-credit classes, role sequencing, and learning format, were significant and then used to for clustering based off a common approach (across regions). In addition, the analyses assessed whether this variation was related to student completion rates as well as whether completion rate and profile membership differed by location, state unemployment rate, and meaningful use payments to eligible providers per county.
5. The team estimated models with an increasing number of profiles and compared them with respect to model fit.
6. Upon selecting the "best" fitting model, we explored whether the profiles differed with respect to student completion rates.
7. Based on the results from step six, we further explored whether the profiles differed with respect to location, state unemployment rate as well as meaningful use payments to eligible providers per county.

This analysis yielded three distinct profiles of community colleges as described in Exhibit 34 below.

Exhibit 34: Community College Profiles

Indicator	Categories	Average	LOW Class 1 (n=19)	MEDIUM Class 2 (n=45)	HIGH Class 3 (n=15)
Pre-HITECH Program	None	26.6%	2.9%	19.7%	100%
	Health IT or other	73.4%	97.1%	80.3%	0.0%
Credit	Non-Credit	60.8%	100%	34.4%	100%
	Credit or both	39.2%	0%	65.6%	0%
Role Sequencing	Some/all multiple roles	46.8%	16.4%	57.6%	57.7%
	One role then next	36.7%	83.6%	18.7%	25.8%
	Only one role to complete	16.5%	0.0%	23.7%	16.5%
Learning Format	Entirely online/Asynchronous	39.2%	70.7%	31.5%	13.5%
	Online with face to face	53.2%	29.3%	64.0%	51.6%
	Entirely in-person	7.6%	0.0%	4.5%	34.9%
Completion Rate		58.8%	44.8%	63.0%	67.5%
State Unemployment Rate	Range: 0.0350-0.1350	0.089%	0.095%	0.085%	0.092%

Indicator	Categories	Average	LOW Class 1 (n=19)	MEDIUM Class 2 (n=45)	HIGH Class 3 (n=15)
Meaningful Use Payments	1st Quartile: 2-144	25.3%	42.1%	20.0%	20.0%
	2nd Quartile: 151-404	25.3%	21.1%	31.1%	13.3%
	3rd Quartile: 415-782	25.3%	15.8%	20.0%	53.3%
	4th Quartile: 791-3825	24.1%	21.1%	28.9%	13.3%
Urban-Rural Classification	Large Central-Small Metro	44.3%	68.4%	35.6%	40.0%
	Micropolitan/Noncore	55.7%	31.6%	64.4%	60.0%

Note: These profiles were derived for the purposes of the typology analysis using unweighted data and thus some of the percentages in this table may vary slightly from those reported elsewhere in this report (e.g., with respect to program completion rates).
Source: ONC administrative data, October 2013.

The first community college profile consisted of 19 colleges with the following characteristics:

- Almost all (97.1 percent) had previous HIT training experience,
- All (100 percent) offered courses on a not-for-credit basis,
- A significant majority (83.6 percent) required students to complete one role before moving to the next, and more than two-thirds (70.7 percent) offered courses entirely online/asynchronously.
- Colleges in this profile had the lowest completion rate (i.e., 45 percent).

The second community college profile consisted of 45 colleges with the following characteristics:

- A significant majority (80.3 percent) had previous HIT training experience,
- Almost two-thirds (65.6 percent) offered course both on a for-credit or a not-for-credit basis,
- More than half (57.6 percent) allowed students to enroll in multiple roles at the same time, and
- Almost two-thirds (64 percent) offered course online with opportunities for face-to-face interaction.
- Colleges in this profile had the second-highest completion rate (i.e., 63 percent).

The third community college profile consisted of 15 colleges with the following characteristics:

- None of the colleges had any prior HIT training experience,
- 100 percent offered the course on a not-for-credit basis,
- More than half (57.7 percent) allowed students to enroll in multiple roles at the same time, and
- About half (51.6 percent) offered courses online but with opportunities for face-to-face interaction.
- Colleges in this profile had the highest completion rate (i.e., 68 percent).

The college profile with the lowest completion rate differed significantly from the other two profiles with respect to the completion rate. However, no differences were found between the college profiles with the highest versus the second-highest rate.

Profile Membership, Completion Rate, and Contextual Factors

The goal of these analyses was to assess the extent to which community college profiles as well as completion rates differed with respect to contextual factors. The team used the following three factors:

- State unemployment rate in 2011: Across the community colleges, this rate ranged from 3.5 percent to 13.5 percent with a mean of 8.9 percent.
- Meaningful use payments to eligible providers per county from January 2011 to August 2013: Across the community colleges, payments ranged from $2 to $3,825 with a mean of $593.40.
- 2006 National Center for Health Statistics Urban-Rural Classification Scheme: The majority (55.7 percent) of community colleges were located in rural areas classified as micropolitan or noncore.

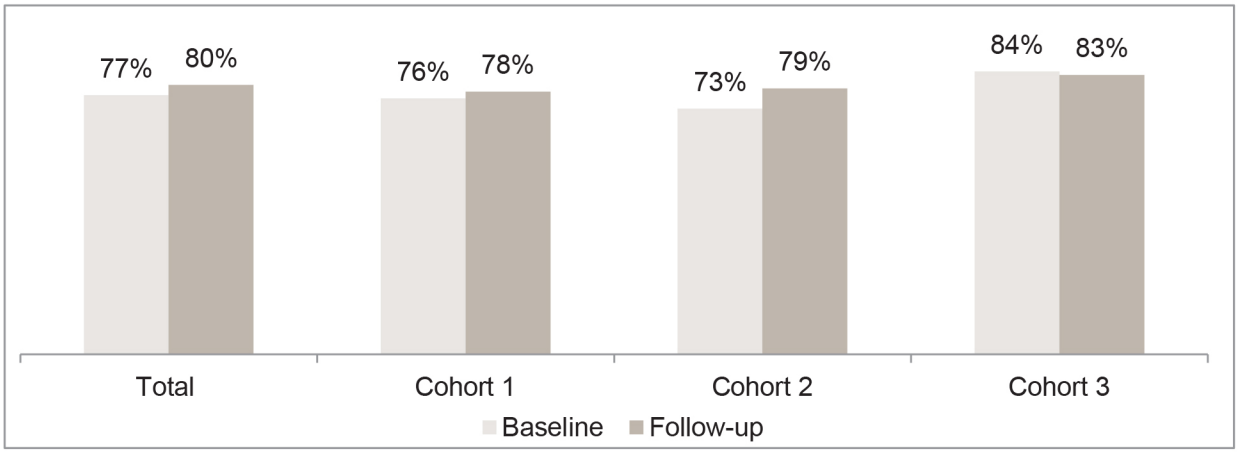
As a first step, the team conducted descriptive analyses to assess whether the previously identified community college profiles differed with respect to the three contextual factors. While the three profiles did not differ with respect to the state unemployment rate or meaningful use payments, significant differences were found with respect to the location of the community college. While the high-performing colleges in profiles 2 and 3 were more likely to be in rural areas (64 percent and 60 percent, respectively), colleges in the low-performing profile were more likely to be in metropolitan areas.

Therefore, using the descriptive analyses as a point of departure, the typology analysis more formally assessed the potential influences of the contextual factors on profile membership and completion rate. When testing the influence of the three contextual factors on program completion rates, only state unemployment yielded a significant result. Controlling for the other two factors, each standard deviation increase in state unemployment rate reduces completion rate by 2.9 percent, which may be due to a perception by students that finding a job will be too difficult and there is less benefit in finishing the program.

Student Employment

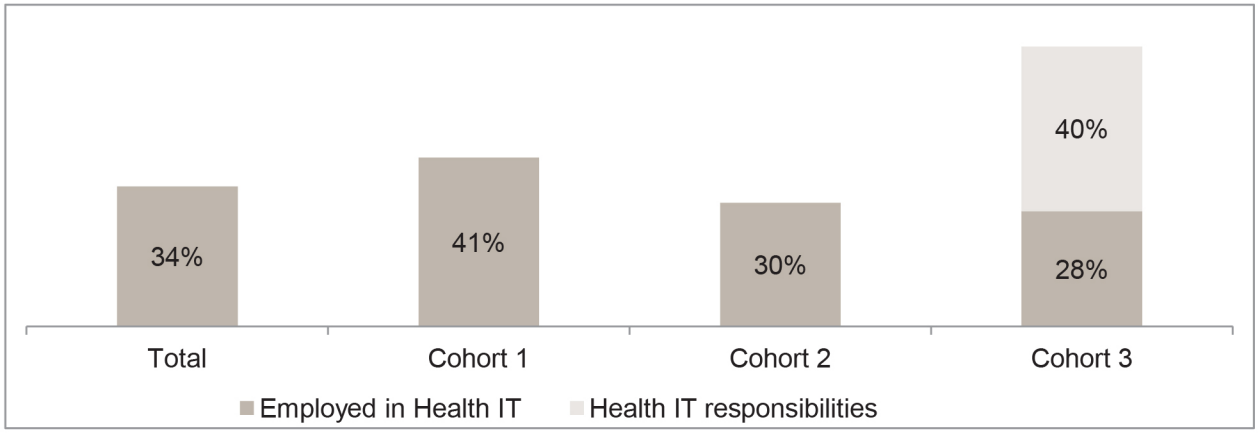
The NORC surveys asked CCC students about their employment status and history at both baseline and follow-up. More students reported having a job at follow-up across all three cohorts. See Exhibits 35 and 36 below for details on differences between baseline and follow-up.

Exhibit 35: Students' Employment at Baseline and Follow-Up Across Cohorts



Source: NORC baseline and follow-up CCC surveys

Exhibit 36: Students' Employment in Health IT at Follow-Up



Source: NORC follow-up CCC surveys

Among the total number of baseline respondents to this question, 77 percent reported having a job; at follow-up, a similar proportion of respondents were employed (80 percent). At follow-up, overall, 34 percent of students reported employment in health IT, although there was some variation in the percentage of students currently employed in health IT across the three cohorts. In Cohort 1, 41 percent indicated employment in health IT at follow-up compared to 30 percent in Cohort 2. Only the Cohort 3 survey contained a question for students who were not employed in health IT, which asked if they had any health IT responsibilities. Thus, in addition to the 28 percent of Cohort 3 students who reported employment in the field of health IT, an additional 40 percent reported having health IT responsibilities, increasing the share working in the health IT space. Exhibit 36, above, contains the follow-up survey

findings regarding student employment in health IT. Cohorts 1 and 2 may have had a similar proportion of students with health IT responsibilities had the question been asked of them as well.

Students who were employed in health IT at follow-up were asked which role best described their current job: health care provider (for example, physician, nurse, therapist, etc.), technical/software support (maintenance), implementation specialist, consultant (for example, practice workflow redesign specialist), administrative (for example, medical coder), or other. Looking at combined responses across cohorts, the most frequent response to this question was technical/software support (22 percent) and administrative (20 percent). The least common response was implementation specialist (9 percent). About a quarter (27 percent) of respondents reported their job as an "other" role. Exhibit 37 below contains student responses regarding their job role across the three survey cohorts.

Exhibit 37: Students' Job Roles, by Cohort*

	Total	Cohort 1	Cohort 2	Cohort 3*
Currently Employed in Health IT	**40%**	**41%**	**30%**	**68%**
Technical/software support (maintenance)	22%	22%	29%	13%
Administrative (for example, medical coder)	20%	20%	9%	32%
Consultant (for example, practice workflow redesign specialist)	12%	12%	20%	5%
Health care provider (for example, physician, nurse, etc.)	11%	10%	8%	16%
Implementation specialist	9%	8%	11%	7%
Other	27%	28%	24%	27%

*Only the Cohort 3 follow-up survey included a question for students who were not employed in health IT, which asked if they had any health IT responsibilities. The data in this column include students who were employed in health IT or reported having health IT responsibilities.
Source: NORC follow-up CCC surveys

At follow-up, as summarized in Exhibit 38 below, between approximately one-quarter and one-third of students working in health IT who were working for the same employer as prior to the program reported receiving salary or wage increases, a promotion, or a change in position or job title. Additionally, between one-third and one-half of respondents who reported these positive changes in their job strongly or somewhat agreed they were due to program participation.

Exhibit 38: Changes in Students' Job Roles, by Cohort

	Total	Cohort 1	Cohort 2	Cohort 3
Current job in health IT with same employer as prior to program	**63%**	**61%**	**63%**	**67%**
Since entering the program: Received salary/wage increase in primary job	31%	36%	29%	29%
Received promotion in primary job	16%	15%	14%	19%
Change in position or title change	26%	21%	28%	31%
Strongly or somewhat agree that: Salary/wage increase due to program participation	27%	35%	26%	22%
Promotion was due to program participation	51%	71%	47%	36%
Position/job title change due to program participation	36%	59%	24%	28%
Current job in health IT with different employer as prior to program	**37%**	**9%**	**37%**	**33%**
Strongly or somewhat agree that: Program participation had positive impact on obtaining current job	53%	51%	55%	53%
Program participation had positive impact on position or job title	50%	49%	61%	39%

Source: NORC follow-up CCC surveys

Given the salience of students' employment in the field of health IT with respect to the success of the training program, the NORC team completed additional analyses of data from the follow-up surveys on employment in order to identify key significant predictors of employment overall and employment in specific relevant fields in particular. Exhibit 39 displays the results of these analyses and highlights the fact that those with previous graduate-level training or previous experience working in the field were more likely to be employed in health IT.

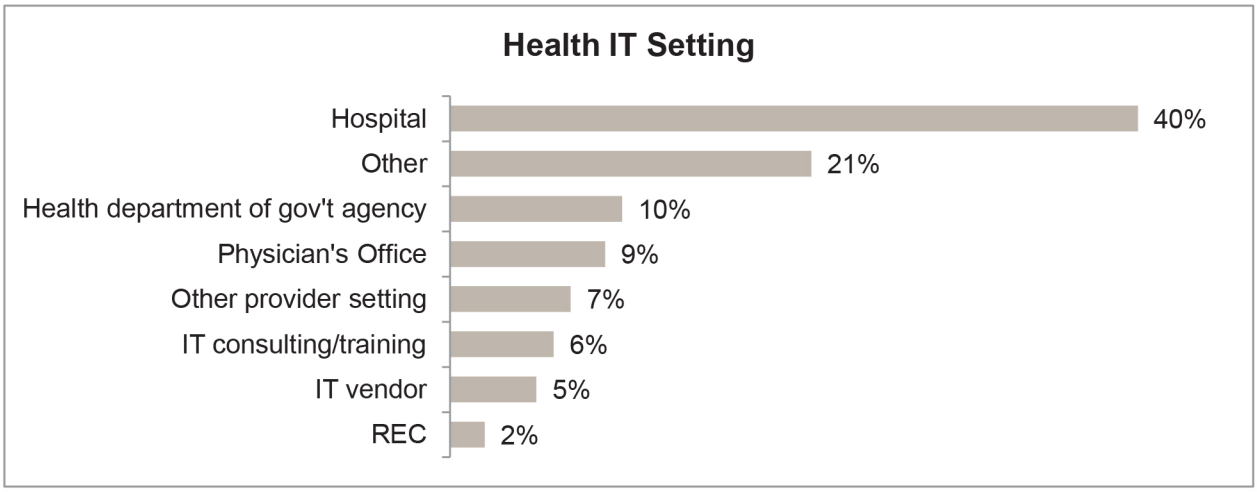
Exhibit 39: Significant Predictors of Employment Status, Odds Ratios (Relative Risk)

These analyses account for clustering of students in CCCs and use the frequency weight (*p<.1, **p<.05, ***p<.01).		Employment Status	
Predictor (Reference)	**Category**	**Health IT**	**Working in other field**
Age (Ref=LT 38; 23.21%)	38-46 (25.96%)	0.51*	0.44***
	46-54 (23.90%)	0.44*	1.18
	GT 54 (26.93%)	0.32***	0.64
Gender (Ref=Female; (29.8%)	Male (70.20%)	1.00	0.60*
Cohort (Ref=Cohort 1; 34.43%)	Cohort 2 (44.54%)	0.61*	1.37
	Cohort 3 (21.03%)	0.52	1.72
Highest Degree (Ref=HS/GED; 24.62%)	Associate's/Bachelor's (52.92%)	1.22	1.07
	Graduate/Professional (22.46%)	2.31**	1.24
Employment Status (Ref=Not Employed; 29.22%)	Employed (70.78%)	8.74***	6.08***
Formal Training in Health Care (Ref=No; 49.31%)	Yes (50.69%)	1.03	1.51
Formal Training in IT (Ref=No; 57.98%)	Yes (42.02%)	0.99	0.79
Formal Training in Health IT (Ref=No; 85.95%)	Yes (14.05%)	1.26	0.60*
Work Exp., Health IT (Ref=LE 3 Years; 84.28%)	> 3 years (15.72%)	4.45***	0.94
Work Exp., Health (Ref=LE 3 Years; 50.84%)	>3 years (49.16%)	1.60	1.04
Work Exp., IT (Ref=LE 3 Years; 68.80%)	> 3 years (31.20%)	0.37***	0.49**
Training: Clinical Consultant (Ref=No; 87.99%)	Yes (12.01%)	0.77	0.90
Training: Imp. Manager (Ref=No; 81.85%)	Yes (18.15%)	0.49**	0.54**
Training: Support Specialist (Ref=No; 70.93%)	Yes (29.07%)	0.49**	0.63
Training: Workflow (Ref=No; 68.61%)	Yes (31.39%)	0.53**	0.84
Training: Software Support (Ref=No; 78.51%)	Yes (21.49%)	0.85	0.83
Training: Trainer (Ref=No; 86.67%)	Yes (13.33%)	0.74	0.60*
Program Satisfaction (Mean=3.59; Range:1-5)	Continuous	0.99	0.90
Program Completion (Ref=Not completed; 38%)	Completed (62%)	0.95	1.13
Learning Format (Ref=In-Person; 10.82%)	Hybrid (28.09%	1.62	1.65
	Online (61.09%)	1.43	2.12
Metropolitan (Ref=Metropolitan Area; 41.99%)	Non Metro (58.01%)	1.31	1.78***
Consortium (Ref=Region A; 13.88%)	Region B (13.80%)	0.61	1.04
	Region C (23.20%)	0.81	1.13
	Region D (27.13%)	0.61	1.44
	Region E (21.99%)	0.49	1.12

Job Setting

In the follow-up survey, students currently employed in health IT and with the same employer as prior to enrolling in the program were asked which of eight settings best described their current health IT job. Among respondents across cohorts, the greatest proportion of students reported working in a hospital setting (40 percent). See Exhibit 40 below for results regarding the remainder of the job settings.

Exhibit 40: Health IT Job Settings at Follow-up



Source: NORC follow-up CCC surveys

During focus groups, the students who gained employment after completing the program generally reflected more positively upon it and felt that completing the program was very useful in helping them find a job. Students who gained employment tended to have used their school's job placement assistance programs, and instructors described them as possessing the "soft skills" employers noted as important. Career counselors commented that the students who were successful in their job searches tended to be those who displayed the most professional maturity as well as those who had previously held supervisory roles. Counselors also noted that the successful students were typically the ones who were motivated and persistent in approaching and following up with potential employers, including introducing themselves to employers at networking events and demonstrating a willingness to accept unpaid internships. At many colleges, there was a perception—among program administrators, students, and instructors alike—that students with prior experience in health care had an easier job finding work in health IT than did those who were transitioning from the IT field. Results from the College of Health Information Management Executives (CHIME) 2012 survey confirmed the NORC team's findings.[33]

While some students turned internships into full-time jobs, others with internships were not as successful in this regard. Students enrolled in community colleges that hired employees of large, local health care

systems as instructors also often had more luck landing jobs at such systems due to opportunities to form relationships with and market themselves to these instructors (who were also potential employers) while in the classroom. In general, however, students enrolled in colleges located near large hospitals or health centers had better luck finding jobs simply by virtue of the number of job openings available.

Perceived Program Benefits

Respondents to both the baseline and follow-up surveys reported on their belief in the program's ability to prepare students for the health IT workforce. As highlighted in Exhibit 41 below, at baseline, approximately two-thirds of respondents who were seeking a job in health IT strongly or somewhat agreed that the skills they were learning would help them obtain the type of health IT position they were seeking (65 percent) and perform well in it (69 percent). Similar majorities of baseline respondents already working in health IT strongly or somewhat agreed that the skills they learned in the program would improve their job performance (76 percent) or improve the potential for promotion or better position (64 percent).

