Working Foundational Documents
Careers in Health Informatics Project

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Introduction

This report presents the Careers in Health Informatics Project (CHIP) preliminary foundational outputs. An accompanying technical report describes the CHIP process in greater detail.

AMIA initiated CHIP to develop a description of informatics careers that would:

- inform prospective entrants into the field about career options and current professionals about career trajectories
- help educational programs improve training options
- lay the groundwork for a future salary survey
- deepen understanding of informatics within health sector organizations
- inform federal policy related to the informatics workforce
- support AMIA programming

As a first step towards these goals, AMIA sought to describe the landscape of informatics careers in a way wherein all health informatics professionals can find themselves.

Health informatics (HI) was defined to encompass all areas of informatics from basic research to applied research to practice, and all levels of informatics focus from molecular to populations in alignment with the professional representation found within AMIA's membership.

CHIP was charged to create a multi-dimensional career framework that:

- reflects the factors that impact HI career trajectories.
- applies to HI careers in research, practice, academics, government, and industry
- conveys the depth and breadth of HI careers in diverse settings
- provides a contemporary yet forward-looking snapshot of HI careers in the U.S
- is foundational and able to evolve over time

To meet this charge, the CHIP Task Force developed a two-part organizing structure for describing HI careers – an overview of HI career stages and a matrix of HI roles. The career stage overview presents the education and experience requirements, high-level responsibilities, and common job titles generally associated with four HI career stages. The HI roles matrix describes HI roles in terms of the focus of HI work and the settings in which HI is practiced.

Health Informatics Career Stages

The Task Force developed a high-level overview describing various elements related to health informatics careers at four stages—student, early career, mid-career, and advanced career. The Overview describes in general terms the educational background and health informatics work experience typically expected, the high-level work responsibilities and scope of autonomy, and a representative set of job titles at each career stage.

Caveats

It is important to keep the following factors in mind when considering the Overview.

- The health informatics profession is incredibly diverse, and no single career pathway or trajectory applies uniformly across all health informatics professionals.
- This Overview represents a snapshot in time in a rapidly evolving profession, reflecting typical health informatics career stages in 2022. As the health informatics profession continues to evolve, the expectations related to each element of the framework may shift accordingly.
- Career stages reflect HI education, training, and experience rather than how long someone has been in the workforce. For example, ***early career in health informatics*** may apply to each of these scenarios.
    - A clinical practitioner with an advanced degree (e.g., MD, PharmD, MSN, MPH) may have just begun to work in health informatics and so is at the early career stage with regard to health informatics specifically, but is farther along their overall career journey.
    - An individual with a Bachelor's degree in information science who has been working for several years in a non-heath related field moves laterally into a healthcare system and begins working in health informatics systems development and optimization. This person is at an early-career stage relative to informatics as well.
    - Someone with little work experience completes a health informatics Master's program and begins their first job in health informatics; they are at an early point in both their HI career and their overall career journey.

  All the people described above are early in their health informatics careers, but are at different points in the own individual career journeys.
- Many clinical professionals may not devote 100% time to informatics. They may continue to practice clinically part of the time. Therefore, years of health informatics experience related to each career stage needs to be considered accordingly.

Education and Experience Expected at Various Career Stages

- Not all combinations listed in the table are required; rather, they illustrate the range of backgrounds that health informatics professionals may bring at different points in their careers. These are ***typical*** expectations across the wide range of individuals, employers, roles, and entry points to practice in health informatics.
- Combinations of educational degree/major course of study with relevant health informatics work experience are intended to reflect a balance of these factors. Various

combinations of formal degree and HI experience may lead to equivalent levels of knowledge, skills, and competencies that are relevant for career advancement.

- Educational background and amount of health informatics work experience do not move in lockstep across all health informatics career trajectories, but may vary based on several factors, including work setting, percent effort in the domain, health informatics role or function performed, organization- or system-specific career pathways, and other factors.
- Currently, there are HI professionals who have not earned a Bachelor's degree working in the mid-career phase, with the associated levels responsibility and scope of control entailed, having risen there based on their years of applied HI experience and on-the-job training. Future expectations related to degree(s) earned may make this pathway less common.
- As both undergraduate and graduate health informatics education programs become more prevalent, the expectations around the types of degrees and the amount of work experience that are expected at various career stages or points in time may become more standardized.

