What training and competencies are required for public health practitioners to support the digital transformation of public health? A rapid review

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Competencies for digital public health identified in the literature.

Competency category	Competency statements
Public Health Sciences	• Develop and ethically apply research methods including data science, statistical genetics & omics technologies (i.e., exposomes), computational biology, epidemic and infectious disease modeling to public health problems.[1–6]
	• Apply systems thinking to public health issues[7]
	• Use different types of data to answer public health questions.[6,8]
	• Aid public health organizations in thinking through, designing and testing new systems.[8]
	• Conduct education and training in public health informatics.[9]
Assessment and analysis	• Use, protect and interpret complex, linked large data sets from multiple sources and across levels of organization from administrative, clinical, biologic, environmental, population to social/societal levels, within and outside the health systems.[1,2,4,5,8–10]
	• Design, analyze and report health science data using a blend of traditional and modern analytic and computational techniques (e.g., biostatistics, informatics, computer-based programming, and software, as appropriate - Tableau, python, MS-SQL, R).[1,2,4,8]
	• Identify needs, challenges, principles, and key details for data sharing, challenges of large-scale data management.[3,4,8,9]

	• Know and understand methodological and statistical problems inherent in the analysis of secondary and big data.[4]
	• Use and interpret findings from data exploration tools and other analytics.[4,9]
	• Use information technologies and communication tools necessary to support epidemiologic investigations and surveillance - e.g., smartphone survey, GPS tracking.[3,4]
	• Understand how "omic" tools can be integrated into an ecological model of health including social and environmental determinants.[3,10]
	• Identify the role of emerging "omics" technologies applicable to epidemiologic research and incorporate them into epidemiologic research.[3,10]
	• Understand general methods for linking data resources for creating information.[3–5]
Policy and program planning, implementation, and evaluation	• Design, implement and evaluate population-based projects, programs or interventions that use social media as a communication platform and a tool for public health education and promotion.[11]
	• Develop tools that protect the privacy of individuals and communities involved in health programs, policies, and research.[3]
	• Support use of informatics to promote disease prevention at the clinical health, environmental and personal health interface.[5]
	• Ensure that knowledge, information, and data needs of project or program users and stakeholders are met.[9]
	• Design, develop and implement user-centred population health information systems.[7,9]
	• Support information system development, procurement, and implementation that meet public health program needs.[7–9]
	• Establish frameworks for evaluating the implementation process of information systems and applications and make recommendations to improve user satisfaction and outcomes.[7–9]
	• Evaluate communication - Assess reach and dose of communication using tools (e.g., website and social media analytics, data mining software, focus groups, in-depth interviews).[3,4,12]

Partnerships, collaboration, and advocacy	• Develop team approaches that bring together diverse disciplines and organizations to develop new and creative ways of designing and implementing studies and addressing public health concerns.[4,9,12]
	• Assess stakeholder data, information, and knowledge needs.[7,8]
	• Use new media to conduct advocacy e.g., social media[12]
	• Manage IT operations related to project or program and those managed by external organizations.[9]
Diversity and inclusion	• Develop team approaches that bring together diverse disciplines and organizations to develop new and creative ways of designing and implementing studies and addressing public health concerns.[4,9,12]
Communication	• Effectively communicate with teams through emails, word processing, spreadsheet, and presentation software.[1,5]
	• Use evidence-based communication program models to disseminate research and evaluation outcomes.[3,4]
	• Use mass media, electronic technology, and communication methods (e.g., social media, social) for public health communication, health education and promotion.[4,11,12]
	• Use information technology to assure openness of public health agency processes and responsiveness to the public.[5,8]
	• Define target audience, develop correct messaging to reach people where they are, considering the people, places, and media they interact with daily and the information sources and formats they trust.[3,4,8,11,12]
	• Tailor surveillance information content and periodicity of dissemination for specific audiences and their uses.[3,4]
	• Evaluate communication - Assess reach and dose of communication using tools (e.g., website and social media analytics, data mining software, focus groups, in-depth interviews).[3,4,12]
Leadership	• Support development of strategic direction for public health informatics within the enterprise.[9]
	• Show entrepreneurial orientation through proactiveness, innovativeness and risk-taking to advance public health, address newly emerging public health issues and better understand risks when aligning community health partners to address health inequities.[11]

	• Address IT development using principles of systems thinking and engineering.[5,7,9,11]
	• Communicate PHI needs and proposed solutions to leaders in public health and elected officials effectively.[5,8]
	• Contribute to the consideration of the best IT systems to use by the enterprise.[5]
	• Manage and direct health informatics planning for projects related to public health and information technology.[8,9]
Data and data systems management and governance	• Apply procedures (policies) and technical means (security) to ensure integrity and protection of confidential information in electronic files and computer systems while maximizing the benefits to public health.[3,4,7–9]
	• Develop tools that protect the privacy of individuals and communities involved in health programs, policies, and research.[3,4,7]
	• Contribute to development of public health information systems that are interoperable with other relevant information systems.[8,9]
	• Manage data and information in compliance with policies, protocols, and informatics standards.[8,9]
	• Aid public health organizations in thinking through and designing testing strategies for new systems.[8]
	• Describe systems analysis methodology, requirements, use cases, data flow diagrams, business process modeling, data modeling, relational data theory, normalization, entity relationship diagrams, SQL, and data warehouses.[8]
	• Document business rules using algorithms and pseudocode.[8]
	• Assess and manage risks associated with using and sharing data and information, data security and intellectual property.[8]
	• Describe conceptualizations of data, medical vocabulary nomenclature, terminologies, coding and classification, standards ethics, privacy, security, health systems, computer technologies, health information exchange, data quality, and information architectures.[8]
	• Construct transactions for health information exchange.[8]

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