At follow-up, fewer respondents who were seeking a job in health IT responded positively. Fifty-one percent of these respondents strongly or somewhat agreed the skills they were learning would help them obtain the type of position in health IT they were seeking and 60 percent strongly or somewhat agreed those skills would help them perform well in the type of health IT job they were seeking. For respondents employed in health IT at follow-up, the same proportion as at baseline agreed that the skills they learned during the program would improve their job performance (62 percent) although fewer (54 percent compare to 64 percent at baseline) reported that the skills would improve their potential for promotion or a better position. Differences between baseline and follow-up for students without a job in health IT may reflect respondents' optimism about finding a job at baseline and disappointment regarding not having a job in health IT at follow-up. Similarly, respondents with jobs in health IT may have experienced an improvement in job performance between baseline and follow-up due to their newly acquired skills (one potential explanation for why proportions remained the same) and differences in their response regarding promotions or getting a better position may reflect optimism at baseline and more realistic perspectives at follow-up.

Exhibit 41: Perceived Program Benefits

		Strongly/somewhat agree %	
	The skills I learned will….	**Baseline**	**Follow-up**
Respondents who were seeking a job in health IT	…help to obtain a health IT position	65	51
	… perform well in a health IT job	69	60
Respondents who were employed in health IT	…will improve job performance	76	62
	… improve the potential for promotion or better position	64	54

Source: NORC baseline CCC surveys

Discussions during site visits provided further insight on students' beliefs regarding program benefits. Although many students gained employment after completing the program, most were skeptical that the six-month program would give them sufficient health IT training to find rewarding jobs in the field. Students explained that most job openings were looking for substantial experience (typically three or more years) and/or more formal health IT education than the program would provide. Students were also unsure they had gained the skills necessary to implement an EHR. Instructors echoed the sense that additional hands-on experience would be necessary to make students employable. In particular, due to the demanding and fast-moving nature of the current health IT environment, employers could not afford to take the time for on-the-job training of new employees; accordingly, real-life skill, practice, and familiarity were necessary to make students employable.

Many program directors, instructors, and students with whom we spoke expressed anxiety about program graduates' job prospects, with regional labor market conditions playing a critical role in the job-search experience. For example, areas in which there was already a high EHR penetration seemed to have less need for individuals with this type of training. For the same reason, community colleges in areas where providers in their local markets were adopting EHRs at a slower rate perceived a lack of demand for health IT employees as well. Many discussion participants agreed that students might have to be willing to move or commute long distances to find the kinds of jobs for which they are ostensibly qualified. On the other hand, a 2010 survey by the College of Healthcare Information Management Executives (CHIME) revealed that vendor and health care provider respondents reported that the most significant barrier in meeting their staff needs is the availability of qualified workers in the area. Close to half of the respondents working for health care provider organizations reported placing an IT initiative on hold or considered placing one on hold because they were unable to find the a sufficient number of qualified staff.[34]

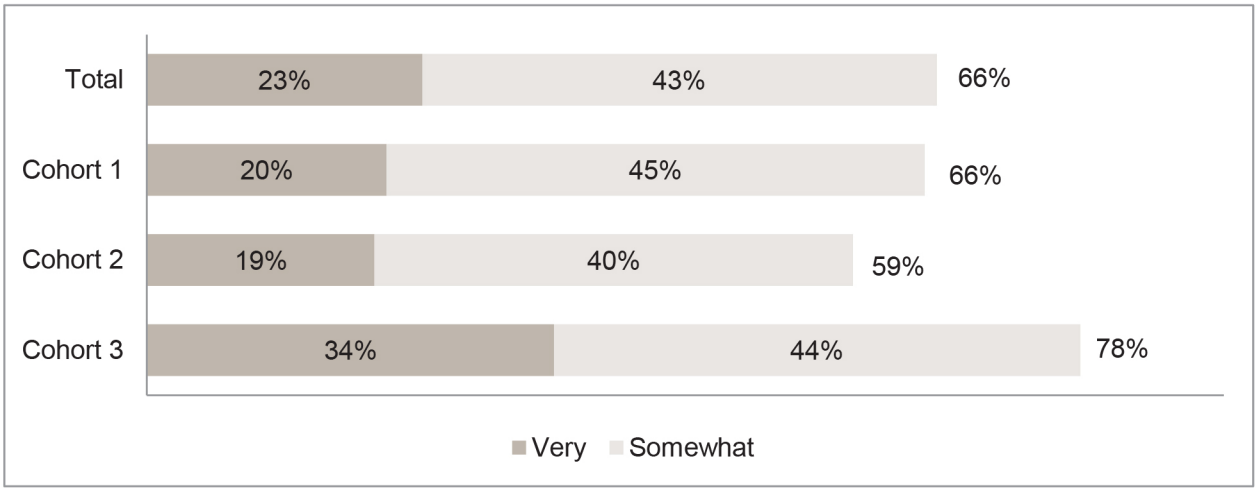
Student and Faculty Satisfaction

NORC collected data on student satisfaction from student surveys (where baseline surveys explicitly asked about satisfaction as well as student beliefs about the quality of course instructors and the curriculum). Findings from NORC's survey of CCC faculty shed light on their perception of student satisfaction. Additionally, qualitative data from discussions with students and faculty during site visits augmented the survey findings regarding satisfaction—and the learning platform in particular.

Overall Student Satisfaction

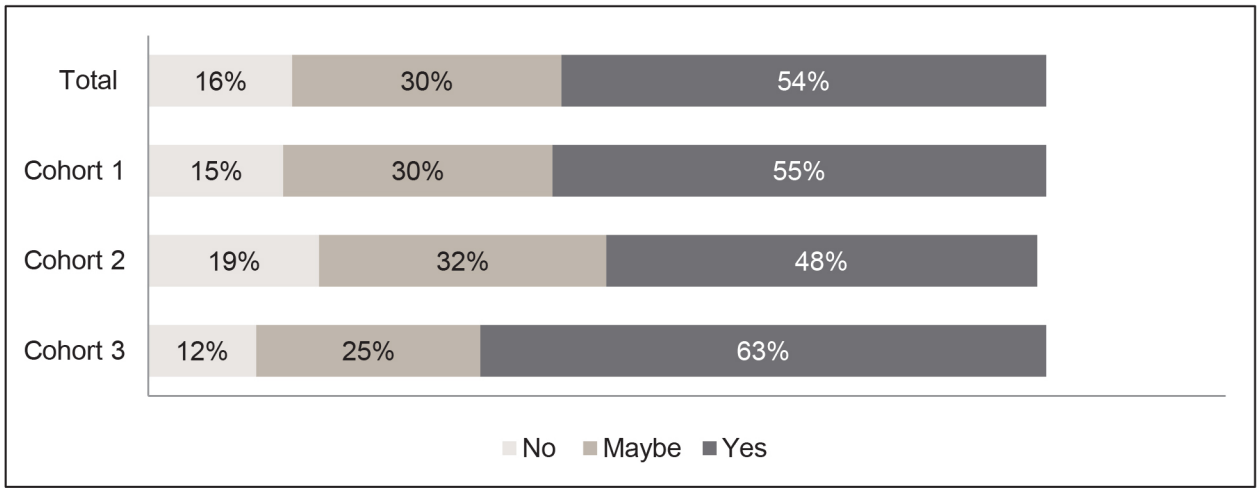
As part of both the baseline and follow-up CCC surveys, NORC asked students about their overall program satisfaction. At follow-up, six months after students took the baseline survey; NORC also asked participants whether they would recommend the program to others interested in entering the health IT field. At baseline, 73 percent of CCC students were somewhat or very satisfied with the program and satisfaction did not change much over time, with 66 percent of CCC students somewhat or very satisfied with the program at follow-up. Fifty-four percent of CCC students also indicated they would recommend the program to others interested in the health IT field. Program satisfaction rates at both baseline and follow-up were similar across the three cohorts, as shown in Exhibits 42 and 43, which focus on the follow-up data.

Exhibit 42: Program Satisfaction at Follow-up, by Cohort



Source: NORC follow-up CCC surveys

Exhibit 43: Students' Willingness to Recommend Program at Follow-up, by Cohort



Source: NORC follow-up CCC surveys

Student Satisfaction with Instructors, Curricula, and Learning Format

NORC's baseline surveys asked students about their instructors, and majorities of students responded positively. More than 6 in 10 students agreed strongly or somewhat that: their instructors are/were knowledgeable in the subject matter (69 percent), their instructors are/were effective teachers (63 percent), they were confident instructors and program staff would be able to answer questions about course content/assignments (69 percent), and their instructors' assignments/exams reflected the course material covered (74 percent).

During student focus groups, the NORC team heard varying feedback about the instructors across the community colleges. When students were dissatisfied with their instructors, they tended to have one of three complaints. First, many felt there was an overall lack of responsiveness on the part of their instructors. Second, and more specifically, they were concerned that some instructors provided limited feedback on assignments. A final concern was that many instructors simply relayed the information on the slides verbatim without adding any additional insights or contextual information.

Other students had very positive feedback on their instructors, particularly those who integrated their own experiences in the field of health IT into the course material. Students were especially appreciative of instructors who helped them secure and prepare for job interviews and served as professional mentors outside of the program. In a number of instances, students suggested a need for additional instructors, particularly as enrollment increased, in order to maintain student-to-instructor ratios that allowed instructors to offer their students sufficient attention.

Similar to the findings regarding course instructors, respondents to the baseline survey felt positively about the curriculum. Majorities of students strongly or somewhat agreed that: the courses met their general expectations of the program (68 percent), the required courses fit together to form a cohesive training program (68 percent), and the courses gave students a clear understanding of the subject matter (70 percent). These findings did not differ across cohort.

Although the discussions during the site visits supported the positive findings from the survey and students reported overall satisfaction with the materials, they also gave students the opportunity to express their opinions regarding relatively more minor issues. A number of students commented that—while extensive—the materials sometimes lacked the detail necessary to introduce them to the topic thoroughly for purposes of employment. Students also raised concerns about the overwhelming volume of information, the lack of cohesiveness in the materials, and the number of factual or typographical errors.

During focus group discussions, students also expressed a desire for a clearer outline of their course of study at the beginning of their training to help set their expectations for each class at the time of enrollment. Many also offered specific feedback on the order in which instructors presented materials. However, in large part, because the community colleges did not receive the full set of curriculum materials prior to starting their programs, there were adjustments to the classes throughout the semester. This caused some confusion and frustration for students, although most acknowledged that the beginning of any new program could be less smooth than would be ideal.

Regarding learning format, during focus groups students noted that in-person courses gave them opportunities for additional discussions with their classmates and instructors, which fostered opportunities for students to get to know each other and to form study groups. The in-person format allowed students to network with instructors, some of whom were potential employers. In addition, in-person sessions made it easier to provide feedback to program administrators about how to improve the program. At the same time, students viewed online classes as more convenient, particularly for those currently employed and/or with competing personal or family responsibilities. Many noted that it was nice to be able to listen to lectures online at a place—and often at a time—of their choosing so they could tailor their coursework to their own daily schedules. On the other hand, a number of students at schools that offered their training mostly or exclusively online reported a preference for more in-person courses as the online format made it difficult to form personal relationships, absorb complicated material, and receive clear and comprehensive responses to questions in real time.

Many courses also used Blackboard or other technologies to allow for online discussions. Students generally liked these technologies, but reported that it often took some time to become comfortable with them. Students also described variable effectiveness of online discussion boards and that they were better-suited for some classes and topics than others.

Regardless of whether the colleges offered courses in-person, online, or a hybrid of the two, students had access to the full set of materials developed by the Curriculum Development Centers, including the slides with voiceovers. Students appreciated that these resources were available and several spoke about the convenience of being able to listen to the audio recordings. Many students noted they would have liked a more traditional textbook as well, although the curriculum developers were not able to include such resources among their materials.

Students consistently referred to two areas for potential improvement in the program: additional opportunities for hands-on experience and a more manageable workload. On the first point, students often stressed the importance of spending time working with EHRs. While use of VistA was a part of many schools' programs, technical problems limited the extent to which it could be integrated at some schools. Students described the process to download VistA cumbersome, several described it as archaic, and others noted it might be helpful but they had little support from their school in using it. For those able to experiment with that application, they appreciated the chance to gain direct experience with an EHR, but most would have preferred a commercial application. Many students expressed interest in exposure to a broader range of more current software and technology.

In terms of the volume of material, although workloads and perceptions thereof varied by schools, students from multiple schools raised concerns about the amount of material they were expected to absorb in a six-month period. Others also felt they were spending so much time doing "busy work," and they lacked the time to process what they were actually learning. Students recommended either increasing the program's duration or limiting the scope of its content.

Faculty Satisfaction

Though NORC's faculty survey did not ask about satisfaction with the program *per se*, it did ask instructors to describe the usefulness of the assistance or support they received from the project director and other administrators to help them successfully teach their courses. The majority of instructors reported satisfaction with the assistance they received, with 38 percent describing the support as good and an additional 35 percent describing it as excellent.

NORC's discussions with faculty members during site visits revealed that many found the teaching experience to be rewarding and enjoyed providing real-world examples in their classes. However, some faculty members described the difficulty in transitioning from industry to academia and balancing teaching with working. At some schools, faculty members found the time commitment required for the teaching positions to be greater than they had initially anticipated. Faculty members specifically mentioned the usefulness of student orientations in terms of setting student expectations, offering an introduction to health IT, and making sure that only students with a likelihood of success continued with the program.

Employer Perspectives

The site visits provided rich opportunities to gather feedback on the extent to which the program was well-suited for employers' current workforce needs. Although these qualitative data are valuable for understanding the perspectives of some health IT employers, NORC's findings must be put in the context of a relatively small sample size and the fact that many of the employers recruited to participate in site visit discussions had existing relationships with CCCs.

Workforce Needs

The extent and specifics of employers' health IT workforce needs varied greatly around the country. Chief Information Officer (CIO) respondents to the CHIME survey revealed that most needed clinical software implementation and support staff, who lead efforts to implement clinical systems such as EHRs and computerized provider order entry. Additionally, other categories of open job positions include infrastructure, and business software implementation and support staff.[35]

At several community colleges, program leadership commented that a source of frustration for job-seeking students was that they believed demand for health IT workers had yet to hit their area. Then, in areas in which employers were keenly interested in hiring new staff, many expressed difficulties identifying suitable candidates whether through the program or other sources. Many health care providers expressed a need for new employees with demonstrable experience using the EHR they had or were about to select, anticipating that this would save considerable time and money they would otherwise need to invest in training.

Several employers included in the employer focus groups conducted during the site visits indicated that small provider offices were unlikely to hire altogether new and newly trained staff for an EHR implementation. While larger health care systems might hire program graduates as part of a larger implementation team, most small practices would be more likely to re-train existing staff. They did note

that, if smaller offices were choosing between two candidates for a medical assistant position, for example, the provider might opt for the one who also had formal health IT training.

Familiarity with the Program

In addition to offering services geared toward their students, many colleges engaged in outreach activities to increase potential employers' awareness of the program. Some administrators identified provider organizations in their communities that might hire their graduates as targets for these communication efforts. Other colleges used local health and technology networking groups to help disseminate information about the program. Further, several colleges noted the importance of reaching out directly to CIOs of health organizations and to vendors, as well as of working through local chapters of The American Health Information Management Association or The Healthcare Information and Management Systems Society. Results of the 2012 CHIME survey support that some outreach may have been successful given that 68 percent of responding CIOs were aware of the community college (and university-based) training programs.[36]

Despite these efforts, and the results of the CHIME survey, numerous employers with whom NORC spoke noted they did not feel the health IT employers in their area were particularly familiar with the community college programs.[37] Several employers mentioned it would be helpful to have a central repository for job postings to help connect potential employers to students enrolled in the community college programs across the country. This may be especially true given the proliferation of health IT job opportunities since 2009 (job postings tripled between 2009 and 2012) which may make the number or sources overwhelming for job seekers.[38] Further, employers, administrators, and faculty alike all thought that additional outreach to employers from ONC, as opposed to just from the schools, would be beneficial.

Employers who were aware of the program were not necessarily aware of the skills acquired by program graduates. CHIME survey results support these findings, as they indicate that only 12 percent of responding CIOs who knew of the programs reported hiring its graduates.[39] Employers and instructors thought it was important for schools to convey the fact that many graduates from these programs also had high levels of prior education and experience, contrary to many employers' expectations about community college students. In marketing the program, they also suggested that schools describe the types of skills that students were acquiring through their training and the nature of the material to which they were exposed. Employers also recommended that the colleges reach out to vendors and ask them to demonstrate their products and provide brief trainings to the students.

Experiences with Program Graduates

Employers who hired program graduates spoke very highly of their new employees, noting their professionalism and eagerness to learn. The majority of these students found entry-level positions, but some who possessed more clinical or advanced technical skills found higher-level positions. As stated above, local workforce needs varied by geographic area, which also affected the types of jobs that were available to students. Largely, employers who hired program graduates said that they would continue to consider such candidates for open positions and looked forward to continue working with the community colleges in the future.

Employers cited the need for candidates with hands-on experience working in health IT. Additionally, many employers stressed the importance of "soft skills." More specifically, employers noted they were looking for candidates with strong people and customer service skills, employees who are problem-solvers, and people who are energetic and eager to learn. The survey asked CIOs about staffing needs and competencies or areas of knowledge that were generally lacking in candidates for IT staff positions. Respondents most frequently mentioned that candidates lacked knowledge of health care and related IT applications. CIOs also noted a lack of practical experience; lack of experience with an organization's system; and an inability to interact successfully with front-line users.[40]

A number of employers explained that they reframed their expectations and approach to hiring students from the program over time. When they first learned about the program, they thought they would be finding high-level experts; however, they opted to retool their job descriptions to suit less-senior candidates. Unfortunately, internships or entry-level positions were generally not appealing or feasible for some program graduates, many of whom were accustomed to significantly higher salaries. Small physician practices in particular were trying to fill health IT positions for help transitioning from paper to EHRs, but were unable to pay the salaries to which a subset of students had become accustomed based on their job history prior to the program.

Challenges and Lessons Learned

CCCs faced a number of challenges in implementing and organizing their training programs as well as ensuring that students enroll, complete the program and find employment in the field of heath IT (thus demonstrating program effectiveness). Although CCCs generally experienced the same types of challenges, schools took different approaches and experienced different levels of success in addressing them.

Program Implementation and Organization

One challenge faced by CCCs during the program implementation and design phases was that differing histories with providing health IT training as well as varied infrastructure made it impossible for schools to offer the same quality of training. The flexibility afforded grantees in terms of the learning format and use of Workforce Program roles proved critical to the ability to launch the programs in a timely manner and to students' satisfaction. Some schools changed their learning platforms as the grant progressed, due in part to student feedback. For instance, one school initially considered offering more online and hybrid classes; however, in student surveys, students expressed a preference for in-person classes as they appreciated the chance for in-person interaction.

Though the grant's flexibility was an opportunity for innovation and for schools to provide health IT training within the bounds of their existing infrastructure, the requirement that students complete their training in six months was reported as a challenge by students and faculty. Students and faculty were skeptical that a six-month non-credit program without a certification would give them sufficient health IT training to be able to find jobs in the field, especially ones that offer acceptable salaries. These concerns were reinforced by many employers' perceptions of the program as well. During the period of grant funding, program administrators and faculty attempted to overcome the challenge of a heavy workload by paring down course materials especially after the first cohorts of students. Additionally, several program administrators discussed increasing the amount of time students could take to complete the training after the end of grant funding.

Another challenge faced by CCCs was the fact that the students entered the program from diverse backgrounds especially insofar as they come from the fields of IT or health care. These backgrounds affected students' experiences in the classroom as well as their ability to find jobs after the fact. In general, those with a health care background found the course materials especially challenging, whereas those with an IT background had challenges breaking into the health care field upon graduation (and often have higher salary expectations as well). Schools attempted to help students from both IT and health care backgrounds by ensuring that they enrolled in the appropriate role based on prior work experience. Additionally, to ensure students had adequate backgrounds, schools used strategies including requiring applicants to take a pre-assessment test; implementing a vetting component to the application process, with applicants having to check boxes to indicate their experience and education; carefully reviewing resumes and transcripts; holding in-person interviews; and speaking with references.

Program Effectiveness

A challenge faced by CCCs that affected attrition and both student and faculty satisfaction was that many students were not sufficiently prepared for the level of difficulty of the courses and/or the workload. Schools addressed this challenge by instituting orientations and "full-disclosure policies" as opportunities to set realistic expectations for students. Several program administrators reported that their schools' orientations were mandatory, while others were optional. Regardless, schools reported that these sessions were useful in terms of giving potential students an understanding of what to expect and weeding out individuals who might not be well suited for the program.