Notes on the educational degrees in the Overview

- Educational backgrounds of HI professionals vary in terms of highest degree earned (i.e., from high school to doctorate) and focus of undergraduate or graduate degrees. Degree focus falls into two major categories: health informatics degrees and degrees related to health informatics.
- Health informatics degrees include, but are not limited to health informatics, bioinformatics, biomedical informatics, clinical research informatics, nursing informatics
- Health informatics ***related*** degrees include, but are not limited to, medicine, nursing, pharmacy, public health, computer science, information technology, data science/analytics, library and information science, healthcare management
- For degrees mentioned in the Overview
    - Clinical and healthcare related **Master's** degrees include, but are not limited to, MSN, MPH, MHA, MLIS, MSBMI
    - Clinical **doctorates** include, but are not limited to, MD, DO, PharmD, DNP, DDS
    - Research **doctorates** include, but are not limited to, PhD, DPhil, DPH, DNSc

Responsibilities and Scope of Autonomy

- Responsibilities are meant to be high-level descriptions of major types of job functions or responsibility. Examples of more detailed responsibilities specific to particular health informatics roles or focus areas as they are performed within particular types of settings in which health informatics professionals work, are provided in the companion ***Health Informatics Roles and Work Settings*** document.
- Scopes of autonomy and control may increase with higher career stages. In some cases, professionals may develop advanced administrative informatics expertise, add supervisory and management responsibilities, and, may work across business units or in organizational leadership. In other cases, subject-matter experts advance to higher

career stages by increasing their technical informatics expertise, engaging in increasingly sophisticated work with greater autonomy over research, and providing thought leadership to the profession.

Representative Job Titles

- There is currently no standard nomenclature related to job titles. Titles are context-dependent and idiosyncratic. They are not standardized across work settings or employers
- Even the titles informatician and informaticist are not standardized. Further, organizations may use the term "informatics" to mean very different things.
- The job titles provided are descriptive of those currently used and are not intended to be prescriptive, nor do they represent AMIA's opinions.
- Similar job titles may appear in more than one career stage due to the differences in how organizations and types of employers define specific health informatics roles and constellations of responsibilities.

We note that these issues related to job titles are not specific to the HI profession, but are typical of job titles in many other professions as well.

Career Stage	Education & Experience	Responsibilities & Scope of Control/Autonomy	Representative Job Titles
Student, Trainee, Fellow	**Education** • Pursuing Associate's, Bachelor's, Master's, Doctorate (clinical or research); Post-doc fellowship • Range of majors or degree programs focused on HI or other fields • Pursuing specialized health informatics training in non-degree program (e.g., employer- or vendor-supplied HI training, HI certificate/certification) **Experience** May range from supervised educational activities to fellowship level	• Learner • Gain experience and skills through experiential learning • Support research activities during graduate education • Conduct research activities under supervision • Support performance of common informatics tasks during residency, internship, or post-doctoral fellowship • Observe and support informatics professionals and processes during student practicum experiences. • Take increasing responsibility for independently developing informatics processes and evaluating outcomes under the guidance/direction of a preceptor.	• Student • Post-doc fellow • Intern • Resident • Research trainee • Research assistant • Teaching assistant

Career Stage	Education & Experience	Responsibilities & Scope of Control/Autonomy	Representative Job Titles
Early Career	**<u>Education & experience combinations</u>** • High school or Associate's degree *plus* health informatics-specific training and/or certification and 0-to-6 years HI work experience • Bachelor's degree in educational major outside of HI and 0-to-5 years HI work experience • Bachelor's degree in health informatics or related degrees and 0-to-4 years HI work experience • Master's in health informatics, public health, information technology, or related field and 0-3 years of HI work experience • Research Doctorate in health informatics, public health, information technology, or related field and 0-to-3 years HI work experience • Clinical doctorate and 0-to-3 years HI work experience	• Perform common informatics tasks that involve following established processes • Analyze work processes, user perceptions, and system usability • Analyze and organize data to make assessments • Conduct research under supervision • Adapt and utilize health informatics systems and applications • Participate in interprofessional project teams • Contribute to budget development • Support higher-level staff	• Assistant professor • Instructor • Informatician • Informaticist • Various clinical informatician titles (e.g., Physician, Nurse, Pharmacy, Nutrition informatician) • Health informatics specialist • Clinical informatics specialist • Laboratory informatics specialist • Research assistant/associate • Associate research scientist • Health informatics researcher • Data scientist • Data analyst • Other analyst titles (e.g., analyst I, II) • Healthcare data quality analyst • Epidemiologist • Statistician • Data or systems engineer • Software developer • Solution architect • Project coordinator