A barrier to both student satisfaction and employment outcomes was the lack of hands-on experience for students during their CCC training. Students most often cited more hands-on components as what they would change about the program, and instructors and employers agreed that hands-on experience is critical for preparing students for the job market. In order to create hands-on experiences for students, some program administrators reached out to providers and vendors in the community to set up internship programs for their students. Additionally, schools were able to utilize open source software to provide students with training on EHRs.

Another challenge to the outcome of students' employment in the field of health IT was that colleges were unsure how to support students in finding jobs. Over the period of grant funding, the schools engaged in a variety of successful approaches to support their students in finding positions. Many program administrators posted job openings either on their websites or in classrooms or otherwise disseminating potential opportunities. Students, program administrators, and faculty agreed that opportunities for student interaction with employers through school-sponsored career fairs, internships, practica, and employer lectures to students provided the best outlets for students to connect with employers and eventually find a job. In the future, schools hoped to collaborate more with the RECs, which could be a useful source of internships and/or permanent positions for students. Several employers suggested a way to help direct students to job opportunities in the future would be to develop a central repository to help connect potential employers to students enrolled in the community college program across the country. Employers also recommended that the colleges reach out to vendors and ask them to demonstrate their products or provide brief trainings to the students as a way to connect them to local employers.

Conclusions

In April of 2010, ONC awarded $68 million to five consortia, which supported 81 community colleges for two years. On balance, the CCC program was effective in enabling colleges to offer non-degree health IT training programs that students would be able to complete within six months in order to support the growing demand for health IT employees.

Colleges took a variety of approaches to implementing their programs and utilizing the prescribed Workforce Program roles. Schools that either proactively placed students in roles depending on their background or modified roles to meet employers' needs reported more success in terms of students completing the program and finding employment. Additionally, for-credit programs appealed more to students than did those that did not offer credit, as did the opportunity to receive government funding to pay for the training. Colleges found success with informal word-of-mouth marketing to recruit students and found student orientations an extremely valuable way to set student expectations regarding the workload. Nearly all faculty members teaching in the programs were adjunct instructors who also worked in the field of health IT and whose real-world experience was of great value to students.

Forty percent of students took courses exclusively online, which was a popular format due to the flexibility it offered. At the same time, others desired face-to-face opportunities for in-person and especially hands-on training and networking. In general, students in the CCC program were older than typical community college students, had at least a bachelor's degree, and enrolled due to their motivation to find a new job or improve their skills and promotion potential in their current job.

In total, 19,773 individuals had completed their health IT training. Schools reported that attrition rates were similar to other community college programs. Students expressed high rates of overall satisfaction with their CCC programs as well as with instructors and the curricula. CCC instructors similarly had positive feedback about the program.

Students were more likely to find jobs, particularly jobs in the field of health IT after completing CCC training. Among the total number of baseline respondents to this question, 70 percent reported having a job and 24 percent a job in health IT. At follow-up, a similar proportion of respondents to baseline were employed (74 percent). At follow-up, overall, 34 percent of students reported employment in health IT. The third cohort received a unique question at follow-up, asked only of those who responded that they were not working in health IT, which asked about health IT responsibilities. Among this group, 28% reported working in health IT and an additional 40% reported having health IT related responsibilities. Cohorts 1 and 2 may have had a similar proportion of students with health IT responsibilities had the

question been asked of them as well. Students employed in health IT were most likely to be working in the role of technical software support and in a hospital setting. Students whose job in health IT was with a different employer as prior to entering the program believed that their program participation had a strong impact on obtaining their job and their position or job title. Students who were seeking a job felt strongly that the skills they learned in the program would help them obtain a job in health IT and perform well in it. Similarly, students employed in the health field believed that the skills they learned would improve job performance and their potential for a promotion.

Employers highlighted the importance of both hands-on training and real-life experience as necessary to prepare individuals for the health IT workforce. Despite CCCs' efforts to reach out to employers, many were unaware of the CCC program and were unclear about what program graduates could offer. Employers who believed that graduates would enter the workforce prepared as highly skilled health IT experts were forced to temper their expectations. On the other hand, employers who experienced first-hand program graduates' abilities were overall very pleased with their work.

By and large, the feedback collected throughout NORC's quantitative and qualitative research demonstrated that CCC programs provided opportunities for community colleges to expand or further develop their health IT training programs and provided students with satisfactory training that helped many find employment in the field of health IT.

6. CURRICULUM DEVELOPMENT CENTERS

Chapter Summary

In April 2010, ONC funded five Curriculum Development Centers to develop curricula and educational materials for the ONC-funded community college programs and for public dissemination. The awardees were Oregon Health & Science University, University of Alabama at Birmingham, Johns Hopkins University, Columbia University, and Duke University. The Developers created materials for 20 components covering a range of health IT subject matter.

The Developers designed the group of 20 components as a "buffet" from which colleges could select materials. The Developers also provided guidance on which components were most relevant to each of the six Workforce roles emphasized by the CCCs. Each Developer was responsible for developing PowerPoint slides with voice-over narration and recordings, class activities and homework assignments, self-assessment questions, and links to supplemental readings and other materials. The Developers worked to create these materials in tandem with each other, with ONC, and with community colleges' advisory boards or committees composed of stakeholders.

Oregon Health and Science University (OHSU) additionally served as the National Training and Dissemination Center (NTDC) responsible for establishing a secure electronic site from which all materials were available for download through the end of 2012, among other roles. From November 2011 to March 2013, the NTDC site received 113,982 visits and saw 187,683 downloads. The Developer collected feedback on the materials through on online tool, a survey of CCC faculty, and a gaps and overlaps analysis performed by the American Medical Informatics Association. They used this feedback to update the materials for two subsequent releases.

In general, CCC program administrators, instructors, and students were satisfied with the Developers' materials. Forty-six percent of instructors found the materials extremely useful and 48 percent rated them as somewhat useful. The majority of CCC instructors also reported that their students were either extremely satisfied or somewhat satisfied with the materials.

However, CCC administrators, instructors, and students also reported several issues with the Developers' materials. Many noted that the volume of information in the materials was overwhelming, that there was too much depth in some areas and too little detail in other areas, that there were redundancies and inconsistences in the information, and that they contained numerous typographical errors and mistakes.

Several colleges indicated that the tendency for the same topic to appear in various places in the materials was a symptom of five different institutions having developed the materials. In focus group discussions, students also reported frustration with the numerous errors, particularly when they occurred in assessments or quizzes. Faculty and students exposed to multiple versions of the materials noted improvements in successive iterations, including corrections of most typographic errors in the Version 2.0 release.

Overall, the Developers were satisfied with the implementation and outcome of the program, but also offered suggestions for improving future awards. They noted that a less-constrained timeline could have resulted in fewer inconsistencies and typographical errors in the Version 1.0 release. They expressed that a better understanding of the materials' target audience could have improved the targeting of the materials. Although the Developers collaborated with one another and the CCCs, many wished that they had had more chances to communicate with both the CCCs and the HIT Pro exam grantee during the development process. The Developers also noted that having one institution develop the materials could have potentially streamlined the process.

The materials developed by the Developers filled a need for baseline health IT educational resources. The materials were useful both to instructors and students participating in the CCC program and to members of the public. Due to the rapid changes in the field of health IT, the Developers emphasized that it is essential for instructors to continue to actively update materials to reflect new developments.

Introduction and Background

The Workforce Program funded five Curriculum Development Centers ("the Developers") around the country, allocating $10 million to develop curricula and educational materials for the ONC-funded community college programs and for public dissemination. The program grant was awarded to Oregon Health & Science University, University of Alabama at Birmingham, Johns Hopkins University, Columbia University, and Duke University in April 2010. The duration of the award was two years.

The overall NORC evaluation explored the following research questions:

- What processes did the grantees use to implement the programs and meet Program goals (e.g., barriers, lessons learned, successful strategies, coordination, program satisfaction)?
- To what extent did the grantees meet the requirements of the Workforce Program (e.g., implementing new educational programs, matriculating and training the expected number of students, developing adequate curriculum materials, and developing and administering a competency exam)?

- To what extent did participants in the program gain and maintain employment in health IT (e.g., job placement, job retention, salary, promotion, job readiness, employer needs)?

Due to the nature of the Curriculum Development Centers awards, this evaluation focuses on answering the first two of these research questions. We begin by analyzing how the Curriculum Development Centers program was organized and implemented across the five grantees. We then analyze the effectiveness of the program overall by examining instructors' use of the materials as well as administrators', stakeholders', instructors', and students' satisfaction with the materials. We conclude with a discussion of challenges encountered and lessons learned.

The NORC team conducted a mixed-method evaluation of the Developers along with the other components of the Program. As part of the evaluation, NORC collected qualitative data from interviews with the Developers and conducted a survey of community college faculty, which collected information on instructors' opinions of the curricula, the extent to which the instructors adhered to the curricula, and their impressions of the implementation of the program at their institution. This survey was administered to the entire population (N=625) of faculty members from September to December of 2011 and had a response rate of 74%. The methodology portion of the Evaluation Overview section of this report details the operational aspects of data collection and analysis activities. The Developers also conducted a self-evaluation of their content development, which they published in the *Journal of the American Medical Informatics Association* and includes analysis of both the quantity of materials downloaded and the feedback collected from educators who used the materials.[41]

Program Organization and Implementation

This section discusses findings related to the research question: What processes did the grantees use to implement the programs and meet program goals (e.g., barriers, lessons learned, successful strategies, coordination, program satisfaction)? We discuss the program's organizational design and implementation process. Findings in this section rely primarily on qualitative data but also include some discussion of survey and administrative data.

Program Organization

This section discusses the organization of the Developers focusing on the component development process, the grantees' previous experience with health IT training, and the role of the National Training and Dissemination Center (NTDC).

Component Development Process

Each Developer was responsible for developing the educational materials for several components, which were together equivalent to one course. The Developers created 20 components, which covered a wide range of subject matter from general introductions such as "The Culture of Health Care" to lab components such as "Installation and Maintenance of Health IT Systems." Each component was in turn broken down into an average 15 "units," which were themselves comprised of "elements." The elements created by the Developers included PowerPoint slides with voice-over narration and recordings; class activities and homework assignments; self-assessment questions; and links to supplemental readings and other resources. Developers worked with community colleges' advisory boards or committees composed of stakeholders to develop the materials. Despite the separate assignments, the five Developers worked together and with ONC to design a cohesive set of components using a consensus-based decision-making process. Over the course of the grant, the Developers created three versions of the materials in succession.

The Developers and ONC designed the group of 20 components as a "buffet" from which colleges could select materials. However, because each Community College Consortium (CCC) program focused on training students for one of the six Community College Workforce Roles developed by ONC, the Developers also worked with ONC to provide guidance on which components to teach. To aid the community colleges in this process, the Developers and ONC provided a matrix of roles by component (often referred to as the "Set Table"), which described which of the components were of highest priority for developing each of the Workforce Program's roles. Additionally, the Developers created "blueprints" for each component that outlined the planned component objectives, unit topics, unit objectives, and unit elements.

Exhibit 44 details the respective components for which each Developer was responsible.

Exhibit 44: Components, by Grantee

Grantee	Components
Oregon Health and Science University (OHSU)*	▪ Introduction to Health Care and Public Health in the U.S. ▪ The Culture of Health Care ▪ Introduction to Information and Computer Science ▪ Configuring EHRs (Lab component)
University of Alabama at Birmingham (UAB)	▪ Terminology in Health Care and Public Health Settings ▪ History of Health IT in the U.S ▪ Professionalism/Customer Service in the Health Environment ▪ Planning, Management and Leadership in Health IT
Johns Hopkins University (JHU)	▪ Working with Health IT Systems (Lab component) ▪ Quality Improvement ▪ Working in Teams
Columbia University	▪ Public Health IT ▪ Special Topics Course on Vendor-Specific Systems ▪ Usability and Human Factors ▪ Training and Instructional Design
Duke University	▪ Health Management Information Systems ▪ Installation and Maintenance of Health IT Systems (Lab component) ▪ Networking and Health Information Exchange ▪ Fundamentals of Health Workflow Process Analysis and Redesign ▪ Introduction to Program Management

*Also served as the National Training and Dissemination Center (NTDC)

Grantees' previous experience

The Developers all had significant prior experience in health IT training programs before the launch of this program. All currently offered graduate-level training programs in health IT, including master's and certificate programs. Four of the Developers also received UBT grants to expand their graduate programs. Furthermore, the grantees all had experience with distance learning, and understood the complexities involved with designing course materials for online use. The Developers cited this expertise and experience as reasons why they chose to apply for this funding.

Although the Developers did need to draft new materials for the components, the grantees noted they were able to leverage some content from their own graduate programs. Additionally, the Developers commented that, when designing the new materials, they were able to draw upon the experience and knowledge of many of their faculty members. Overall, the grantees felt having multiple years of experience with their own health IT programs and curriculum development put them in an excellent position to design high-quality materials for the CCC programs.

The Role of the National Training and Dissemination Center (NTDC)

ONC awarded additional funds to Oregon Health and Science University (OHSU) to serve as the NTDC. In this capacity, OHSU assumed multiple responsibilities, including developing mechanisms for disseminating the curriculum materials to the CCCs and to the public, providing technical support, and training community college faculty in their use. The NTDC established and administered a secure electronic site from which all materials were available for download through the end of 2012. After each Developer uploaded its materials to the site, NTDC staff "spot checked" the materials for quality assurance purposes. The NTDC also led the 508-compliance check of all uploaded materials.

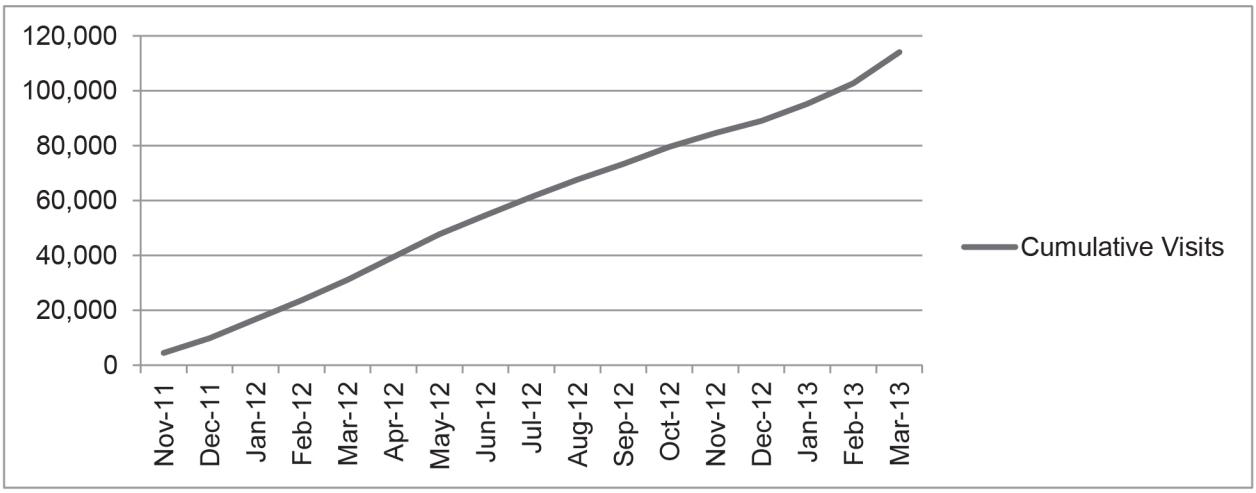
NTDC site visits and downloads. Exhibit 45 below presents the number of visits to the NTDC site from November 2011 to March 2013 and stratifies them by whether the user was a new or return visitor. Exhibit 46 presents the cumulative number of visits to the NTDC site from November 2011 to March 2013.

Exhibit 45: New and Return NTDC Visits between November 2011 and March 2013

Month	Visits	Return Visits	New Visits	% New Visits
Nov-11	4,461	2,297	2,164	48.51%
Dec-11	5,366	3,364	2,002	37.31%
Jan-12	6,919	4,358	2,561	37.01%
Feb-12	6,802	4,130	2,672	39.28%
Mar-12	7,517	4,279	3,238	43.08%
Apr-12	8,283	5,119	3,164	38.20%
May-12	8,318	5,218	3,100	37.27%
Jun-12	6,872	4,666	2,206	32.10%
Jul-12	6,757	4,397	2,360	34.93%
Aug-12	6,243	4,018	2,225	35.64%
Sep-12	5,770	3,681	2,089	36.20%
Oct-12	6,232	3,803	2,429	38.98%
Nov-12	4,925	2,902	2,023	41.08%
Dec-12	4,539	2,692	1,847	40.69%
Jan-13	6,155	3,622	2,533	41.15%
Feb-13	7,483	4,519	2,964	39.61%
Mar-13	11,340	7,346	3,994	35.22%
Total	**113,982**	**70,441**	**43,541**	**38.20%**

Source: Email correspondence with Oregon Health and Science University, May 5, 2013

Exhibit 46: Cumulative NTDC Visits between November 2011 and March 2013



Source: Email Correspondence with Oregon Health and Science University, May 5, 2013

Users made a total of 113,982 visits to the site between November 2011 and March 2013. New visitors constituted 38.2 percent of this total. While the United States accounted for over 96 percent of visitors to the site, visitors from 111 other countries and territories also accessed the site. The total number of visitors first peaked in May 2012, declined, and then rose to meet a high of 11,340 in March of 2013. The peak in visitors in May 2012 coincides with the release of Version 3.0 of the materials by the NTDC in May 2012. The cumulative number of visitors to the NTDC site grew steadily throughout the assessment period.

Exhibit 47 below presents the total number of downloads made for four elements of the curriculum material from October 2010 to March 2013. On the NTDC site, users could download blueprint documents for each of the 20 components or the entire set, each unit of a component, the VistA Education installers' guide, and a guide to the changes made in Version 3.0 of the materials. As demonstrated in Exhibit 47 below, CCC visitors accounted for just slightly more than 4 percent of the total downloads, reflecting the public's widespread interest in these materials.

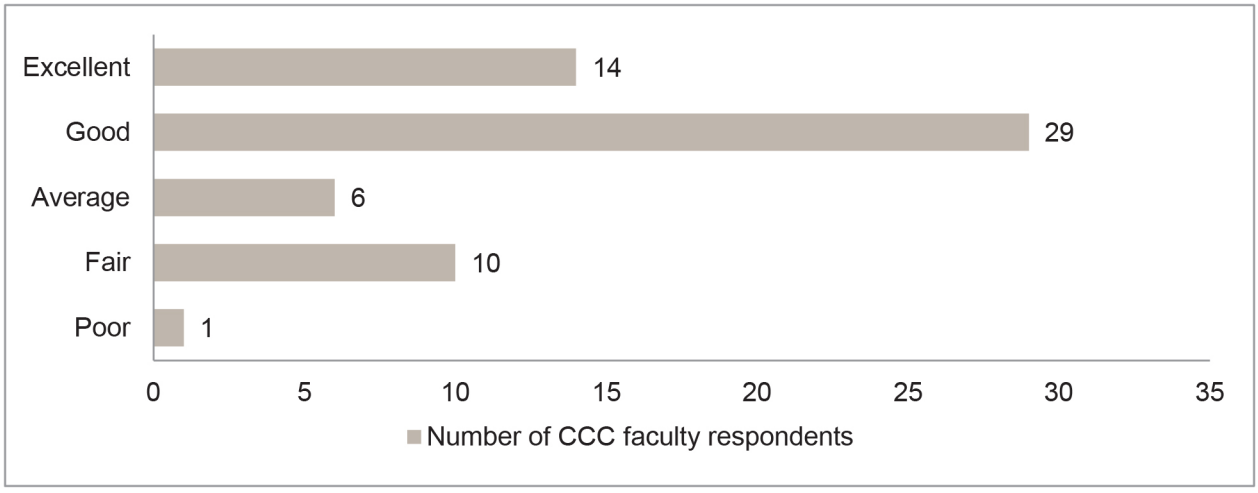
Exhibit 47: NTDC Downloads October 2012 – March 2013

Downloads	CCC	Public	Total
Blueprints	202	4,955	5,157
Components (unit and complete)	7,368	170,476	177,844
VistA and documentation	197	1,481	1,678
Changes to Version 3.0	198	2,806	3,004
Total	**7,965**	**179,718**	**187,683**

Source: Email correspondence with Oregon Health and Science University, May 5, 2013

NTDC support for users. The NTDC also provided technical support to users of the materials such as answering questions and providing assistance with downloads. In NORC's CCC faculty survey, 83 percent of instructors reported that they did not seek support from the NTDC, 14 percent asked for and received support, and 4 percent asked for it but did not receive it. Among the 60 CCC instructors who did receive support from the NTDC, 71 percent described its usefulness as "excellent" (23 percent) or "good" (48 percent). Only one respondent described the support as "poor." Exhibit 48 below displays the results for this question across all instructors who reported receiving assistance from the NTDC.