Career Stage	Education & Experience	Responsibilities & Scope of Control/Autonomy	Representative Job Titles
Mid-Career	**<u>Education & experience combinations</u>** Mid-career roles ***typically*** call for at least 4 years of HI-specific work experience, and may require up to 10 years, depending on major and terminal degree • High school or Associate's degree and 8 or more years of HI work experience • Bachelor's degree in health informatics or related field and 5-to-10 years HI work experience The following combinations are consistent with AHIC requirements • Master's degree in health informatics or related field and 4-to-10 years HI work experience • Research doctorate and 4-to-8 years HI work experience • Clinical doctorate and 4-to-8 years HI work experience	• Apply informatics knowledge and skills to a range of increasingly complex situations • Extract actionable insights from HI data and processes • Use sophisticated data mining and visualization methods • Apply skills in UX, interoperability, data manipulation, program development • Develop and optimize HI systems and applications • Engage in independent decision-making to solve informatics problems • Develop expertise in specialized areas of HI based on role, function, or work setting • Engage in policy development and advocacy (e.g., in data use, sharing, and interoperability) • Lead project teams • Pursue funding for HI research and development • Develop budgets for HI projects and organizational units • Foster interdisciplinary collaboration • Serve as manager or department head in a division or unit • Manage resources and personnel	• Associate professor • Chief informatician in various clinical roles or health domains (e.g., Chief nurse, pharmacy, or physician informatician) • Manager/ Sr. manager/ Sr. program manager • Manager, EHR informatics • Sr. / Lead informatics manager • Associate/Assistant CMIO, CNIO, CHIO, CDO, CPIO • Vice president, Assistant VP • Clinical applications coordinator • Clinical informaticist/informatician • Healthcare informatics analyst • Clinical analyst • Research analyst • Analyst II, Analyst III • Program analyst • Biostatistician • Sr. / Lead epidemiologist • Sr. / Lead data scientist • Sr. / Lead laboratory informatician • Sr. / Lead systems analyst • Sr. / Lead HI architect • Sr. / Lead software engineer • Sr. / Lead data or systems engineer • Sr. / Lead application coordinator • System specialist • HIT manager • Library director • Consultant

Career Stage	Education & Experience	Responsibilities & Scope of Control/Autonomy	Representative Job Titles
Advanced Career	**<u>Education & experience combinations</u>** Advanced-career roles ***typically*** call for 8-to-10 or more years of HI work experience for all educational degrees • Master's degree or above in a primary health field • Master's degree in HI, biomedical informatics, or related field • Research doctorate in health informatics, bioinformatics, or related field • Clinical doctorate	• Engage in complex health informatics research, systems development and optimization • Develop strategic goals and oversee initiatives related to innovation in the use of health informatics • Develop strategic goals and lead initiatives related to the optimization of health information technologies, systems, and architectures • Lead departmental and organizational initiatives to optimize the collection, analysis, and application of health data • Contribute to organization-level financial planning • Lead organizational change in technology, practice, and culture • At this career stage, judgments may impact organizational performance	• Professor • Department chair • Dean • Various Chief clinical informatician titles (e.g., CMIO, CNIO, CHIO, CDO, CPIO) • Other C-suite titles, incl. CEO • Medical officer • Director, • Sr. Director • Executive director • Sr. VP (for various departments or functions) • President • Lead epidemiologist • Lead laboratory informatician • Program director • Research scientist • Sr. clinical researcher • Sr. clinical research informatician • Sr. systems analyst • Sr. content solution designer • Sr. policy advisor • Consultant, Sr. consultant

HI Roles: Focus Areas and Work Settings

The overarching goal of health informatics work is to improve the health of individuals, populations, and communities. Informaticians may contribute to this goal by applying their informatics expertise to:

- Discovery of biomedical and clinical knowledge
- Transformation of healthcare delivery and health promotion processes
- Development of a workforce with informatics competencies
- Enhancement of national, regional, or organizational infrastructures that enable informatics practice

HI professionals perform their work in myriad health sector organizations. The focus of an organization's efforts to advance health (e.g., through research, via healthcare delivery) determines which informatics skills, abilities, and competencies are most essential for a particular work setting. Different types of organizations might pursue the same general focus but do so from different perspectives (e.g., provide patient care services, versus bring new EHR functions to the market, versus create safety standards).

In recognition of the multiple factors that shape HI professional roles, the Task Force described informatics roles in terms of:

- primary emphasis or **focus of health informatics work** (i.e., work that entails the application of informatics models, concepts, and theories)
- **major settings** where health informatics work is performed.

These two dimensions serve as the axes for the matrix that the Task Force developed to describe the range of typical informatics roles. Descriptions of the elements included in these axes appear below.

Some activities performed by HI professionals cut across all informatics focus areas and roles. These include innovation, discovery, evaluation, performance improvement, continuous quality improvement, knowledge generation, and knowledge dissemination. When approached from a systems perspective, these activities can be framed as part of a "learning health system." All informatics professionals have a role to play in achieving a learning health system.

Caveats

The matrix of HI roles developed during this project:

- captures the current point in time for a dynamic field during a rapidly evolving era for both the structure of work in general, and health informatics work in particular
- offers flexibility to accommodate anticipated evolution in HI roles
- is intended to be descriptive rather than prescriptive
- is not exhaustive, given the wide range of ways that informaticians are involved in the health sector

Some of the identified settings involve all areas of HI work focus, while other settings primarily involve one or two areas of HI work focus. As a result, there may be areas of the matrix that are less populated than others.

HI professionals in the workforce are not evenly distributed across settings. Based on previous surveys conducted by AMIA, the majority of informatics professionals work in healthcare delivery organizations or systems, followed by universities, industry, and public health agencies. Settings where fewer numbers of informaticians work have been grouped together in groups that have commonalities in goals or mission; however, this does lead to some challenges in characterizing informatics work in these settings fully.

Job titles and work activities are not unique to settings or work focus areas.

Many job titles could be modified by specifying “informatics” or “interoperability” before or after the titles.

Health Informatics Work Focus

The primary HI roles and focus areas are outlined below.

- **Discover New Knowledge and Optimize Existing Knowledge**
    - Expand understanding of biomedical and health data, information, knowledge, decision making, and related technologies
    - Conduct or support quantitative and qualitative research using informatics methodologies and tools
    - Create informatics tools (including systems and applications) and methodologies in support of advancing biomedical science and transforming health services delivery
- **Improve Individual, Population, and Community Health Processes and Outcomes**
    - Use health informatics approaches to transform health systems and processes
    - Apply informatics theories, methods, and practices to health information systems and health data
    - Translate research into innovation and practice
    - Support emerging evidence-based approaches to health promotion and care delivery
- **Develop Health Informatics Workforce and Users**
    - Provide education, training, and professional development in health informatics across settings and systems
    - Provide mentorship, leadership, and collaborative support

- **Advance the Health Informatics Ecosystem**
    - Design, develop, and manage capacities and technical infrastructure needed to leverage the potential of data and information systems to support healthcare delivery, public health, and biomedical and clinical research
    - Develop policies to advance health informatics and inform public policy
    - Develop guidelines and policies for the ethical use of health information technology and adhere to professional codes of ethics
    - Develop infrastructure to enable health professionals to share information across health organizations or setting
    - NOTES: The HI ecosystem can be at multiple levels – organizational, system or national. This may be a part-time or even volunteer function or focus area.

Work Settings

The types of employers, organizations, and settings where health informaticians are outlined below.

- **Health Care Delivery Organizations**

  This setting includes all types of healthcare delivery organizations, including public (e.g., VA, DOD, Indian Health Service) and private healthcare delivery systems, community hospitals, long-term care facilities (e.g., nursing homes), pharmacies, laboratories, and clinician practices. These organizations typically provide healthcare services directly to patients or provide tools to support personal health management.

- **Public Health Agencies**

  These government agencies focus on surveillance, prevention, preparedness, guidance, and promotion of public health and related work in population health (e.g., federal, state, local, or tribal health agency, CDC).

- **Universities and Research Centers (Public and Private)**

  This setting includes organizations such as universities, government agencies, and private research institutes where the preponderance of research occurs (e.g., National Institutes of Health, RTI, Westat). Universities also play a pivotal role in the development of the HI workforce through degree programs, fellowships, and other education activities.

- **Industry, Vendors, and Consulting Firms**

  This setting includes a wide range of for-profit private sector organizations that develop and offer information systems and related tools to support the health sector, employ informatics practices and tools to develop health products, and support health organizations in the implementation of HIT or achievement of other organizational objectives. This setting includes, but is not limited to, electronic health record (EHR) and related systems, pharmaceutical, digital health, medical

equipment, biotech, biomedical engineering, and imaging vendors; and change management and organizational development consulting firms.