Exhibit 48: Quality of NTDC Support



N = 60
Source: NORC Survey of CCC Faculty, September – December 2011.

Implementation

This section discusses the implementation of the Curriculum Development Centers program, how the Developers organized their development teams, how they collaborated with partners, what efforts they made to seek input from employers and other stakeholders, how they revised the materials for the Version 2.0 and 3.0 releases, and the training for community college faculty provided by the NTDC.

Development teams

In their grant applications, the grantees identified which components they felt they could best develop and ONC subsequently used this information to assign components to the Developers. All of the Developers used a "team" approach to designing their components. In some cases, one team developed all components; in others, different teams developed each one. The teams consisted of project/team leads, curriculum/instructional designers, technical writers, and content experts. Although some Developers already had the staff necessary to fill these positions, others hired staff or consultants to serve in various roles such as instructional designers and technical writers.

Each Developer's team/s met regularly in-person and virtually to design their assigned components. One of the Developers that used a separate team for each component convened all teams for a kick-off meeting. They then periodically reconvened the development teams to update one another on their progress. All of the Developers noted that they sought input on the materials from various departments within their university. For instance, one university used the Department of Biomedical Informatics (DMBI) meetings as a forum to discuss their progress and the content of their components.

Collaboration with partners

The Developers all worked with community colleges – some of which were CCC grantees – to develop the materials. Some Developers also partnered with other local colleges and universities. In some cases, these partners were on the development teams and/or served as team leads. In others, the partners reviewed the draft components after they were developed but prior to their release and provided higher-level feedback. In addition, one Developer had 30 students from a local community college test the first round of materials by reviewing the PowerPoint slides and exams and providing feedback.

The five grantees communicated and collaborated in various ways over the course of the development process. ONC convened the Developers for weekly calls to discuss the progress of the curriculum development. All Developers felt ONC was very engaged in the development process, which allowed the five grantees to collaborate more effectively. The Developers also noted that the relationship among the grantees was extremely collaborative. Many of the project directors had worked together on other prior projects and appreciated the collaborative nature of the program. However, due to the timeline, the Developers did not review others' materials prior to distribution and would have appreciated the ability to do so.

Although the Developers communicated regularly with each other during the process, many wished they had had more opportunity to communicate with the CCCs. As mentioned, the Developers all partnered

with community colleges to develop the materials, and some of these were part of the CCC program. However, one noted that more-frequent communication with the CCC program leadership and consortium leads would have helped ensure the materials targeted the correct audience, and would have helped inform their revisions. All of the Developers noted it was difficult to assess the needs of the materials' target audience. In their self-evaluation, the Developers stated that their uncertainty regarding "the backgrounds and workplace competencies of the students who would be enrolling in the community college programs" made it difficult to develop the materials.[42]

From what they had been told about the CCC programs, the students being trained could range from individuals with very little background in health and/or IT to highly trained medical professionals, making it difficult to develop a curriculum appropriate for all students. Additionally, some Developers described themselves as originally under the impression that the CCCs would be providing an intensive six-month training program for unemployed individuals. As the programs progressed, however, many of the community college students were incumbent workers who enrolled in the program to gain additional skills. Furthermore, one developer commented it would have been helpful to the revision process to hear how faculty members at the community colleges were using the materials. Although the NTDC conducted a survey of CCC facility in the summer of 2011 in part to collect information on how faculty were using the materials, several Developers commented that this survey was of limited use due to a low response rate and answers that focused primarily on technical or process issues.

The Developers also felt it would have been helpful to have increased collaboration with the HIT Pro exam developers. They noted that, because the curriculum materials and exams were developed in silos, there was no guarantee the exam was a good reflection of the materials. This was problematic in that the community college training programs using the curriculum materials may not have adequately prepared students for the HIT Pro exam.

Outreach to employers and other stakeholders

In addition to their partners, all of the Developers had advisory boards or committees composed of stakeholders, including vendors, staff from community colleges, clinicians, consultants, and other local employers. Some of these boards reviewed the components as they were being developed. Others provided higher-level guidance at the outset of the project and then periodically throughout development. Additionally, some advisory boards served as conduits to local employers who provided feedback on the materials. At least one Developer also solicited feedback from local employers prior to developing the components to ensure the materials aligned with local workforce needs.

Revision Process

As noted, the NTDC released three versions of the materials over the course of the program. To inform the revisions for Versions 2.0 and 3.0, the NTDC and Developers collected feedback on the training materials using the following three methods.

1. ***The NTDC's online feedback tool.*** The NTDC's website included a feedback mechanism through which CCCs could submit feedback on the course materials. The CCCs had mixed perceptions of this function. One director commented that she routinely submitted feedback via the website and the issues were usually addressed quickly, while other faculty members and directors felt OHSU did not consistently address their feedback. The NTDC and Developers alike noted that most of the feedback received through the NTDC website concerned technical rather than substantive issues, and that Version 2.0 addressed most of these issues.
2. ***Surveys.*** The NTDC conducted a survey of the CCC faculty in the summer of 2011 to solicit their comments on the materials. Several schools noted they were pleased that the NTDC administered this survey and hoped the Developers would continue to gather feedback and consider CCC faculty comments when revising the materials. However, at least two Developers noted that, as with the submissions to the online feedback tool, the responses to this survey focused primarily on technical and process issues rather than substantive issues, that the response rate was low, and that there were few responses to questions on some components. The Developers were hopeful that the NORC survey of CCC faculty members would complement the NTDC's feedback-collection efforts and provide further substantive input on their efforts thus far.
3. ***Gaps and overlaps analyses.*** The NTDC also contracted with the American Medical Informatics Association (AMIA) to do a "gaps and overlaps" analysis of the existing materials across the set of 20 components. This analysis identified useful information that was missing from the materials as well as instances where multiple components covered the same content.

The Developers used the feedback they collected to inform subsequent versions of the materials. The first half of Version 1.0 was released in August of 2010, with the second half following in October of 2010. Version 2.0 was subsequently released in May of 2011, and Version 3.0 was released in May of 2012. The revisions to Version 2.0 were mostly technical in nature. In this release, the Developers focused on correcting typographical errors, improving the quality of voice-overs and the slides, and other similar issues. By contrast, the revisions to the material in Version 3.0 focused on substantive issues such as filling gaps in the material by adding new information and minimizing overlap among the components.

Exhibit 49: Version Release Dates

Materials Version	Release Date
Version 1.0	August 2010 – first half of the materials October 2010 – second half of the materials
Version 2.0	May 2011
Version 3.0	May 2012

For the Version 2.0 release, the Developers concentrated on revising formatting and resolving technical issues. As mentioned above, the Developers acknowledged there were many technical issues with Version 1.0, including inconsistencies, typographical errors, and poor quality of narration in the audio-recordings. According to the Developers, these issues were a result of the short amount of time allotted to create the materials, and the lack of time for conducting quality checks. Most of the feedback submitted by the CCCs through the NTDC online feedback tool and in the NTDC's survey of CCCs called attention to these mistakes. Therefore, the Developers focused on addressing the CCCs' feedback regarding technical errors in the first update of the material.

For the Version 3.0 release, the Developers concentrated on revising substantive content. In particular, they worked together to examine the results of AMIA's gaps and overlaps analysis, which identified missing material and instances of overlapping information between components. The developers met in July of 2011 to review the analysis and then formulated plans to fill critical gaps and ensure that any redundancies were valuable (and consistent in substance). When multiple components covered the same content, they discussed how to ensure the information was consistent and determined whether the repetition was valuable from a pedagogical standpoint, or merely redundant. Version 3.0 incorporated these sources of feedback.

Training for Community College Faculty

During the summer of 2010, prior to the release of the first version of materials, the NTDC hosted a two-day in-person training event for CCC leadership and instructors. This training consisted of various workshops and sessions on each component in the first version of the materials. Instructors were able to ask the Developers questions about the materials and became familiar with the components before the CCC programs began. Additionally, instructors attended hands-on workshops focused on the various lab components.

Program Effectiveness

This section discusses findings related to the research question: To what extent did the grantees meet the requirements of the Workforce Program? In this section, we focus on evaluating whether the Curriculum Development Centers program succeeded at developing adequate curriculum materials. We examine CCC instructors' use of the materials, including the extent to which instructors modified the materials when teaching students. We also examine CCC administrators', stakeholders', instructors', and students' satisfaction with the materials.

Instructors' Use of the Materials

In general, CCC administrators and faculty appreciated receiving the materials produced by the Developers. The CCCs took varying approaches to revising the materials. In some instances, instructors used the materials in the exact form in which they arrived. In others, instructors received refined versions of the materials from the colleges. Other schools left it to individual instructors to revise the materials. At one school, instructors were given a $1,000 bonus if they chose to review and revise the components prior to starting the course.

Instructional Designers

To address the large volume of materials, some community colleges hired instructors or instructional designers to review all of the materials and select the most relevant ones for inclusion in the program. For example, one college noted that their instructional designer trimmed the materials down to roughly 200 hours of instruction by removing redundant lessons and selecting the materials that were considered most likely to appear on the exam or be useful in a job setting. Even still, one instructor in that program noted there might have been 300 slides to cover in one six-hour course. Due to the condensed timeline, some member colleges were unable to spend as much time as they would have liked preparing the materials before courses began.

Novel Approach to Using the Materials
One consortium lead took a systematic approach to reviewing and re-packaging all materials to help member colleges use materials "out of the box." When the consortium lead first received the components' blueprints from ONC, staff created a framework of competencies and relevant topic areas for each role. As materials became available from the Developers, staff took each of the units within the components and fit them into this framework. The repackaged materials reduced redundancies across and within components and helped to reduce gaps in information. The consortium lead distributed these repackaged materials to all member colleges as each component was ready. One issue that arose was that, due to the constrained timeline, some member colleges may have rolled out their courses before they received the repackaged versions of the materials from the consortium lead. In these instances, it was up to each member college to decide if they would use the repackaged materials and how to work them into their existing courses.

Survey Findings

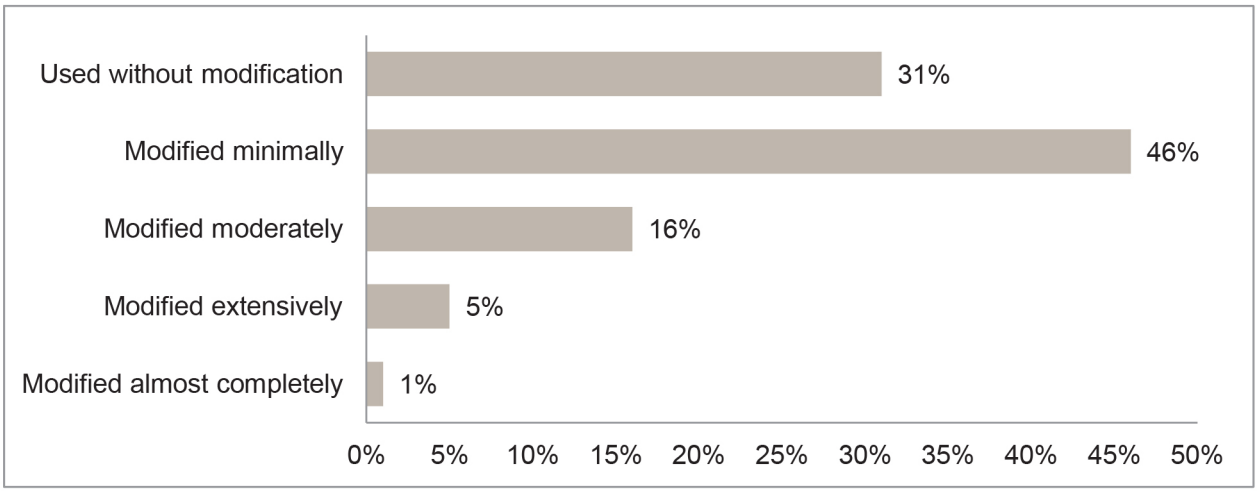
NORC's survey of CCC instructors shed light on their use of the Developers' materials. Eighty-six percent of the CCC instructors reported using Version 1.0 of the materials to teach CCC classes, 82 percent reported using Version 2.0, and 67 percent used both versions. Many colleges expressed that they were uncertain if they would incorporate the Version 3.0 materials into their courses due to its release date in the final semester of their programs. NORC also asked instructors to report which specific components they used to teach their classes. The results indicated that many CCC instructors taught each component to some extent, and that CCCs were generally equally likely to have used each component. Among the 457 instructors surveyed, 38 percent reported using the materials for "Health Management Information Systems," the most frequently used component. Nineteen percent of instructors reported using the materials for "Training and Instructional Design," the least frequently used. Between 23 and 36 percent of the faculty reported using materials for the remaining 18 components, suggesting broad implementation across the CCCs.

Instructors' Modifications of Materials

As mentioned above, some schools asked individual instructors to tailor the materials for their own purposes. The NORC survey asked instructors to what extent they modified the materials for each component as well how useful they found each component's materials. Although instructors' perceptions of the materials are discussed in more detail later, we compare responses across these two questions in this section to analyze whether instructors were more likely to modify materials that they found less useful.

Extent of Instructors' Modifications to Materials. Exhibit 50 below displays the percentages of instructors who used the Curriculum Development Centers' materials without modification, minimally, moderately, extensively, or almost completely across each component taught.

Exhibit 50: Extent of Instructors' Modifications to Materials



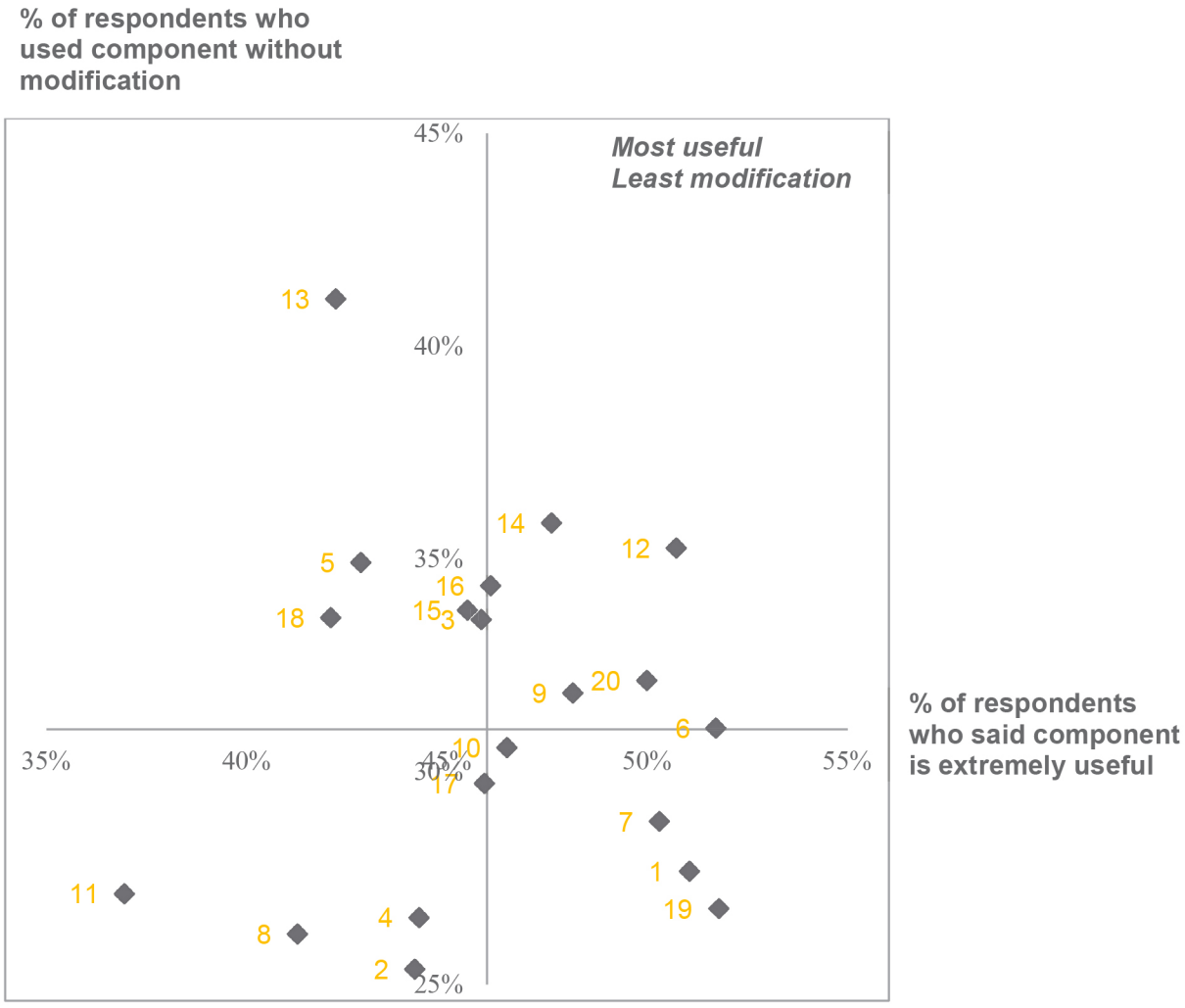
N = 2,624
Source: NORC Survey of CCC Faculty, September – December 2011.

For every component, the majority of instructors reported either modifying the materials minimally or using the materials without modification. The two components most likely to be used without modification were "Public Health IT" (41%) and "Special Topics Course on Vendor-Specific Systems" (36%). The two components least likely to be used without modification were "The Culture of Health Care" (25%) and "Installation and Maintenance of Health IT Systems" (26%). In general, the plurality of instructors reported modifying the materials minimally, suggesting many instructors added supplementary material of their own. According to site visit discussions, instructors frequently integrated examples from their professional lives into the curriculum material. Others identified YouTube videos to highlight stories from the field. In an effort to enhance the courses' practical aspects, at some schools, instructors also added new activities to provide students with hands-on experiences that would be relevant to EHR implementation. For example, one school created an exercise related to the vendor Request for Proposal (RFP) process. Six percent of instructors reported modifying the materials extensively or completely.

Usefulness of Materials Versus the Extent of Instructors' Modifications. Exhibit 51 below presents the relationship between the instructors' perceptions of the usefulness of the materials for each component and the extent to which they modified the materials when teaching. The horizontal axis maps the percentage of instructors who said that the component's materials were extremely useful, with percentages increasing to the right of the graph. The vertical axis maps the percentage of instructors who reported that they used the component without modification, with percentages increasing toward the top of the graph. The component key indicates which course title corresponds with each number on the figure. For example, component #12 – "Quality Improvement" – is located in the upper-right quadrant of the

figure because instructors rated this course as extremely useful and used this course's materials without modification at above-median rates.

Exhibit 51: Relationship Between the Instructors' Perceptions of the Usefulness of the Materials and the Extent to Which They Modified the Materials



Note: Axes intersect at the median values: using the component without modification (31%); rating the component extremely useful (46%).
Source: NORC Survey of CCC Faculty, September – December 2011.

Component	Set Number
Introduction to Health Care and Public Health in the US	1
The Culture of Health Care	2
Terminology in Health Care and Public Health Settings	3
Introduction to Information and Computer Science	4
History of Health IT in the U.S.	5
Health Management Information Systems	6
Working with Health IT Systems (Lab component)	7
Installation and Maintenance of Health IT Systems (Lab component)	8
Networking and Health Information Exchange	9
Fundamentals of Health Workflow Process Analysis and Redesign	10
Configuring EHRs (Lab component)	11
Quality Improvement	12
Public Health IT	13
Special Topics Course on Vendor-Specific Systems	14
Usability and Human Factors	15
Professionalism/Customer Service in the Health Environment	16
Working in Teams	17
Planning, Management and Leadership in Health IT	18
Introduction to Program Management	19
Training and Instructional Design	20

This cross-tabulation of survey responses does not reveal a clear relationship between CCC instructors' perception of the usefulness of the materials and their tendency to modify the materials. There are some components located in the lower-left quadrant for which instructors tended not to not view the component materials as extremely useful and modified the course's materials more frequently than was observed for other courses. However, there are also several components in the lower-right quadrant for which the instructors rated the materials as useful and yet were still likely to modify the materials. In fact, the component used most frequently without modification achieved a below-median usefulness rating (13). This lack of a clear relationship suggests that other factors beyond perceived usefulness may have influenced instructors' tendencies to modify materials when teaching the CCC courses.