- **Government Agencies and Entities that Support Health Research, Public Safety, and the Health Information Infrastructure**

  This setting includes government agencies and entities that support and advance use of health informatics throughout the health sector through vision, policy, and funding (e.g., NIH, NLM, NSF, AHRQ, FDA, ONC).

- **Policy and Professional Associations, Non-Profit Collaborative Organizations, Community Groups, Foundations, NGOs**

  This setting includes a wide range of non-profit private sector organizations that provide leadership, vision, funding, representation of stakeholder perspectives, and platforms for building consensus. This setting includes, but is not limited to, WHO, JSI, PATH, IHTSDO, SNOMED International, IEEE, HIEs, HL7, ISO, Robert Wood Johnson Foundation, AMIA, HIMSS.

- **Public and Private Payors/Insurers**

  This setting includes organizations that pay for healthcare services and set standards for the quality of services provided. Due to their influence, insurers play a pivotal role in shaping healthcare delivery (e.g., Centers for Medicare and Medicaid (CMS), state Medicaid programs, private insurers, pharmacy benefit managers).

Health Informatics Roles

Work Setting	Health Informatics Work Focus			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
Health Care Delivery Organizations	**Examples of HI job-related activities** • Extracts meaningful patterns from biomedical and other types of data (knowledge discovery), using automated computational and statistical tools and techniques (data mining) • Collects data and information as a by-product of delivering care • Develops systems to collect, collate, and manage information • Develops alone or with vendors new kinds of clinical decision support	**Examples of HI job-related activities** • Integrates clinical and information processes to achieve successful adoption and application of new technologies. • Supports all aspects of managing and optimizing clinical computing tools • Designs, implements, and adapts HI systems • Improves tools and techniques • Leads and/or implements organizational change • Administers and manages programs and organizational operations • Develops telehealth solutions • Develops and implements organizational health data governance • Analyzes workflow and processes • Creates tools to support patient engagement • Evaluates effectiveness of health informatics activities and supports quality improvement related to user experience and IT usability • Assesses impact of information systems on health equity	**Examples of HI job-related activities** • Coordinates, develops, and facilitates activities related to computer applications, documentation tools, and implementations impacting Health Informatics initiatives. • Leads and/or implements organizational change to promote adoption of HI • Educates, guides, and mentors staff in the value and use of health informatics systems • Contributes to training materials and participates in training related to HI systems	**Examples of HI job-related activities** • Develops system-wide informatics infrastructure • Expands the interoperability of data between and among other health care delivery systems and community-based organizations • Create/maintain multi-organization distributed query systems • Implements systems to collect, collate, and manage information • Supports regional/national health data governance • Serves as the conduit for bringing the national/international informatics evidence to regional/local level to enhance organizational informatics maturity • Represents informatics and promotes the value and benefit of the field and personnel as an essential part of the healthcare delivery system

Work Setting	Health Informatics Work Focus			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
	Examples of Job Titles • Data scientist • Data analyst • Epidemiologist • Knowledge-based systems specialist • Researcher • Research scientist	**Examples of Job Titles** • Clinical informatician • Health informatician (non-clinical) • Health informatics specialist • Data scientist/analyst • Project manager • Systems developer/designer • Consumer health informatician • Healthcare terminologist • Health information officer • Change management officer/leader/coordinator/specialist • Telehealth specialist/implementor/analyst • CMIO/CNIO/CPIO • Business analyst • Usability analyst • Clinical systems analyst • Patient safety officer/director • Quality improvement officer/director	**Examples of Job Titles** • Health informatics specialist • Trainer for HI system users • Clinical informatics faculty • Informatics workforce development officer • Clinical informatics fellowship program director • Change management officer/coordinator/specialist	**Examples of Job Titles** • Chief, health informatics • Director, health informatics • VP, health informatics • EHR integrator • Interoperability manager/coordinator • Cloud services lead • System architect

Work Setting	Health Informatics Work Focus			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
Public Health Agencies	**Examples of HI job-related activities** • Investigates public health, population health, and health equity issues, challenges, and trends using informatics • Conducts research on new methods for public health informatics (e.g., advanced bio-surveillance/syndromic surveillance capabilities, outbreak management) • Supports research related to population health issues such as communicable and environmentally mediated diseases, and chronic diseases that present population level challenges	**Examples of HI job-related activities** • Uses informatics tools (e.g., data visualization) to support health promotion, manage outbreaks, improve individual and community health, and advance health equity • Supports efficient reporting (e.g., vital events, disease, injury, immunizations) from healthcare providers • Supports emergency preparedness and response of healthcare organizations • Works to advance interoperability between clinical and public health systems • Accesses, manages, and extracts actionable information from public registries • Implements community-level health improvements using various data sources including patient-generated data • Implements change management initiatives	**Examples of HI job-related activities** • Trains public health and population health workforce • Improves informatics understanding in frontline public health workers • Partners with educational programs to advance understanding of public health by health workforce	**Examples of HI job-related activities** • Develops, implements, and maintains inter-organizational data pooling for surveillance, research, and intervention • Develops systems to collect and manage environmental and climate information to track impact on health and identify appropriate intervention strategies • Develops, implements, and maintains health surveillance systems and other population-based measures of health • Develops system used in preparedness for infectious disease outbreaks • Communicates the value of and need to invest in high quality, interoperable data to policy/decision makers
	Examples of Job Titles • Epidemiologist • Public health analyst/specialist • Administrator • Planning director • Data scientist • Research scientist • Program manager	**Examples of Job Titles** • Epidemiologist • Public health informatician • Data and interoperability lead • Administrator • Project manager • Program manager • Information technology specialist	**Examples of Job Titles** • Public health informatician • Program manager • HI system trainer	**Examples of Job Titles** • Immunization registry administrator • Biosurveillance network coordinator • Chief informatics officer • Chief interoperability officer • Interoperability manager/coordinator • Cloud services lead • Policy analyst

Work Setting	Focus of Health Informatics Work			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
Universities and Research Centers (Public and Private)	**Examples of HI job-related activities** • Generates knowledge of health informatics methods, processes, and uses through research • Develops informatics tools, techniques, and systems for basic, biomedical, clinical, and qualitative research to improve the process of both discovery and evaluation of efficacy of interventions • Engages in biomedical discovery using advanced informatics tools and techniques (e.g., drug discovery, diagnostics) • Develops new ontologies, terminologies, messaging, and transmission standards and/or implementation guides to enhance interoperability	**Examples of HI job-related activities** • Develops informatics tools (e.g., CDS and knowledge dissemination) to support health promotion and healthcare delivery • Implements, improves, and maintains systems that support cutting-edge patient care (e.g., genome analysis, DNA sequencing, tumor boards, algorithms that monitor care quality) • Engages patients and the public to conduct research that informs care delivery, behavioral and mental health. • Studies the value and unintended consequences of informatics tools deployed in clinical and public health systems, HIT usability and clinician burden, bias mitigation in practice patterns and system development and deployment	**Examples of HI job-related activities** • Designs, develop, implements, and evaluates educational programs at all levels and across various modalities (e.g., curriculum, internships) • Provides just-in-time training of health professionals • Provides supervision and mentorship to students and trainees	**Examples of HI job-related activities** • Serves on work groups or task force groups that inform federal, state, and local other agencies • Volunteers with scientific societies or consensus-building activities • Develops and oversees data integration processes and procedures • Develops processes and systems that make data access for translational researchers easier • Educates regulators and elected officials on the benefit of health information systems and provides advice on legislative initiatives
	Examples of Job Titles	**Examples of Job Titles** • Technician • Clinical informatician • Clinical bioinformatician • Data scientist/analyst • Information specialist	**Examples of Job Titles** • Professor (all levels) • Dean/Associate dean • Program coordinator • Department head • Department chair • Director • Program director • Faculty • Adjunct faculty • Instructor	**Examples of Job Titles** • Dean/Associate dean • Professor (all levels) • Institute director • Researcher • CIO/CRIO • Research network manager • Interoperability manager/lead • Committee chair • Committee member

Work Setting	Focus of Health Informatics Work			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
	• Biomedical informatics researcher • Health informatics researcher • Translational bioinformatician • Clinical research informatician • Imaging informatician • Research scientist • Research specialist • Data scientist • Data analyst • Research associate • Professor • Epidemiologist		• Informatics educator • Biomedical informatics educator • Master's-level educator • Doctoral-level educator • Fellowship advisor • CMIO/CNIO/CPIO • Library director • Information scientist	