Perceptions of Materials

The NORC evaluation team gathered information about CCC administrators', faculty members', and students' perceptions of the materials through site visit discussions and surveys of CCC students and faculty. Exhibit 52 presents a summary of each stakeholder group's perceptions of the materials.

Exhibit 52: Stakeholders' Perceptions of Materials

Stakeholders	Perceptions of the Curriculum Development Centers' Materials
Administrators/ Program Leadership	▪ Overwhelming volume of information ▪ Some redundancies and inconsistences
Instructors	▪ Comprehensive coverage of important topics ▪ Useful for teaching ▪ Too in-depth in some areas ▪ Too little detail in some areas ▪ Numerous typos and errors
Students	▪ Overwhelming volume of information ▪ Some redundancies and inconsistences ▪ Satisfactory and helpful as a whole ▪ Too little detail in some areas ▪ Numerous typos and errors ▪ Too "academic" and not sufficiently focused on applicable skills

Source: NORC Survey of CCC students and qualitative data gathering (site visits, focus groups, etc.).

Administrators'/program leadership's perceptions

In general, the program administrators appreciated receiving materials produced by the Centers. However, all colleges noted that not having access to the full set of materials in advance of the programs' start made it difficult to recruit instructors and students and otherwise prepare for the program's launch in September of 2010. The Developers received their cooperative agreement funds at the same time that the funds for the other three Workforce Programs were released, and were therefore on a compressed timeline to create materials for the September 2010 launch of the CCC programs. Many participants commented that this parallel timing of the Centers and CCC programs was problematic, and that it would have been beneficial had the government implemented the programs sequentially.

The CCC administrators and leadership also noted that the volume of materials from the Developers was overwhelming. The schools understood that the materials were meant to be a "buffet" from which they could select units to teach. However, many colleges were reluctant to remove materials out of fear that they would omit topics addressed on the HIT Pro exams. As discussed above, ONC provided a matrix of roles by component (the "Set Table") that described which of the components were of highest priority for each of the Workforce Program's roles. One CCC estimated that teaching all of the materials associated with components considered Priority 1 or Priority 2 on the Set Table would take approximately 450 hours of instruction per role—far more than was feasible in the six-month timeframe.

One factor contributing to the volume of materials was the perceived redundancy of the content, both within a single component and across components. Both instructors and students indicated that some

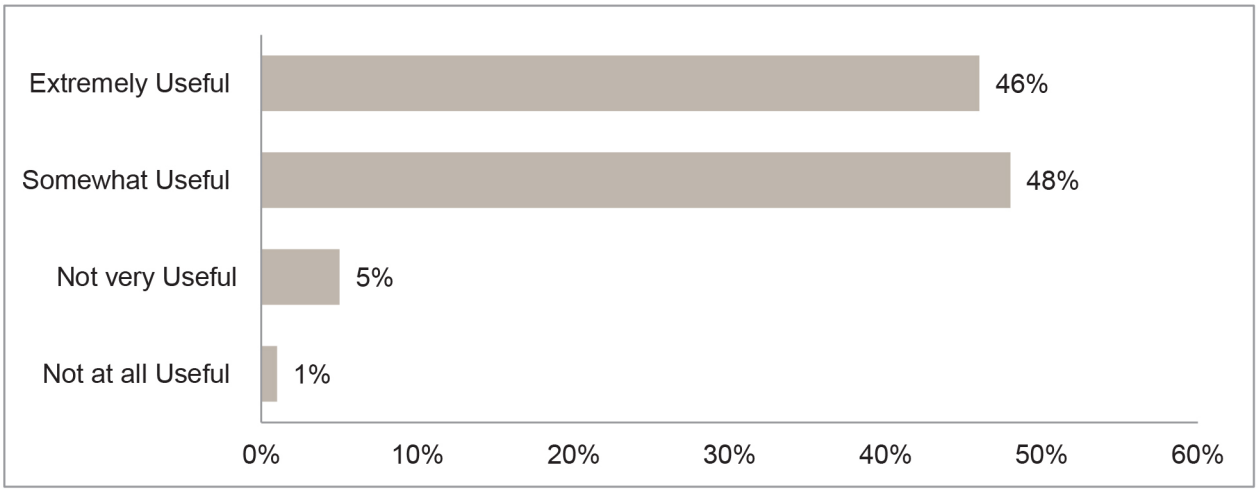
items were included multiple times. While some CCCs felt this was a problem, others noted that some redundancy in course materials can be a good thing in order to ensure students are adequately exposed to particularly important information.

Several colleges indicated that the tendency for the same topic to appear in various places in the materials was a symptom of five different institutions having developed the materials. Many schools noted the materials seemed disjointed and that some terms (e.g., "confidentiality") were defined multiple times throughout the materials—and each time with a different definition. In other instances, the materials used different terminology to describe the same concept. Additionally, schools noted inconsistencies in how the materials were presented. Often, there was a clear mapping between the lesson objectives, the slide content, and the quizzes and assessments. However, not all components shared that structure. Furthermore, all schools agreed that some of the components were of higher overall quality than others. Because of the limited time the Developers had to prepare the materials, there may not have been adequate opportunity for close coordination across the different universities awarded cooperative agreements to develop the materials.

Instructors' perceptions

In general, instructors complimented the comprehensiveness of the materials and felt they would provide students with a solid knowledge base in health IT. NORC's survey of CCC faculty asked instructors to rate the usefulness of the materials for each component. The results for this question across all responding instructors are presented in Exhibit 53 below.

Exhibit 53: Instructors' Perceptions of Materials



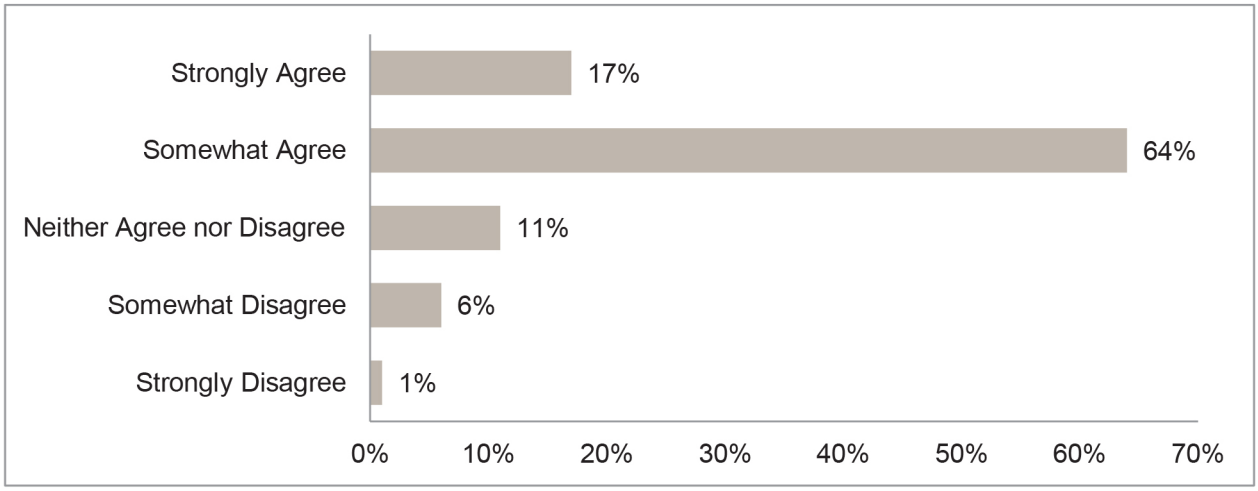
Respondents were asked this question about each component they taught. N = 2,627.
Source: NORC Survey of CCC Faculty, September – December 2011.

A plurality of instructors rated the materials as a whole as "somewhat useful" and all but 6 percent of instructors found the components to be either "extremely useful" or "somewhat useful." In most cases, a majority or plurality of instructors rated each component's materials as extremely useful. Most of the remainder rated the materials as somewhat useful, with few instructors responding that a given component's materials were "not very useful or "not at all useful." The components most likely to be rated "extremely useful" were "Introduction to Project Management" (52%) and "Health Management Information Systems" (52%). The components least likely to be rated as "extremely useful" were "Installation and Maintenance of Health IT Systems" (41%) and "Configuring EHRs" (37%).

Some instructors noted the materials went into too much depth in some areas (e.g., detailed information about data modeling as part of the workflow course) and provided too basic an overview in other areas. The wide range in students' backgrounds and expertise may have posed particular challenges to the Developers in determining the appropriate level of detail for the training materials. Faculty also commented that there were numerous typographical errors and other mistakes in the slides, although this was primarily an issue with Version 1.0. Finally, individuals at some colleges felt that an instructors' manual that included guidance on how to most effectively deliver the materials to the class (e.g., instructions for setting up group assignments) would have been helpful to receive with the materials. Interestingly, while several of the Developers mentioned having developed manuals, the schools were not aware of them.

Faculty who were exposed to multiple versions of the materials noted differences and improvements in successive iterations. In NORC's survey of CCC faculty, 17 percent strongly agreed and 64 percent somewhat agreed that the Developers improved the course materials over time. A combined 7 percent somewhat or strongly disagreed with this assessment. Exhibit 54 displays the results for this survey question.

Exhibit 54: Instructors' Perceptions of Improvements Between Versions 2.0 and 3.0



N = 309
Source: NORC Survey of CCC Faculty, September – December 2011.

Many instructors appreciated that most of the errors present in Version 1.0 were fixed in Version 2.0. Furthermore, they noted that Version 3.0 fixed a number of the substantive problems observed in Versions 1.0 and 2.0. However, some did feel that earlier problems such as disjointed lectures and gaps in materials still existed in Version 3.0, albeit to a lesser extent.

Colleges and instructors also pointed out that it was challenging to keep up with the small changes made to the materials between the releases of different versions. For schools that took a more proactive approach to revising the materials, it was particularly challenging to keep track of these mid-course corrections. There were also some concerns about the timing of the revisions. During the first round of site visits, colleges were unsure if they would use the third version of the materials, as it was unclear whether the Developers would release the updated materials before the program's final semester. During the second round of site visits, some schools had opted not to use the Version 3.0 materials.

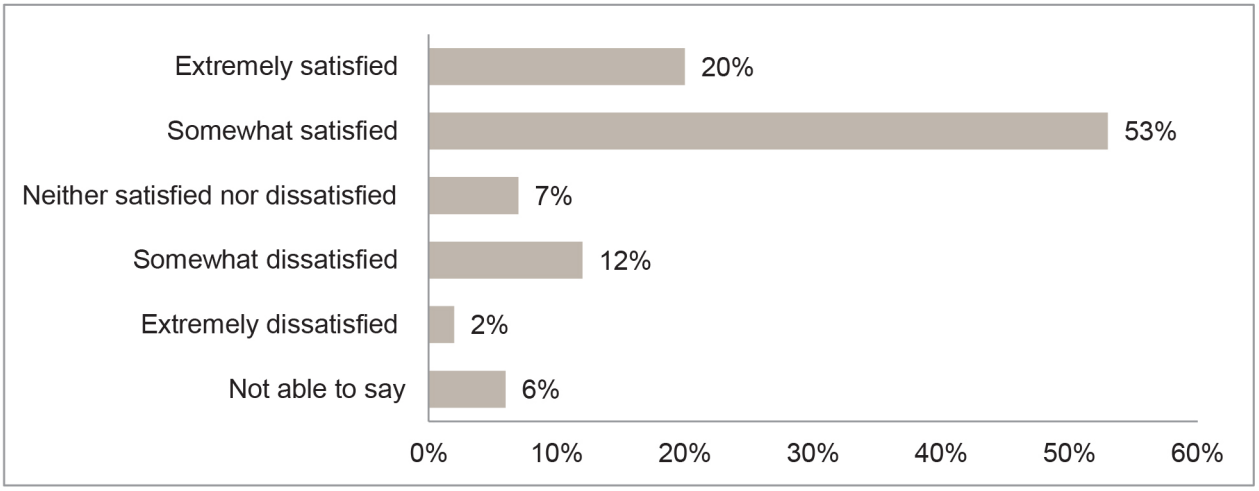
While many faculty members felt the materials would provide students with a solid knowledge base in health IT, some also raised concerns that they were too "academic" and not sufficiently focused on building the immediately applicable workforce skills that employers demand. Other faculty noted that materials did not cover some useful areas in sufficient depth.

Students' perceptions

Students shared their perceptions of the training materials in focus group discussions, through the student surveys, and indirectly through the program administrators and faculty who received feedback directly from students as well.

In the survey of CCC faculty, NORC asked CCC instructors to rate the degree to which they thought students were satisfied with the materials developed by the Curriculum Development Centers. The results for this question are displayed in Exhibit 55. Twenty percent thought that students were extremely satisfied with the materials, and 53 percent that students seemed somewhat satisfied. Only 14 percent of faculty thought students were either "somewhat dissatisfied" or "extremely dissatisfied" with the materials.

Exhibit 55: Instructors' Perceptions of Students' Satisfaction with the Materials



N = 446
Source: NORC Survey of CCC Faculty, September – December 2011.

NORC also conducted focus groups that offered students an opportunity to discuss the materials, although it should be noted that the students' experiences with the curriculum materials may have been affected by changes made to the curriculum by consortia, colleges, and individual instructors. In general, students saw the materials as helpful. Several noted that the materials would serve as a valuable reference in their careers in health IT.

However, several students also commented that, while the materials were extensive, they sometimes lacked sufficient detail to thoroughly introduce them to the topic at hand. Much like the instructors, students also raised concerns about the overwhelming volume of information, the lack of cohesiveness in the materials, and the number of errors. Students were particularly frustrated when they encountered errors in the assessments or quizzes. Students also noted some technical issues with some materials. For example, while several appreciated the availability of audio recordings, the recordings' quality was sometimes poor. Students acknowledged these types of improvements in the Version 2.0 updates to the materials as well.

Many students also requested a clearer outline for their course of study, so they would know from the time of enrollment what to expect in each class. Students also offered some specific feedback on the order in which materials were presented. In one school, students suggested that there be a more complete introduction to EHRs and "meaningful use" from the program's start to provide context for other courses.

Much like the faculty, students exposed to later versions of the training material noted improvements. They observed that the typos had been fixed in Version 2.0 and that Version 3.0 addressed many of the substantive problems in the training materials. At the same time, they were concerned that the materials were too "academic" and not sufficiently focused on building the immediately applicable workforce skills that employers demand. Students also expressed a desire for more hands-on experience as part of the program curriculum. In particular, students stressed the importance of spending time working with EHRs. Furthermore, while students who worked with the Veterans Administration's VistA CPRS (Computerized Patient Record System) in their lab components greatly appreciated the experience, most would have preferred the chance to work with a commercial EHR application such as Epic, Cerner, or AllScripts. It is important to note the Developers did reach out to a number of vendors in an attempt to gain access to their applications. However, the vendors did not grant this request, thus limiting students' exposure to commercial EHR applications.

Some community colleges were able to work with vendors to provide access to their products for students (as discussed in the Community College section of this report). However, for the most part, students' exposure was limited to VistA, which created some challenges when looking for employment, as many employers wanted candidates who were trained in the use of specific other systems. The Developers, students, community college faculty and leadership, and employers alike felt that greater exposure to commercial applications would have given students an advantage in looking for jobs.

Lessons Learned

This section discusses challenges encountered and lessons learned over the course of the program. We focus on lessons learned with respect to the rapidly evolving field of health IT, the program timeline, the division of labor among the Developers, and the use of partnerships. Overall, the Developers were pleased with the format of the program, but had mixed opinions on some aspects of it and offered some suggestions for improvements.

Rapidly Evolving Field

One high-level challenge that many of the grantees noted was that health IT is a rapidly evolving field, making it difficult to create curriculum materials that do not quickly become outdated. The Developers noted that the revision cycles helped ensure that new information could be incorporated into the materials. However, they also acknowledged that their revision to the materials could not always keep pace with changes in the field. In the Developers' self-evaluation report, they noted that despite their efforts to update materials with each release or iteration, "the rate of change in the field was at a pace hard to match with static materials." In particular, they note that educators who downloaded and used the materials reported that web-based information was especially likely to become rapidly out-of-date resulting in old or broken links.[43]

The Developers indicated that, because of the rapid evolution of the field of health IT, individual instructors in the program needed to augment the materials with new information as they taught CCC students. As discussed above, many instructors did take this approach and integrated materials from other sources such as recent YouTube videos and publications into their courses. In addition, even if the material presented to students was not always up to date with the latest standards of the field, students could use this training as a foundation to build upon throughout their careers.

The Timeline

The Developers all noted that the greatest challenge they faced was the timeline of the program. They also expressed this in their self-evaluation report, which describes the timeline as "tight."[44] The Developers acknowledged there were many technical issues with Version 1.0, but pointed out that these issues were resolved in subsequent versions. The Developers said the technical issues with Version 1.0 were a result of the short amount of time allotted to create the materials and conduct quality checks.

The Developers felt it would have been helpful if the program funds had been awarded earlier or if the start date of the community college programs had been pushed back. This would have allowed them time to ensure that all of the materials could be developed before the community colleges started enrolling students. The short development timeline also limited collaboration among the Developers, as they did not have time to review one another's materials prior to distribution. As the Developers released subsequent updates to the material, timing continued to present challenges. As discussed above, instructors found it difficult to incorporate updated materials into courses that had already begun.

Division of Labor Among the Developers

While the Developers felt that the "buffet" approach to the curriculum was effective in allowing community colleges to select which materials to teach, some noted drawbacks of having five universities design separate components. Two of the Developers mentioned that designing an "off the shelf" curriculum may have better ensured that all students were taught the skills necessary for each role. However, they also acknowledged that designing such a curriculum for more than 80 community colleges with varying programs and student bodies across the country would have been quite difficult.

One Developer suggested that having one institution as opposed to five create the materials would have streamlined the curriculum development process. They felt this would have helped reduce both gaps and overlaps in the materials, and may have resulted in a more cohesive and consistent curriculum. This echoes the observation from some CCCs that information may have been repeated across components because five separate institutions had developed the materials. Another Developer suggested that starting with units and building up to components might have been a more effective method, as it would have better ensured there were no gaps in any of the Workforce Program's roles. A third Developer suggested that the materials could have been developed at the unit level as opposed to at the component level in order eliminate gaps in the roles.

Use of Partnerships

Although the Developers collaborated with one another, with community colleges (some of which were CCC grantees), and with their advisory boards, many wished they had more chances to communicate with both the CCCs and the HIT Pro exam grantee during the development process. Furthermore, one Developer commented that it would have been helpful in the revision process to hear how faculty members at the community colleges were using the materials.

The Developers noted that stronger partnerships with the CCCs would have helped them target the materials to the correct audience. They also felt that stronger collaboration with the HIT Pro exam developers would have ensured that the training materials reflected the exam's content. Additionally, the Developers recommended developing partnerships and collecting input from potential employers to modify and update the program so that it would continue to prepare employable students going forward.

Other Lessons Learned

Textbooks. The Developers acknowledged that many faculty and students had requested textbooks. However, because the health IT field is evolving so rapidly, the Developers felt textbooks would have

quickly become out of date. Instead, they suggested that instructors supplement the materials with current articles to ensure that the information included was up to date and met students' needs.

Determining the audience. As discussed above, the Developers reported that they struggled to determine the correct audience for the materials. They expressed that more-detailed guidelines from ONC at the beginning of the program about the intended audience would have helped them to craft the materials. They also suggested that ONC could have produced a style guide at the beginning of the program to avoid having to make formatting changes later in the process.

508 compliance. The Developers found the process of ensuring that the materials were 508-compliant to be a major unanticipated challenge. They expressed this observation both to NORC and in their self-evaluation report where they indicate that it was burdensome to include a transcript of all audio materials, an audio descriptor of all images, and to tag "every photograph, chart, text box, and smart art image in the materials" with a full description.[45] The Developers were frustrated that they were not given clear instructions at the beginning of the program on what this entailed, and subsequently had to redo several components. The NTDC had since hired a company to conduct 508-compliance checks on all components, but this had been a costly and time-consuming activity. Additionally, each Developer was obligated to run plagiarism-detection software on their materials. The Developers indicated that these two activities drew resources away from other planned tasks such as making more substantive revisions to the materials.

Training program length. Lastly, the Developers felt that a six-month training program may not have been sufficient for students to gain the skills necessary to find employment in health IT. Additionally, they noted the curriculum would have been vastly improved by more hands-on learning opportunities, as employers value this type of experience. Providing students with greater access to a range of EHRs may have better prepared them for working in the health IT field as well.

Conclusions

In April 2010, ONC funded five Curriculum Development Centers for two years to develop curricula and educational materials for the ONC-funded community college programs and for public dissemination. The Developers created materials for 20 components covering a range of health IT subject matter. The Developers worked to create these materials in tandem with each other, with ONC, and with community colleges' advisory boards or committees composed of stakeholders. Additionally, Oregon Health and Science University (OHSU) served as the National Training and Dissemination Center (NTDC)

responsible for establishing a secure electronic site from which all materials were available for download through the end of 2012, among its other roles and responsibilities. The Developers collected feedback, made updates, and released two subsequent versions of the materials.

In general, CCC program administrators, instructors, and students were satisfied with the Developers' materials. A majority of surveyed instructors reported that the Developers' materials were useful and that they used both the Version 1.0 and Version 2.0 materials to teach students. However, CCC administrators, instructors, and students also reported that the volume of information in the materials was overwhelming, that there was too much depth in some areas and too little in others, that there were redundancies and inconsistences in the information, and that there were numerous typographical errors and mistakes, although this issue was corrected in the Version 2.0 release.

Overall, the Developers were pleased with the format and outcome of the program, but also offered suggestions for improvement. They noted that a less-constrained timeline, more frequent communication with CCC program and consortia leadership, and a better understanding of the materials' target audience could improve the development process. The Developers also observed that, due to the rapid changes in the field of health IT, it is essential for instructors to actively update materials to reflect new developments.

The materials developed by the Developers filled a need for baseline health IT educational resources among both CCC instructors and students program and interested members of the public. Although the materials will need to be updated to stay useful, they provide an important foundation for health IT instruction.

7. COMPETENCY EXAMINATION FOR INDIVIDUALS COMPLETING NON-DEGREE TRAINING

Chapter Summary

The Northern Virginia Community College (NOVA) partnered with the American Health Information Management Association (AHIMA) to develop the Health Information Technology Professionals (HIT Pro) competency exam for each of the six Community College Consortia (CCC)-targeted roles. NOVA and AHIMA worked with Pearson VUE, a computer-based testing solutions company, to secure test locations and widespread dissemination of the examinations. The grant also provided vouchers, available until March 31, 2013, to cover the cost of the exam for individuals who completed one of the Community College Consortia (CCC) programs. Employers were also able to request vouchers to give to interested employees. Health IT professionals were also able to sit for the HIT Pro examination without a voucher.

To inform the development of the exams, exam developers established an advisory council comprised of 22 industry stakeholders and convened teams to work on each role-specific exam. The exams were then reviewed by subject matter experts and cross-walked against a jobs analysis (previously performed by AHIMA) and the materials created by the Curriculum Development Centers (the Developers). The exam developers conducted an Alpha test of the exams to ensure that they addressed any problems before officially launching the exams. The first cohort of exam takers participated in a Beta test in which they completed the exam just as they would after the full launch, but did not receive their scores immediately after completing the test. The purpose of the Beta test was to determine a cut-off score for passing the exam and thus defining a minimally qualified candidate for each role.

The exam developers advertised the exams through various means including the radio, the internet (including social media such as Facebook and Twitter), in newspapers, via professional organizations, at professional conferences, and outreach to employers and CCCs. The grantees delivered 9,514 exams during the period of grant funding. The exam's pass rate was 62%. While the overall numbers of administered exams lagged behind the expected numbers, there was a large increase in the number of exams administered at the end of the grant funding due in part to increased publicity and a change in marketing tactics by the grantees. Notably, during the final three months of grant funding, AHIMA allowed anyone to take the exam, and to take as many exams as they wanted, free of charge.

There was a great degree of variability in the background of individuals who took the exam. Test takers also elected to take the exams for different reasons including to validate formal experience in the field, to

challenge and assess themselves and their skill sets, and to support career development/advancement. Exam takers all reported preparing for the exam in some way, with many individuals downloading the curriculum materials to use as study aides. Exam takers found these materials to be useful to varying degrees. While many students elected to take the exam because they hoped it would help to make them more marketable, employers remained largely unaware of the exam and were not sure what it demonstrated in terms of an applicant's skill set. Communication to employers about the exam and the significance of a passing score is necessary to provide relevance to the exam in the eyes of both employers and potential exam takers. Additionally, students, faculty members, and employers all felt the exam would mean more to employers if it conferred a certification. As of July 29, 2013, the HIT Pro exam has been transitioned to the AHIMA Certified Healthcare Technology Specialist (CHTS) credentials, which does confer a certification.[46]

Introduction and Background

The HIT Pro competency exam, funded through ARRA, laid the groundwork for the establishment of a nationwide program of competency examinations for health IT professionals. The two-year, $6 million cooperative agreement with NOVA provided support for the development, testing, and implementation of a mechanism to assess whether examinees had attained a certain set of health IT competencies. The grant also provided vouchers, available until March 31, 2013, to cover the cost of the exam for individuals who completed one of the CCC programs. Other health IT professionals were also able to sit for the examination.

NOVA partnered with AHIMA, a leader in health information and informatics advocacy, education, research and professional credentialing; and Pearson VUE, a company that develops and delivers computer-based testing programs for leading academic, health care, government, IT and professional credentialing clients around the world. The grantees developed a competency exam for each of the six CCC-targeted roles. The six exams are:

- Clinician/Practitioner Consultant
- Implementation Manager
- Implementation Support Specialist
- Practice Workflow & Information Management Redesign Specialist
- Technical/Software Support Staff
- Trainer

The HIT Pro exams assess the competency of health IT professionals to assess workflows, select hardware and software, work with vendors, install and test systems, diagnose IT problems, and train practice staff on systems.

NOVA, which is composed of six campuses and four centers located in Northern Virginia, led the development of the exam with input from AHIMA. Pearson VUE worked to secure test locations and provide widespread dissemination of the examination. After March 31, 2013, when exam vouchers expired, AHIMA continued to administer the exam for a fee. Individuals interested in taking the HIT Pro exam had to do so at one of 230 Pearson Professional Centers around the country.

Program Implementation and Organization

The following section details how grantees developed the six competency exams and recruited exam takers to implement the program.

Exam Development. To gather guidance for the exam-development process, the exam developers established an advisory council of 22 industry stakeholders that included representatives from the Curriculum Developers, the CCCs, the Regional Extension Centers (RECs), the Department of Labor, and various employers. The exam developers convened teams to work on each role-specific exam and to identify—in consultation with industry leaders—the knowledge, skills, and abilities (KSAs) necessary to fulfill the responsibilities associated with each role.

Based on the feedback from role-specific teams, writers then drafted questions for six role-specific Alpha exams for review by health IT subject matter experts. The exam developers formulated each exam to contain 125 questions that would take approximately three hours to complete. In addition to review by subject matter experts, the exam developers further ensured the questions' relevance by cross-walking questions to a jobs analysis (previously performed by AHIMA), as well as to the curriculum materials created by the Developers and the learning objectives contained in those curriculum materials. NOVA noted that these cross-walking exercises yielded largely consistent results, suggesting that their initial work to define KSAs aligned well with the learning objectives in the curriculum materials.

The developers conducted an Alpha test of the exams to ensure that they addressed any problems before they officially launched the exams. The first cohort of exam takers participated in a Beta test in which they completed the exam just as they would after the full launch, although they did not receive their scores immediately after completing the test. The purpose of the Beta test was to determine a cut-off score for passing the exam. It took several months for a sufficient number of individuals to take the exam so

that the developers could perform this analysis. The exams' cut-off scores were ultimately determined by defining a minimally qualified candidate for each role.

Recruiting Exam Takers. In order to publicize the exam and encourage individuals to take it, the exam developer advertised on the radio, the internet (including social media such as Facebook and Twitter), in newspapers, via professional organizations, and at professional conferences. Additionally, the exam developers sent information directly to health IT employers, conducted special outreach to the program's community colleges, and provided them with a "toolkit" to help further spread the word about the exam. Exam developers also launched a promotion stipulating that those who signed up to take the exam within a certain period would receive a voucher to take another competency exam (either to retake the exam for the same role or to take a second role-specific exam) free of charge. However, site visit findings suggest that the extent to which the community colleges communicated with their students about the exam varied greatly. Several schools emphasized its importance to students from the very beginning of the program, whereas others did not request any vouchers and had little to no communication with students about the exam.

Program Effectiveness

Outcomes of program effectiveness detailed in this section include the use of vouchers, information about exam takers, and employment prospects.

Vouchers. The exams were open to individuals who participated in the CCC program, as well as to other professionals in the field. As noted, ARRA funding provided a limited number of vouchers to allow individuals to sit for the exam free of charge. Individuals interested in taking the exam were able to receive vouchers from one of the CCCs, other eligible academic institutions, or health care employers. Individuals not affiliated with any of those entities were able to request a voucher directly from AHIMA. The grantees delivered 9,514 exams during the period of grant funding. The exam's pass rate was 62%. When the funding period ended there were an additional 891 exams scheduled. As shown in Table 1, this was a large increase from March 2012 particularly with respect to the number of exams scheduled.

Exhibit 56: Number of Exams/Vouchers

Number of exams delivered, by role:	As of 3/24/12	As of 3/31/13
Clinician/Practitioner Consultant	534	1,430
Practice Workflow & Information Management Redesign Specialist	880	2,121
Implementation Manager	693	1,683
Implementation Support Specialist	687	1,749
Technical/Software Support Specialist	487	1,243
Trainer	490	1,288
Total number of exams delivered	**3,771**	**9,514**
Number of exams scheduled	**293**	**10,405**

In discussions with the exam developers in 2012, they reported that the number of exams administered at the time was well below the numbers they had expected. At that time, NOVA and AHIMA believed the low completion rate was due to several factors, including: community colleges not placing an emphasis on program graduates taking the exam; the fact that the exam was not a requirement for graduation from the programs; ONC's lack of advertising of the exam to the public; the fact that passing the competency exam would not confer any credential; and employers' lack of awareness of the exam or its value.

A follow-up conversation with AHIMA in late 2013 revealed a number of reasons for the large increase in exams delivered and scheduled at the end of the period of grant funding. Notably, during the final three months of grant funding, AHIMA allowed anyone to take the exam, and to take as many exams as they wanted, free of charge. Additionally, the grantees changed the messaging in their outreach efforts. Throughout the period of grant funding, AHIMA regularly emailed their membership, and NOVA and ONC reached out via health IT email distribution lists to inform potential test-takers of the free exam. During the final three months of the grant funding, email outreach emphasized that the exam would no longer be free after March 31, 2013, and that individuals should act quickly if they wanted to take the exam without a fee.

Demographic Information About Exam Takers. NORC conducted focus groups via teleconference with individuals around the country who completed the HIT Pro exam, but who were not students or instructors at one of the CCCs or involved in the development of the exam. These exam takers had varying backgrounds, although the majority had health care or health IT experience. Participants' backgrounds/roles included health IT consulting, health IT research, nursing, clinical analysis, clinic-based IT oversight, research, coding and billing, pharmacy, software development, and business analysis for telecommunications. Exam takers' formal health IT training also varied. One was enrolled in a

master's health information management program, while another had formal health IT training as a credentialed HIMSS professional. Other participants had received informal on-the-job training with EHRs. As shown in Exhibit 57, the individuals who took the exam represent a broad array of professional and educational backgrounds.

Exhibit 57: Demographic Information About Exam Takers (as of 3/31/2013)

	Exam					
	Clinician/ Practitioner Consultant	Implementation Manager	Implementation Support Specialist	Practice Workflow & Information Management Redesign Specialist	Technical/ Software Support Staff	Trainer
Health Care IT	22%	32%	22%	27%	28%	26%
Health Care – Non-clinical	15%	21%	15%	24%	12%	24%
Health Care – Clinical	44%	9%	8%	11%	6%	15%
IT - Not health-care related	2%	13%	19%	10%	21%	6%
Other	4%	9%	11%	9%	12%	11%
Unemployed	11%	15%	22%	16%	19%	17%
Unanswered	2%	1%	3%	2%	3%	2%
PhD/MD	8%	2%	1%	1%	1%	2%
MA	23%	32%	18%	25%	24%	25%
BA	37%	40%	40%	38%	41%	34%
AA	19%	13%	20%	19%	22%	20%
Non-degree certificate	8%	9%	14%	11%	15%	13%
High school	2%	3%	5%	4%	4%	3%
Unanswered	2%	1%	3%	2%	3%	2%

Focus group participants learned of the exam through various means, including the ONC website, colleagues, presentations at local community colleges, magazines, listservs, university advisors, and from the AHIMA conference. Most participants received and used the free exam vouchers, and agreed that the voucher was an incentive to take the exam. Some participants felt it was easy to determine which exam to take based on their background, while others felt that there was overlap in the subject matter of the exams, making it difficult to assess which exam would be the best fit. Overall, participants had no significant logistical issues related to registering for and taking the exam; however, several indicated there was a perception that individuals must go through the community college program courses before they can take the exam.

Additionally, NORC's baseline and follow-up surveys of CCC students asked about their experience with and plans to take the HIT Pro exam. During the baseline survey, the majority of students (57 percent) reported having taken or planning to take the exam. At follow-up, 20 percent of students across cohorts reported taking the exam and an additional 30 percent of students reported planning to take the exam in the future. Students' plans regarding the HIT Pro exam differed between Cohorts 1 and 2, and Cohort 3. At baseline, more students in Cohorts 1 and 2 (62 and 56 percent, respectively) had taken or were planning to take the exam compared to students in Cohort 3 (45 percent). At follow-up, more students in Cohorts 1 and 2 (23 and 22 percent, respectively) reported already having taken the exam compared with students in Cohort 3 (15 percent). Correspondingly, of students who had not taken the exam at follow-up, more students in Cohorts 1 and 2 (35 and 36 percent, respectively) reported planning to take the exam in the future than in Cohort 3 (26 percent).

Reasons for Taking the Exam. Exam takers participating in focus groups offered a variety of reasons for taking the exam(s). These motives included to validate formal experience in the field, to challenge and assess themselves and their skill sets, to evaluate themselves against a national standard, to test knowledge gaps, and to support career development/advancement (i.e., to be able to list the exam on a resume or to help make the case for a promotion). Participants in these discussions believed it would be difficult to pass the exam without any kind of relevant applied job experience or formal training. Additionally, individuals acknowledged that the ability to take the exam free of charge was appealing and a reason they took the exam. Focus group participants reported receiving vouchers from their employers or local community colleges. Many participants were planning to use a voucher to take a second exam. Several individuals stated that they were interested in taking the exam while the vouchers were still available in the hope that it would become a credential in the future.

Site visit findings provided more detail regarding why CCC students had not taken or did not plan to take the exam. Students at some colleges expressed confusion about it. In particular, several were under the impression that they would receive a credential if they passed the exam and were disappointed to learn this was not the case. Indeed, some program administrators acknowledged that when prospective students learned about the lack of credential, some lost interest in the program altogether.

Preparation for the Exam. Exam takers all reported engaging in some form of preparation for the HIT Pro exam. The amount of time individuals spent studying ranged from a few hours to several weeks. Some exam takers downloaded and reviewed the curriculum materials, choosing to focus primarily on topic areas for which they felt the least prepared. One focus group participant felt an Implementation Management book she ordered through the HIMSS website was useful for study preparation. Exam takers

wished for greater transparency about the availability of study aids from the National Training and Dissemination (NTDC) website. Several exam takers were not aware of the availability of these resources and others found them difficult to access given that they were spread across various websites. More focus group participants reported finding the exam blueprints, but did not feel they were especially helpful due to their lack of specificity. Additionally, focus group participants expressed some confusion about the difference between an official ONC HIT Pro study guide and the materials prepared for the ONC-funded community college programs.

During site visit discussions, students, program administrators, and instructors also raised concerns about students' ability to do well on the exam. Because there was a limited understanding about what materials would be covered on it, there was anxiety that students were not learning the content necessary to pass it. Additional issues surrounding the alignment between the exam and the materials covered in the programs arose at schools that restructured the curriculum materials or the roles. At one school that merged multiple roles, program staff advised students to consider which role they felt most comfortable with and sit for the exam in that area. However, to the extent that schools repackaged the materials to add and subtract content, there were concerns that some exam topics were not being raised in classes.

Exam Relevance and Value. Generally, focus group participants believed the exam reflected the competencies well. Some exam takers felt that answering the questions required applied information, noting an individual could likely pass the test solely with knowledge from relevant work experience and that the exam tested general knowledge, rather than classroom-based knowledge. Other focus group participants expressed the opinion that the exam questions were more theoretical than focused on real-world application.

Some exam takers believed that many questions on the exam were not worded clearly, or had multiple correct answers. Several participants felt that the "correct" response to a question might vary depending on the setting. For example, different clinical settings might use different project management terminology or approach a similar task in different ways. Generally, exam takers who took more than one exam agreed there was a lot of overlap between the exams.

Relatively few students participating in discussions during site visits had sat for the exam. However, among those who had, many confirmed that some test questions covered material or themes with which they were unfamiliar. Two students from one school took the exam and noted several sections contained information to which they not been exposed at all. They both searched their coursework after the exam was over and were unable to find mention of those topics in their notes or slides. Several students who

took the exam were also surprised that it seemed to focus disproportionately on IT, rather than on health care topics. Regardless of whether they had taken the exam, students explained that it would be helpful to be able to review a practice exam beforehand.

Employment Prospects. Focus group participants were unsure whether or not the exam would help them to secure new positions or advance in their current positions, but expected it would be helpful in the future as a way to demonstrate familiarity with and understanding of the industry. Several individuals felt the exam would be most helpful for individuals looking to break into the field in entry-level positions. Some participants voiced concern that many employers were unaware of the exam. To help spread awareness of the exam, they recommended that ONC post more information about it on the web or engage in a marketing campaign to encourage employers to see the benefit of the exam. Several exam takers who worked in health IT at the time of their discussion and who told their employers they passed the exam reported that, while their employers were pleased, it was not clear whether passing the exam would result in a promotion or salary increase. Participants also expressed concern that without additional job training or relevant work experience, the exam did not carry much value on a resume. Because of this, some exam takers felt it would not be worth paying for. Participants agreed that the exam would be more beneficial for employment purposes, and entice them to prepare more, if it conferred a certification. As of July 29, 2013, the HIT Pro exam has been transitioned to the AHIMA Certified Healthcare Technology Specialist (CHTS) credential, which does confer a certification.[47]

The variation in CCC students' intentions to take the exam, expressed during site visit discussions, reflected their mixed views about the exam's value to potential employers. At some schools, most students planned to take the competency exam, as they believed it was the only way to demonstrate what they had learned from their courses. They perceived successful completion of the exam as an indication that they met a "national standard." However, even those students expressed some uncertainty about employers' awareness of the exam.

Additionally, some of the employers interviewed during site visits had not previously heard of the exam. Among those familiar with it, they were unsure how much of an impact it would have on their hiring decisions. Other sources have found that, in general, employers in the health care field place a high value on certification. A recent AHIMA survey found that 68 percent of employers reported that they had chosen a certified candidate over one who was not certified and 53 percent considered certification when promoting employees over equally skilled and experienced workers.[48] Not surprisingly, in addition to the HIT Pro exams, there are a number of certification exams and designations available to health IT professionals including the CompTIA Healthcare IT Technician certificate, the Certified Professional in

Healthcare Information & Management Systems (CPHIMS) designation, the Certified Health Informatics Systems Professional (CHSIP) designation, and the College of Healthcare Information Management Executives (CHIME) Certified Healthcare CIO (CHCIO) designation. Additionally, AHIMA oversees a number of other certification programs, including the Registered Health Information Administrator (RHIA) for executive-level health information specialists.[49]

During site visit discussions, employers noted that the HIT Pro exam might help to distinguish between two similarly qualified candidates; however, in general, employers felt it would take time for the exam to establish credibility among the existing credentials and exams. They explained that the exams that tend to have the most influence in the hiring process are ones that have a credential attached to them—a particularly important factor in the health field; are sponsored by well-trusted organizations (e.g., HIMSS); and have a proven track record of differentiating among more- and less-qualified candidates.

Lessons Learned

Collaboration among NOVA, AHIMA, and the CCCs resulted in an exam that reflected the curriculum taught by CCCs and competencies necessary for success in the health IT workforce. Although exam takers reported a variety of reasons for taking the exam, the ability to take it free of charge was the driving factor reported most consistently.

Communications regarding the exam was one area with room for improvement. Given that one of the main reasons students were aware of the HIT Pro exam was that their CCC had informed them about it, ensuring health IT training programs publicize the exam is key to having students take it. Additionally, better communication about and easier access to exam preparation materials on the NTDC website could have reduced students' dissatisfaction with the exam preparation process. Lastly, communications to employers about the exam and the significance of a passing score can help convey the relevance of the exam to both employers and potential exam-takers.