Work Setting	Focus of Health Informatics Work			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
Industry, Vendors, and Consulting Firms	**Examples of HI job-related activities** • Conducts health, clinical, pharmaceutical, imaging, laboratory, usability, etc. research and/or develops applications to support healthcare and public health • Generates new informatics knowledge about applied health informatics, including implementation science • Enhances regulation-compliant access to health input and outcomes data • Works with health organizations and universities to conduct research on CDS development, knowledge dissemination, standards development, etc.	**Examples of HI job-related activities** • Develops and optimizes health information systems and applications to meet client needs (including EHRs, ancillary systems, public health management systems, mobile health, patient-facing applications) • Develops biomedical/hospital equipment and systems, including imaging, that integrate with EHRs • Identifies requirements for system development, including engineering, UX, knowledge representation • Engages clinicians and other system users to obtain guidance on tools that will positively impact health care processes • Collaborates with health organizations and other vendors to install and evaluate new systems and tools • Brings new HI discovery or applications to the marketplace	**Examples of HI job-related activities** • Provides support to end users • Provides support to in-house technical and IT staff	**Examples of HI job-related activities** • Provides regulatory and integration support • Pursues interoperability among health systems and across vendor platforms by addressing technical feasibility, using standardized terminology, applying standardized profiles of semantic, syntactic and secure connectivity • Supports knowledge dissemination through open science and access • Supports public and private sector standards development initiatives • Investigates the development of systems to collect, collate, and manage information
	Examples of Job Titles • CTO/CKO/CHIO • Clinical research informatician • Research informatician • Translational bioinformatician • Business analyst • Usability expert • Clinical informatics consultant • Scientist • Data scientist	**Examples of Job Titles**	**Examples of Job Titles** • Trainer of system users • Consultant • Systems support / coach • E-learning team leader • Instructional developers, multi-media developers	**Examples of Job Titles**

Work Setting	Focus of Health Informatics Work			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
		• CMO, CMIO, CNO, CNIO, CEO • System developer • App developer (digital health) • Consumer health informatician • Data scientist • Software developer • System or software engineer • Information specialist • Director health informatics and clinical quality management		• Health informatician • Business analyst • Data analyst • Manager, content delivery • Terminology specialist • Director, informatics • Interface coordinator • System architect • Information architect • Vice president, informatics

Work Setting	Focus of Health Informatics Work			
	Discover New and Optimize Existing Knowledge	**Improve Individual, Population, and Community Health Processes & Outcomes**	**Develop Health Informatics Workforce and Users**	**Advance the Health Informatics Ecosystem**
Government Agencies and Entities that Support Research, Public Safety, and the Health Information Infrastructure	**Examples of HI job-related activities** • Identifies trends and areas for research • Conducts basic, biomedical, clinical, or health services research • Develops, improves, and refines resources and terminologies • Develop software review tools • Develop informatics systems to track safety of new drugs during the drug development process	**Examples of HI job-related activities** • Creates federal processes that protect public health by regulating medical devices and Artificial Intelligence (AI) algorithms • Works to safeguard privacy, security, and program integrity (e.g., fraud, waste, and abuse) • Develops policies and regulations that drive the implementation and use of health information technology • Develops, improves, and refines resources and terminologies • Creates and maintains processes to improve individual and population health by identifying and maintaining quality measures, facilitated by use digital information collection • Develops standardized and publicly available tools for implementation within healthcare delivery systems	**Examples of HI job-related activities** • Funds, supports, and oversees federal education programs in HIT and informatics • Manages university fellowship programs and other programs to support young researchers • Manages fellowship program within agency. • Supports education of health systems, industry, vendors and consultants on relevant public policy	**Examples of HI job-related activities** • Articulates national, state, or regional vision and priorities • Develops strategies and policies to enable effective use of HI throughout the health sector and promote safe use of HI advances (e.g., AI, ML, PGHD) • Informs legislation • Build consensus on standards and other cross-cutting issues • Supports research, evaluation, and dissemination of new knowledge and best practices • Develops vision for national informatics infrastructure • Develops and maintains standards, terminologies, and technical specifications • Develops safety analytics standards • Promotes, supports, standardizes, and incentivizes HIE development • Leads/coordinates/informs activities to improve interoperability of health information systems • Identifies knowledge gaps that impede knowledge dissemination and effective use of information in