Conclusions

In April 2010, ONC entered into a two-year, $6 million cooperative agreement with NOVA to provide support for the development, testing, and implementation of a mechanism to assess whether individuals had attained particular health IT competencies. The grant also provided vouchers to cover the cost of the exam for individuals who completed one of the CCC programs, although other health IT professionals were also able to sit for the examination, available until March 31, 2013. While the grantees experienced

some challenges in administering the exams, with a smaller than expected number of individuals sitting for the exam, they were able to mitigate these challenges in a number of ways. Towards the end of the grant, the grantees permitted people to sit for the exam free of charge. Additionally, they changed their marketing strategy by emphasizing that the exam would only be free of charge for a limited period of time.

NOVA collaborated with AHIMA to develop a HIT Pro competency exam for each of the six CCC-targeted roles. Providing all exams free of charge and allowing exam takers to sit for more than one exam, in combination with promoting the fact that individuals would have to pay for exams in the future, led to a large increase in the number of exams delivered at the end of the period of grant funding. One challenge was that health IT employers were largely unaware of the exam. Looking to the future, ensuring that employers understand the exam and the value of a passing score will make it a more valuable indicator for job-seekers and employers alike.

8. KEY LESSONS LEARNED AND CROSS-CUTTING FINDINGS

As detailed in this report, the independent evaluation of the Workforce Program drew upon multiple data sources and methodological tools to assess the progress and success of the four components of the program as well as its impact as a whole. Careful synthesis of the information gathered throughout this process highlights several key takeaway messages that are pertinent to each component, cross-cutting findings that apply to the program as a whole, and some helpful guidance for future health IT training programs (and other workforce programs more generally) in the years ahead. This section distills these findings in brief.

Program of Assistance for University-Based Training (UBT)

The nine universities funded under the program used their grants in a number of ways, whether to create new master's and certificate training programs altogether or to enhance previously existing capabilities and programs through adaptations such as moving to an online format, providing more robust financial support to students, creating new courses, or hiring additional faculty and support personnel. The universities effectively leveraged the funds to train students across all of the Workforce Program's roles at both the certificate and master's levels. As of December 2013, 1,704 individuals had completed the program and 86 individuals were enrolled in the training.

In addition to preparing a significant number of professionals for the demands of the current health IT workforce, the program helped forge lasting partnerships among schools within the universities—with several drawing upon a variety of schools, including Schools of Medicine, Nursing, Public Health, Pharmacy, and Business. The aforementioned adaptations that the schools spearheaded with these funds also positioned them at the cutting edge of online learning, with universities employing a variety of platforms to structure their learning format in different ways. The funding also afforded the schools the flexibility to draw on a variety of materials for course content. These included, for instance, didactic lectures with slides, reading assignments (from not only textbooks but also the health IT literature, media, federal laws and regulations), and case studies. Opportunities for interaction among students were effective in both dealing with the potentially isolating experience of online learning and simulating a team-based workplace environment. To this end, the universities designed group projects that called for collaboration among students with diverse professional and educational backgrounds and set up internships or practica to generate hands-on experience. These opportunities proved critical in equipping students with the expertise and confidence needed to secure employment following graduation.

Community College Consortia (CCC) to Educate IT Professionals in Health Care

The funding awarded to the Community College Consortia (CCC) enabled colleges to offer non-degree health IT training that students could complete within six months to help support the growing demand for health IT employees. The member colleges were tremendously diverse in terms of their previous experience with providing training in this field. Those less-familiar with the field faced more challenges with implementation than others, especially given the tight timeframe within which the program was implemented.

Colleges took a variety of approaches to implementing their programs and utilizing the prescribed Workforce Program roles. Schools that either proactively placed students in roles depending on their background or modified roles to meet employers' needs reported more success in terms of students completing the program and finding employment. Additionally, for-credit programs appealed more to students than did those that did not offer credit, as did those that provided comprehensive tuition assistance using the government funding.

In terms of attracting students at the outset, colleges found success with informal word-of-mouth marketing to recruit students and found student orientations extremely valuable in setting student expectations regarding the workload and the program overall. CCC administrators noted that it was very important to ensure students had adequate backgrounds in order to be successful in the program. To do this, schools used strategies including requiring applicants to take a pre-assessment test; implementing a vetting component to the application process, with applicants having to check boxes to indicate their experience and education; carefully reviewing resumes and transcripts; holding in-person interviews; and speaking with references.

Nearly all faculty members teaching in the programs were adjunct instructors who also worked in the field of health IT and whose real-world experience was of great value to students. Two-thirds of students took courses exclusively online, which was a popular format due to the flexibility it offered. At the same time, as with those in the UBT program, many desired face-to-face opportunities for in-person and especially hands-on training and networking.

As of October 2013, 19,733 individuals had completed their health IT training at one of the community colleges funded under this program. Schools reported attrition rates that were similar to those of other community college programs. Students expressed high rates of overall satisfaction with their CCC

programs as well as with instructors and the curricula. CCC instructors had similarly positive feedback about the program.

The program was successful in helping many students find jobs after graduation, either directly through career assistance services or indirectly. Graduates were more likely to be working in health IT positions in particular after completing CCC training, most often in the role of technical software support and in a hospital setting. Students whose job in health IT was with a different employer as prior to entering the program believed their program participation had a strong impact on obtaining their job and their position or job title. Students who were seeking a job felt strongly that the skills they learned in the program would help them obtain a job in health IT and perform well in it. Similarly, students employed in health believed the skills they had learned would improve job performance and their potential for a promotion.

One challenge was that many employers were unaware of the CCC program and skeptical that graduates would be prepared to take on the responsibilities necessary for the roles they needed filled. They were especially emphatic about the importance of both hands-on training and real-life experiences in preparing individuals for the health IT workforce. This concern aside, employers who had hired program graduates were by and large very pleased with their work. Overall, the feedback collected throughout NORC's quantitative and qualitative research demonstrated that CCC programs provided students with satisfactory training that helped many find employment in the field of health IT while also creating meaningful opportunities for community colleges to expand or further develop their health IT training programs.

Curriculum Development Centers

One of the most innovative aspects of the Workforce Program was the funding of five universities to develop the curriculum materials used by the CCCs. Although this component of the program saw some early significant challenges in creating the course content, in the end, the Developers were all generally pleased with the format of the program, but had some suggestions for improvement. One high-level issue many noted was simply the rapidly evolving field itself, which posed difficulties for keeping curriculum materials up to date at any given time. Although the three revision cycles helped ensure that new information could be incorporated into the materials, there was not a lot of time for substantive changes to be made.

The Developers all cited the timeline for the program's launch as a whole as a major challenge, with the content still a work in progress even as the community colleges started enrolling students. Perhaps as a result, many of the CCCs and students observed technical issues with Version 1.0 in particular, including

inconsistencies, typographical errors, and the poor quality of the narration in the audio-recordings. For the most part, the Developers addressed these issues in subsequent versions of the materials. The short development timeline also limited collaboration among the Developers, who did not have time to review one another's materials prior to distribution; and posed problems for instructors, many of whom found it difficult to incorporate updated materials into courses mid-stream.

While the Developers felt the flexibility offered to the community colleges in terms of which specific materials to use was a positive attribute of the program, some noted that having five universities design separate components made it difficult to ensure that all students were taught the skills necessary for each role. Some of this may have been intrinsic to the complexities of designing a curriculum for more than 80 community colleges with varying programs and student bodies and in diverse labor markets across the country.

Competency Examination for Individuals Completing Non-Degree Training

In April 2010, as another component of the Workforce Program, ONC funded Northern Virginia Community College (NOVA) to support the development, testing, and implementation of a competency examination of health IT competencies for those graduating from the CCC program or others seeking to demonstrate their knowledge of the field. NOVA collaborated with the American Health Information Management Association (AHIMA) to develop an exam for each of the six CCC-targeted roles. This portion of the grant provided vouchers to cover the cost of sitting for the exam in large part to provide an incentive for individuals to take it.

The number of individuals who had taken the exam was initially much lower than the number of vouchers that had been issued. This lag appeared attributable to uncertainty about the content of the exam vis-à-vis the colleges' curricula, skepticism regarding employers' awareness of the exam (skepticism that proved warranted in discussions with employers), and variation in the extent to which the colleges emphasized the importance of the exam to students.

Based on a follow-up conversation with AHIMA in late 2013, there was a large increase in the number of exams delivered and scheduled at the end of the period of grant funding. The grantees delivered 9,514 exams during the period of grant funding. When the funding period ended, there were an additional 891 exams scheduled. The grantee attributed this to a number of reasons. Notably, during the final three months of grant funding, AHIMA allowed anyone to take the exam, and to take as many exams as they wanted, free of charge. Additionally, the grantees changed the messaging in their outreach efforts to

emphasize that the exam would no longer be free after March 31, 2013, and that individuals should act quickly if they wanted to take the exam without a fee.

Cross-Cutting Findings

Looking across the findings and information gathered from the full array of evaluation activities across all four components of the program, a number of common themes shed light on the program's success as a whole—and can be readily applied to other schools looking to launch or improve workforce training programs.

First, to varying degrees, individuals associated with all four components of the program voiced the importance of communication and clarity of purpose at the outset. Especially in light of the rapid timeline along which the program was launched and the fact that all four components were getting up and running at the same time, many felt they would have benefited from more-structured communication channels early on. For instance, although the Developers collaborated with one another, with community colleges, and with their advisory boards, they would have appreciated time to communicate with both the CCCs and the HIT Pro exam developer during the process to help them target the materials to the correct audiences most effectively.

Second, the flexibility that ONC provided the grantees emerged as one of its greatest assets and this manifested in several ways. For instance, both the community colleges and universities were afforded significant latitude in structuring their curricula to meet their needs, capacities, and programmatic priorities. CCCs and individual faculty made several changes to the materials the Developers produced, including restructuring the components and units, reworking the roles, or repackaging the materials to add and subtract content as they deemed appropriate. In terms of flexibility in the format of the learning experience, both CCC and UBT students appreciated the opportunity to participate in a partially or fully online learning experience. School administrators also generally touted the online learning platform, as it was quicker to launch than an in-person program, while also allowing for the recruitment of students from a wider geographic area and range of personal and professional circumstances.

Third, as the training programs got under way, it became clear that students' ability to find employment hinged on their opportunities to gain "real-world" experience, which were driven in large part by schools' efforts to forge solid connections with the employer community. Reaching out to industry experts and employers was an effective means of soliciting feedback on ongoing training, setting up internship programs, and introducing the program to those in a position to hire graduates. One challenge facing

several students upon graduation was that many employers were by and large unaware of both the CCC and UBT training programs. However, once they learned about them, they felt confident the training could fill gaps in the workforce. Additionally, employers who hired program graduates were generally satisfied with their job performance. Hands-on opportunities proved critical in preparing students for employment, and schools with well-developed partnerships with employers were better able to support students in this regard as well.

Sustainability and Looking Ahead

Although grantees are no longer receiving grant funding, at present, 63 of the original CCCs and all nine of the UBTs that received grant funding are continuing their health IT educational offerings. In addition, while ONC is no longer funding curriculum development under this program, the materials the funding previously supported are still being used around the country by educational institutions, individuals, and others. Program administrators generally believed that their respective universities and colleges were happy with the programs and supportive of continuing the training they were providing. Universities and colleges reported planning to charge students for the training and believed the demand would sustain the programs over time.

On July 29, 2013, the Commission on Certification for Health Informatics and Information Management (CCHIIM) announced that the HIT Pro competency exams had been converted to AHIMA-certified Healthcare Technology Specialist credentials and thus AHIMA and Pearson VUE continue to offer the HIT Pro exam. AHIMA argues that these credentials will offer professionals increased job opportunities, validation of expertise and knowledge in the topic area, preparation for future changes in health care and IT, and long-term endorsement of their skills.

As noted above, program administrators and faculty members from both the CCCs and UBTs observed that programs needed to adapt continuously to the changing health IT landscape—and health-care system more generally—in order to remain successful and relevant. Some schools started addressing these evolving needs while they were receiving Workforce funding. For instance, to provide hands-on training with EHRs, one program opened an on-campus health IT learning center to simulate the use of health IT in a clinical setting. Another grantee was addressing the unique challenges of rural and urban low-resource areas by creating a set of training materials focused specifically on these settings. One university held a meeting bringing together local health IT educators, Chief Information Officers (CIOs), and vendors. The meeting served as a call to action and provided a forum for health IT stakeholders to

communicate their needs and develop an actionable plan for creating and sustaining a health IT workforce.

Such sustainability will also be contingent in part on the extent to which training and the skilled employees it generates are sufficiently versatile to adapt to the changing health-care system in the wake of the Affordable Care Act. For instance, many of the innovative care-delivery and payment models now under way have a renewed focus on coordinated care and patient-centered team-based care. These approaches call for modifications to workflow and procedures that will change the way health IT can best be integrated into the care process.[50]

Looking forward, colleges and universities have a variety of plans in place for their training programs. Among the community colleges, for instance, 63 plan to continue offering health IT training after the end of the funding period.[51] A number of colleges plan to allow students more than six months to complete their training and to focus more on hands-on and virtual lab learning. Several colleges not sustaining the certificate program plan on moving the training curriculum into existing health IT programs, offering the training on a not-for-credit basis or through continuing education, or creating a degree program. Universities are also looking into developing additional degree programs. Colleges and universities alike are looking into other grant opportunities to replace the support they received through the ONC grants. The CCC consortium lead that offered the eight-week Veterans Affairs training program discussed earlier secured a grant to provide health IT training for veterans, their eligible spouses, and others. Several of the project's initiatives include developing a pilot of federally registered health IT apprenticeships launched in the veterans' community, curricula for new core health IT courses, evidence-based online course materials, and health IT facility development.[52]

Several program administrators from both CCCs and UBTs are working to ensure that their curricula and programs evolve by reaching out regularly to employers to gauge their needs, identify the specific skills they are seeking in potential employees, and adapt their programs to meet these needs. This will be necessary for all training programs striving to remain relevant as the field of health IT advances.

Conclusions

Through careful synthesis of the range of data and information gathered as part of the independent evaluation of the Workforce Program, this report addresses the three research questions that serve as the framework for the evaluation.

What processes did the grantees use to implement the programs and meet Program goals?

ONC afforded grantees significant leeway in the way they used their funding. Thus, the grantees, particularly community colleges and universities, demonstrated creativity in their use of resources for a wide range of purposes. Schools used funds to create new training programs and improve or modify existing ones, hire faculty or instructors, pay for student tuition, and fund career services personnel or activities.

To what extent did the grantees meet the requirements of the Workforce Program?

Grantees successfully met the requirements of the Workforce Program and many aspects of the program have continued beyond the end of the period of grant funding. The UBTs trained 1,704 individuals in all of the Workforce Program's roles and each of the nine UBTs are continuing to offer training. The Centers developed the curriculum materials, which the CCCs used successfully in training 19,733 students in all of the Workforce Program's roles. Generally, students expressed satisfaction with their overall training experience and faculty conveyed similar degrees of satisfaction with the curriculum materials. The majority of CCCs will continue their training and use of these materials beyond the expiration of the grant funding. The exam developers successfully developed the HITPRO exam and delivered 9,514 exams during the period of grant funding.

To what extent did participants in the program gain and maintain employment in health?

Students who participated in the Workforce training offered through both the CCCs and UBTs were more likely to be employed in health IT than they had been prior to their participation. Generally, students attributed having gained employment in the field to their workforce training.

In sum, taken together, the four components of the Workforce training program achieved the overarching goal of providing "assistance to institutions of higher education (or consortia thereof) to establish or expand health informatics education programs, including certification, undergraduate, and master's degree programs, for both health care and information technology students to ensure the rapid and effective utilization and development of health information technologies."[53]

9. APPENDIX A: RESEARCH QUESTIONS

NORC's independent evaluation of the Workforce Program focused on addressing three key research questions:

Research Question #1: What processes did the grantees use to implement the Programs and meet Program goals?

To foster improvement in the Workforce Program over time, it was important to understand the strategies the grantees used to try to achieve their goals. In particular, the evaluation gathered information to answer the following questions:

a) What were the characteristics of the courses (format, use of curriculum materials, etc.)?
b) Were schools able to recruit well-qualified instructors?
c) How were students recruited?
d) Were schools able to recruit students who were adequately prepared?
e) What motivated individuals to participate in the training program?
f) What motivated individuals to take the exam?
g) Were schools able to tailor the training programs to account for students' past experience and education?
h) How were the community college and UBT programs integrated into existing programs?
i) What factors affected enrollment and retention of students?
    i) Recruitment methods?
    ii) Approach to assessing/providing credit for past work experience?
    iii) Whether the schools had relevant training programs prior to receiving the grant?
j) How did the programs get feedback on employers' needs?
k) What career placement and support systems were offered?
l) How did the different grant programs coordinate with each other?
m) How did the community colleges use the curricula developed by the Curriculum Development Centers?
n) How responsive were the Curriculum Development Centers to the community colleges' needs?
o) How satisfied were the community college faculty members with the curriculum materials?
p) How satisfied were students with the classes, instructors, and curriculum materials with respect to meeting their needs and expectations?
    i) Did this vary by:
        (1) The role/s in which students were trained?
        (2) Faculty qualifications?
        (3) Whether students were distance learners?
q) How did exam takers perceive the value, relevance, and clarity of the exam?

r) What were the challenges and lessons learned in administering the program?
s) Will the competency exam and training programs continue after funding ends?

Research Question #2: To what extent did the grantees meet the requirements of the Workforce Program?

The evaluation explored the following topics to determine the extent to which the grantees fulfilled the expectations of the grant program:

a) How many community college and university-based programs offered training for each role?
b) How many students participated in and completed the training for each role? Did the grantee institutions train the expected number of students?
c) Were an adequate number of curriculum units developed to meet the needs of community college instructors training students in each of the roles?
d) How many individuals took the HITPRO exam to assess their competency in each of the roles?
e) What were the characteristics of the students who participated in the training programs?
f) What were the characteristics of the individuals who took the exam?

Research Question #3: To what extent did participants in the program gain and maintain employment in health?

a) What percentage of program graduates were working in health IT and for what types of employers?
b) What salaries did program graduates earn?
c) To what extent did program graduates feel the program helped them secure positions or promotions?
d) How aware were employers of the program components and what was their interest in employing program participants?
e) Were the roles defined in a way that met employers' needs? Were there any additional roles that would have been helpful in the current environment?
f) Did employers and students feel that the program prepared graduates effectively for the job market and the positions they hoped to obtain?