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				the health sector and develops programs to address those gaps • Analyzes policy • Sets priorities for funding and research • Allocates resources to formative initiatives
	Examples of Job Titles • Policy and regulations developer • Investigator in Clinical Data Science • Investigator in Biomedical Image Processing • Staff scientist 1 • Health/Population officer • Associate director of biomedical informatics • Clinical data scientists • Public health informatician • Laboratory informatician • Terminologist	**Examples of Job Titles** • Systems developer • Informatician • Data scientist • Epidemiologist • Health officer • Privacy /security/ officer	**Examples of Job Titles** • Program director	**Examples of Job Titles** • Regulation and policy developer • Librarian • Program officer • Staff scientist • Scientific director • Investigator in clinical data science • Investigator in biomedical Imaging • Policy (Program) analyst • HI branch chief • Strategic information branch chief • Legislative aide

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Policy and Professional Associations, Non-Profit Collaborative Organizations, Community Groups, Foundations, NGOs	**Examples of HI job-related activities** • Develops/enhances new systems, architecture, and terminology for use in other settings • Conducts research specific to communities, stakeholder groups, or populations • Synthesizes existing knowledge into wisdom while collaborating cross-system informatics problems	**Examples of HI job-related activities** • Develops programming to support/address underserved and underdeveloped countries and communities, health equity, social determinants of health, and other emergent areas • Collects, analyzes, and disseminates information provided by the community and patients to inform health initiatives	**Examples of HI job-related activities** • Manages training grants for researchers and other doctorally-prepared professionals • Manages grants to support curriculum development • Expands understanding of the value of informatics to achieving health system goals within home organization and across the health sector • Organizes conferences and publications to disseminate health information technology knowledge	**Examples of HI job-related activities** • Develops policy and interventions/technologies • Provides input into funding of research agendas and other ecosystem projects • Represents stakeholder interests • Identifies knowledge gaps that impede knowledge dissemination and effective use of information in the health sector and develops programs to address those gaps, usually through contracts and grants • Supports development and maintenance of standards, terminologies, and technical specifications
	Examples of Job Titles • Researcher • Research scientist • Health system researchers • Community health research informatician • Data scientist • Business analyst	**Examples of Job Titles** • Global health informatician • Digital health specialist • Data analyst • Policy analyst • Program analyst	**Examples of Job Titles** • Digital health specialist • Health informatics specialist • Health informatics educator • Instructor • Director, conferences/education programs	**Examples of Job Titles** • Standards developer • Health informatician • Community health informatician • Systems architect • Program manager • Policy analyst • Vice president, informatics

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Payors/ Insurers	**Examples of HI job-related activities** • Analyzes claims, enrollment, EHR, and customer service data to monitor quality, and predict outcomes generally and for specific populations • Integrates diverse data from a variety of sources, including text data	**Examples of HI job-related activities** • Uses predictive analytics, including machine learning techniques, and population health management practices to support case management targeted interventions for subscribers/enrollees and providers • Supports organizational risk adjustment activities • Identifies gaps in care and quality and cost variation within regions and among providers • Identifies, implements, and analyzes state of the art measures of health and healthcare in collaboration with appropriate stakeholders • Builds portals or apps, including dashboards, to support subscriber/enrollee and provider ability to manage care, access relevant health knowledge, and track costs and quality • Communicates with providers regarding performance, including in value-based programs	**Examples of HI job-related activities** • Builds informatics, data, and analytics expertise among organizational staff • Supports training opportunities for fellows/trainees • Expands understanding of value-based care best practices across health organizations	**Examples of HI job-related activities** • Supports interoperability of payment systems • Develops systems to link claims and clinical data • Facilitates development and use of HIEs • Collaborates with healthcare delivery, industry, and academic organizations to identify and implement new approaches for care delivery and health promotion, and alternative payment models • Evaluates program interventions and value-based programs for continuous improvement opportunities and dissemination • Chairs organizational governance structure to ensure data privacy, appropriate data sharing and data use
	Examples of Job Titles • Systems analyst • Data analyst • Data scientist	**Examples of Job Titles**	**Examples of Job Titles** • Health informaticist senior-RN • Chief informatics officer	**Examples of Job Titles** • Healthcare informatics analyst • System architect • Health informatician • Chief informatics officer • Director, analytics • Data scientist

		• Database manager • Quality manager • Healthcare informatics analyst • Senior clinical informatics analyst • Outcomes analyst • Data scientist • Health informaticist senior-RN		