10. APPENDIX B: TYPOLOGY TABLES

Exhibit 58: Comparison of Community College Assignments to the Profile with the Lowest Completion Rate, by Analytic Strategy

	Profile 1 N=15	Profile 2 N=45	Profile 3 N=19
Completion Rate	**60.7%**	**58.2%**	**38.7%**
Region B			**1**
SAN DIEGO MESA COLLEGE			**X**
Region C			**2**
KIRKWOOD COMMUNITY COLLEGE			**X**
MORAINE VALLEY COMMUNITY COLLEGE			**X**
Region D			**16**
BROWARD COLLEGE			**X**
MIDLAND COLLEGE			**X**
HOUSTON COMMUNITY COLLEGE		**X**	
ATLANTA TECHNICAL COLLEGE			**X**
CATAWBA VALLEY COMMUNITY COLLEGE			**X**
INDIAN RIVER STATE COLLEGE			**X**
PITT COMMUNITY COLLEGE			**X**
CENTRAL PIEDMONT COMMUNITY COLLEGE			**X**
CHATTANOOGA STATE COMMUNITY COLLEGE			**X**
DALLAS COUNTY COMMUNITY COLLEGE DISTRICT			**X**
DYERSBURG STATE COMMUNITY COLLEGE			**X**
FLORENCE-DARLINGTON TECHNICAL COLLEGE			**X**
HINDS COMMUNITY COLLEGE			**X**
ITAWAMBA COMMUNITY COLLEGE			**X**
JEFFERSON COMMUNITY & TECHNICAL COLLEGE			**X**
NATIONAL PARK COMMUNITY COLLEGE		**X**	
TULSA COMMUNITY COLLEGE			**X**
SANTA FE COLLEGE		**X**	
WALTERS STATE COMMUNITY COLLEGE			**X**

Exhibit 59: Frequencies of Categories for the Average Community College, those in Region B, and San Diego Mesa College

Indicator	Categories	Average	Region B	San Diego Mesa College
Pre-HITECH Program	None	26.6%	38.5%	**0.0%**
	Health IT or other	**73.4%**	**61.5%**	**100%**
Credit	Non-Credit	**60.8%**	**53.8%**	**100%**
	Credit or both	39.2%	46.2%	0.0%
Role Sequencing	Some/all multiple roles	**46.8%**	**61.5%**	0.0%
	One role then next	36.7%	30.8%	0.0%
	Only one role to complete	16.5%	7.7%	**100%**
Learning Format	Entirely online/asynchronous	39.2%	30.8%	**100%**
	Online with face to face	**53.2%**	**69.2%**	0.0%
	Entirely in-person	7.6%	0.0%	0.0%
Completion Rate		**53.4%**	**50.6%**	**43.9**

Exhibit 60: Frequencies of Categories for the Average Community College, those in Region C, as well as Kirkwood and Moraine Community College

Indicator	Categories	Average	Region C	Kirkwood	Moraine
Pre-HITECH Program	None	26.6%	47.1%	0.0%	0.0%
	Health IT or other	**73.4%**	**52.9%**	**100%**	**100%**
Credit	Non-Credit	**60.8%**	**58.8%**	**100%**	**100%**
	Credit or both	39.2%	41.2%	0.0%	0.0%
Role Sequencing	Some/all multiple roles	**46.8%**	23.5%	0.0%	0.0%
	One role then next	36.7%	29.4%	**100%**	**100%**
	Only one role to complete	16.5%	**47.1%**	0.0%	0.0%
Learning Format	Entirely online/Asynchronous	39.2%	35.3%	**100%**	0.0%
	Online with face to face	**53.2%**	**58.8%**	0.0%	**100%**
	Entirely in-person	7.6%	5.9%	0.0%	0.0%
Completion Rate		**53.4%**	**59.8%**	**35.9%**	**53.8%**

Exhibit 61: Posterior Class Probabilities for San Diego, Kirkwood, and Moraine Community College

Profile: Completion Rate	San Diego	Kirkwood	Moraine
Profile 1: 60.7%	0.000	0.000	0.000
Profile 2: 58.2%	0.061	0.061	0.241
Profile 3: 38.7%	0.939	0.939	0.759

Exhibit 62: Frequencies of Categories for the Average Community College, those in Class 2 (i.e., Profile 3), as well as Houston, National Park, and Santa Fe Community College

Indicator	Categories	Average	Region D (n=19)	Houston	National Park	Santa Fe
Pre-HITECH Program	None	26.6%	0.0%	0.0%	0.0%	0.0%
	Health IT or other	**73.4%**	**100%**	**1000%**	**100%**	**100%**
Credit	Non-Credit	**60.8%**	**94.7%**	**100%**	**100%**	0.0%
	Credit or both	39.2%	5.3%	0.0%	0.0%	**100%**
Role Sequencing	Some/all multiple roles	**46.8%**	10.5%	**100%**	**100%**	0.0%
	One role then next	36.7%	**89.5%**	0.0%	0.0%	**100%**
	Only one role to complete	16.5%	0.0%	0.0%	0.0%	0.0%
Learning Format	Entirely online/Asynchronous	39.2%	**63.2%**	0.0%	**100%**	0.0%
	Online with face to face	**53.2%**	36.8%	**100%**	0.0%	**100%**
	Entirely in-person	7.6%	0.0%	0.0%	0.0%	0.0%
Completion Rate		**53.4%**	**38.66%**	**59.1%**	**38.2%**	**44.5%**

Exhibit 63: Posterior Class Probabilities for Houston, National Park, and Santa Fe Community College

Profile: Completion Rate	Houston	National Park	Santa Fe
Profile 1: 60.7%	0.000	0.000	0.000
Profile 2: 58.2%	0.832	0.504	1.000
Profile 3: 38.7%	0.168	0.496	0.000

Exhibit 64: Descriptive Statistics for Unemployment Rate and Meaningful Use Payments

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
State Unemployment Rate	79	.0350	.1350	.088671	.0194163
Meaningful Use Payments to Eligible Providers per county	79	2.00	3825.00	593.3671	617.69331
Valid N (listwise)	79				

Exhibit 65: Descriptive Statistics for NCHS Urban-Rural Classification Scheme

2006 NCHS Urban-Rural Classication Scheme

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Large Central Metro	3	3.8	3.8	3.8
	Large Fringe Metro	4	5.1	5.1	8.9
	Medium Metro	12	15.2	15.2	24.1
	Small Metro	16	20.3	20.3	44.3
	Micropolitan	15	19.0	19.0	63.3
	Noncore	29	36.7	36.7	100.0
	Total	79	100	100	

Exhibit 66: State Unemployment Rate and Meaningful Use Payments, by College Profile

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
State Unemployment Rate	1.00	45	.084956	.0191014	.0028475	.079217	.090694	.0440	.1350
	2.00	19	.095000	.0154164	.0035368	.087570	.102430	.0590	.1170
	3.00	15	.091800	.0232139	.0059938	.078945	.104655	.0350	.1170
	Total	79	.088671	.0194163	.0021845	.087322	.093020	.0350	.1350
Meaningful Use Payments to Eligble Providers per county	1.00	45	604.5778	597.63471	89.09012	425.0284	784.1271	2.00	2409.00
	2.00	19	577.4211	904.51874	207.51083	141.4570	1013.3851	21.00	3825.00
	3.00	15	579.9333	581.62831	150.17578	257.8383	902.0284	8.00	2409.00
	Total	79	593.3671	671.69331	75.57140	442.9160	743.8182	2.00	3825.00

Anova

		Sum of Squares	df	Mean Square	F	Sig.
State Unemployment Rate	Between Groups	.002	2	.001	2.084	.131
	Within Groups	.028	76	.00		
	Total	.029	78			
Meaningful Use Payments to Eligible Providers per county	Between Groups	13,193.812	2	6,596.906	.014	.986
	Within Groups	3,517,8214.54	76	462,871.244		
	Total	3,519,1408.35	78			

Exhibit 67: Community College Location, by Profile

modal_c3 * Location Recoded Crosstabulation

			Location Recoded		
			Metropolitan	Rural	Total
modal_c3	1.00	Count	16	29	45
		% within modal_c3	35.6%	64.4%	100.0%
		% within Location Recoded	45.7%	65.9%	57.0%
	2.00	Count	13	6	19
		% within modal_c3	68.4%	31.6%	100.0%
		% within Location Recoded	37.1%	13.6%	24.1%
	3.00	Count	6	9	15
		% within modal_c3	40.0%	60.0%	100.0%
		% within Location Recoded	17.1%	20.5%	19.0%
Total		Count	35	44	79
		% within modal_c3	44.3%	55.7%	100.0%
		% within Location Recoded	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp Sig (2-side)
Pearson Chi-Square	5.987[a]	2	.050
Likelihood Ratio	6.027	2	.049
Linear-by-Linear Association	.892	1	.345
N of Valid Cases	79		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.65.

Exhibit 68: Modeling Opportunities in Latent Class Analysis

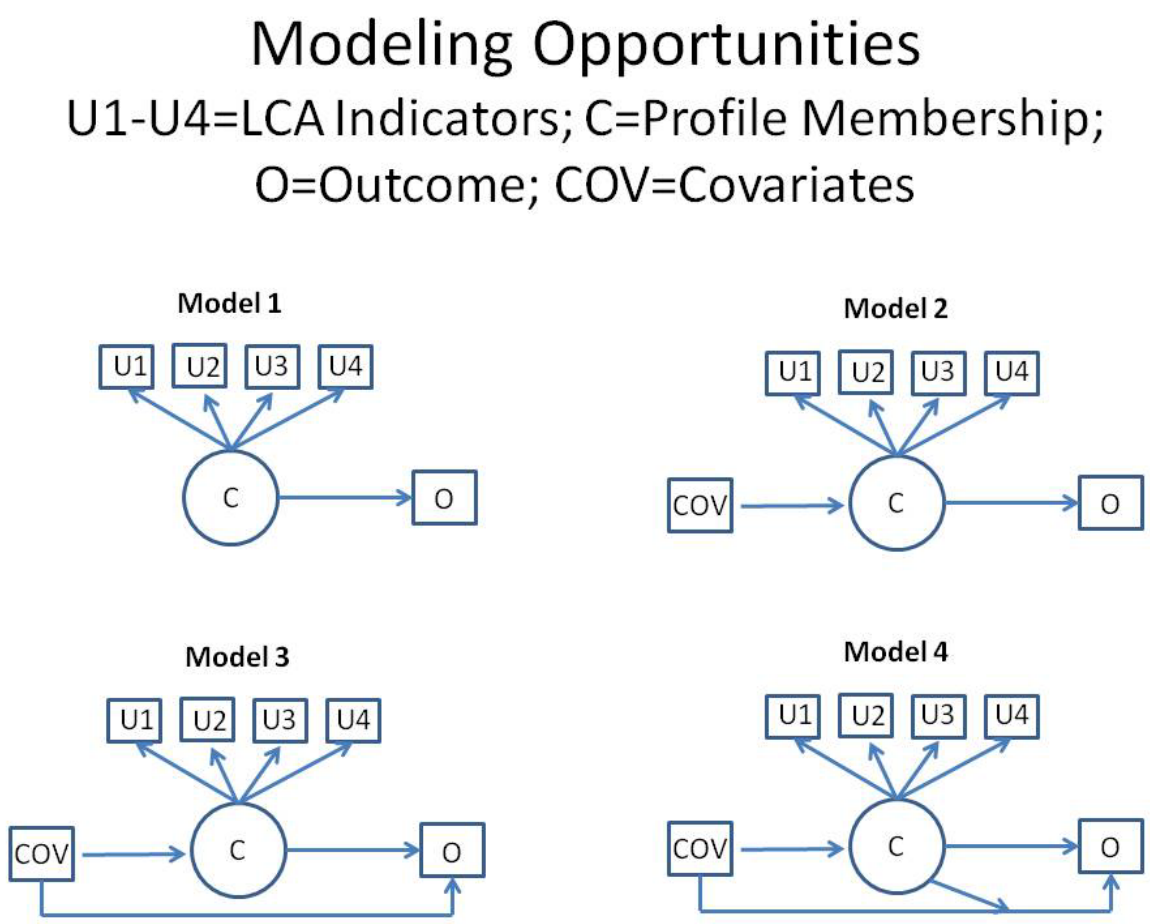


Exhibit 69: Model Comparison for Nested LCA Models

Model	Log Likelihood	# of Parameters	Scaling Correction Factor	Model Comparison
Model 1	-600.693	24	0.7709	M2 versus M1: 14.87 (6), p<.05
Model 2	-596.363	30	0.7405	
Model 3	-592.500	33	0.7476	M3 versus M2: 9.44 (3), p<.05
Model 4	-591.147	(39)	0.7021	M4 versus M3: 5.99 (6), ns

Exhibit 70: Results of the Multinomial Logistic Regression (Parameterization Using the Profile with a High Completion Rate as the Reference Class)

	Est.	S.E.	Est./S.E.	P-Value	OR
Medium vs. High Profie					
Unemployment Rate	-0.244	0.183	-1.337	ns	ns
Meaningful Use: 1st versus 4th Quartile	-1.007	1.084	-0.929	ns	ns
Meaningful Use: 2nd versus 4th Quartile	-0.319	1.039	-0.307	ns	ns
Meaningful Use: 3rd versus 4th Quartile	**-1.958**	**0.838**	**-2.336**	**p<.05**	**0.141**
Micropolitan/Noncore vs. Small Metro or larger	-0.247	0.722	-0.342	ns	ns
Low vs. High Profile					
Unemployment Rate	0.012	0.203	0.059	ns	ns
Meaningful Use: 1st versus 4th Quartile	-0.534	1.234	-0.433	ns	ns
Meaningful Use: 2nd versus 4th Quartile	-0.503	1.210	-0.415	ns	ns
Meaningful Use: 3rd versus 4th Quartile	**-1.922**	**1.025**	**-1.876**	**p<.01**	**0.146**
Micropolitan/Noncore vs. Small Metro or larger	-1.225	0.798	-1.534	ns	Ns

Exhibit 71: Linear Regression of Program Completion Rate on Contextual Factors

Completion Rate	Est.	S.E.	Est./S.E.	P-Value
Unemployment Rate	**-2.907**	**0.979**	**-2.971**	**p<0.01**
Meaningful Use: 1st versus 4th Quartile	5.546	6.767	0.820	ns
Meaningful Use: 2nd versus 4th Quartile	-8.383	5.437	-1.542	ns
Meaningful Use: 3rd versus 4th Quartile	-4.272	5.237	-0.816	ns
Micropolitan/Noncore vs. Small Metro or larger	7.770	5.199	1.494	ns

REFERENCES

[1] Section 3016 of the Public Health Service Act (PHSA), as added by Title XIII in Division A of the American Recovery and Reinvestment Act of 2009, calls for "assistance to institutions of higher education (or consortia thereof) to establish or expand medical health informatics education programs, including certification, undergraduate, and master's degree programs, for both health care and information technology students to ensure the rapid and effective utilization and development of health information technologies (in the United States health care infrastructure)."

[2] AHIMA. Certified Healthcare Technology Specialist (CHTS) Exams. Accessed 1/13/2014 from: http://www.ahima.org/certification/chts

[3] Section 3016 of the Public Health Service Act (PHSA), as added by Title XIII in Division A of the American Recovery and Reinvestment Act of 2009, calls for "assistance to institutions of higher education (or consortia thereof) to establish or expand medical health informatics education programs, including certification, undergraduate, and masters degree programs, for both health care and information technology students to ensure the rapid and effective utilization and development of health information technologies (in the United States health care infrastructure)."

[4] Blumenthal D. 2010. Launching HITECH. *New England Journal of Medicine*; 362(5): 382-385.

[5] Other programs funded under the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 include the Beacon Community Cooperative Agreement Program; the State Health Information Exchange (HIE) Cooperative Agreement Program; the Health Information Technology Regional Extension Center (REC) Program; and the Strategic Health IT Advanced Research Projects (SHARP) Program.

[6] Blumenthal D. 2010. Launching HITECH. *New England Journal of Medicine*; 362(5): 382-385.

[7] Centers for Medicare & Medicaid Services. Details for: Medicare and Medicaid Health Information Technology: Title IV of the American Recovery and Reinvestment Act. June 16, 2009.

[8] Department of Health and Human Services. Office of the National Coordinator for Health IT. 2009. *Justification of Estimates for Appropriations Committee.* http://www.healthit.gov/sites/default/files/fy_2013_onc_cj_final.pdf

[9] HIMSS. The Healthcare IT Workforce. *September 2009*. http://himss.files.cms-plus.com/HIMSSorg/Content/files/vantagepoint/pdf/VantagePoint_200909.pdf

[10] Bureau of Labor Statistics, U.S. Department of Labor. *Occupational Outlook Handbook – 2012-13 Edition.* Medical Records and Health Information Technicians. http://www.bls.gov/ooh/Healthcare/Medical-records-and-health-information-technicians.htm

[11] Hsiao CJ, Hing E. Use and characteristics of electronic health record systems among office-based physician practices: United States, 2001-2012. *NCHS data brief*, no. 111. Hyattsville, MD: National Center for Health Statistics, December 2012.

[12] DesRoches CM, Charles D, Furukawa MF, Joshi MS, Kralovec P, Mostashari F, Worzala C, Jha AK. 2013. Adoption of electronic health records grows rapidly, but fewer than half of US hospitals had at least a basic system in 2012. Health Affairs; 32(8): 1478-1485.

[13] Ibid.

[14] CSC. U.S. Health Workforce Shortages: HIT Staff. Global Institute for Emerging Healthcare Practices. Accessed 1/15/2014: http://www.csc.com/health_services/insights/50201-u_s_healthcare_workforce_shortages_hit

[15] Furukawa MF, Vibbert D, Swain M. HITECH and Health IT Jobs: Evidence from Online Job Postings. *ONC data brief*, no. 2. Washington, DC: Office of the National Coordinator for Health Information Technology, May 2012. http://www.healthit.gov/sites/default/files/pdf/0512_ONCDataBrief2_JobPostings.pdf

[16] Ibid.

[17] Schwartz A, Magoulas R, Buntin M. 2013. Tracking Labor Demand with Online Job Postings: The Case of Health IT Workers and the HITECH Act. *Industrial Relations: A Journal of Economy and Society*, 52: 941–968.

[18] Ibid.

[19] Department of Health and Human Services. Office of the National Coordinator for Health IT. *Regional Extension Centers (RECs)*. Accessed 1/7/2014: http://www.healthit.gov/providers-professionals/regional-extension-centers-recs

[20] Department of Health and Human Services. Office of the National Coordinator for Health IT. *State HIE Cooperative Agreement Program.* Accessed 1/7/2014: http://www.healthit.gov/providers-professionals/state-health-information-exchange

[21] Department of Health and Human Services. Office of the National Coordinator for Health IT. *Health IT Adoption Programs – Beacon Community Program*. Accessed 1/7/2014: http://www.healthit.gov/policy-researchers-implementers/beacon-community-program

[22] Department of Health and Human Services. Office of the National Coordinator for Health IT. *Research & Innovation – Strategic Health IT Advanced Research Projects (SHARP).* Accessed 1/7/2014: http://www.healthit.gov/policy-researchers-implementers/strategic-health-it-advanced-research-projects-sharp

[23] Based on information provided on the ONC UBT website and in the Funding Opportunity Announcement.

[24] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[25] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[26] Healthcare Information and Management Systems Society (HIMSS). 2013 HIMSS Workforce Survey, Final Report. July 2013. http://apps.himss.org/content/files/2013HIMSSWorkforceSurvey.pdf

[27] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[28] Blumenthal, D. 2010. "Launching HITECH." *New England Journal of Medicine* 362(5): 382–85.

[29] Furukawa MF, Vibbert D, Swain M. HITECH and Health IT Jobs: Evidence from Online Job Postings. ONC Data Brief, no. 2. Washington, DC: Office of the National Coordinator for Health Information Technology, May 2012.

[30] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[31] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[32] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[33] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[34] Ibid.

[35] Ibid.

[36] Ibid.

[37] Ibid.

[38] Furukawa MF, Vibbert D, Swain M. HITECH and Health IT Jobs: Evidence from Online Job Postings.ONC Data Brief, no. 2. Washington, DC: Office of the National Coordinator for Health Information Technology, May 2012.

[39] College of Healthcare Information Management Executives (CHIME). 2012. CHIME Survey Report: Demand Persists for Experienced Health IT Staff. http://www.cio-chime.org/chime/press/surveys/pdf/CHIME_Workforce%20_survey_report.pdf

[40] Ibid.

[41] Mohan, Vishu, Patricia Abbott, Shelby Acteson, et al. "Design and evaluation of the ONC health information technology curriculum." *Journal of the American Medical Informatics Association*. 10.1136 (2013): 1-8. Web. 8 Jan. 2014.

[42] Ibid.

[43] Ibid.

[44] Ibid.

[45] Ibid.

[46] AHIMA. Certified Healthcare Technology Specialist (CHTS) Exams. Accessed 1/7/2014 from: http://www.ahima.org/certification/chts

[47] AHIMA. Certified Healthcare Technology Specialist (CHTS) Exams. Accessed 1/7/2014 from: http://www.ahima.org/certification/chts

[48] Clinical Insights. *The Importance of a Coding Certificate.* August 2009. http://www.clinical-insights.com/resources-Aug09Coding.html

[49] InformationWeek. *8 Health IT Certifications That Pack Career Power.* August 2012. http://www.informationweek.com/government/leadership/8-health-it-certifications-that-pack-career-power/d/d-id/1106514

[50] Mohla C, Reed C, Keesey P, McKenzie H, Damico D, and Sital S. (2013) Readying the Health IT Workforce for Patient -Centered Team-Based Care: Understanding Training Needs. http://www.healthit.gov/sites/default/files/summer_workforce_meeting_paper_508.pdf

[51] HealthIT.gov. Workforce Development Programs: Participating Community Colleges. http://www.healthit.gov/providers-professionals/participating-community-colleges

[52] United States Department of Labor. Announcement: SGA-DFA-PY-11-08 | Applicant Name: Bellevue Community College. http://webapps.dol.gov/DOLGrantData/GrantInformation.aspx?appid=15290

[53] Section 3016, Health Information Technology for Economic and Clinical Health (HITECH) Act, Title XIII of Division A and Title IV of Division B of the American Recovery and Reinvestment Act of 2009 (ARRA), Pub. L. No. 111-5, 123 Stat. 226 (Feb. 17, 2009), codified at 42 U.S.C. §§300jj et seq.; §§17901 et seq.